~~Appendix L~~Appendix K Construction Inspection Checklists

Inspections before, during and after construction are required to ensure that SWMPs are built in accordance with the approved plan specifications. Inspectors will use detailed inspection checklists that require sign-offs by qualified individuals at critical stages of construction to ensure the contractor's interpretation of the plan is consistent with the designer's intent.

This appendix includes the following construction phase inspection checklists:

~~**Practice Type Page**~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Green Roof Construction Inspection Report**~~

~~Building Permit # _____ Plan # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Date Started: _____ Final Inspection Date: _____~~

~~Green Roof Type: Extensive __ Intensive __ New Construction__ Retrofit of Existing Roof__~~

~~If this is a Retrofit Green Roof Attach a Copy of the Roof Structural Certification__~~

~~As-Built Plan Due Date: _____~~

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~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~Deck Preparation :~~ ~~Is the deck free of all trash, debris, grease, oil, water and moisture?~~ ~~Are all concrete surfaces properly cured, dry and free of voids, cracks, or holes?~~ ~~For retrofitted roofs are all existing membranes and flashing removed to the bare concrete or deck?~~ ~~Are all expansion joints free of broken edges or loose aggregate and sealed to a depth at least twice as wide as the joint?~~ ~~Is a leak detection device installed? *(include manufacturer and testing information)*~~				
~~Water Proofing:~~ ~~Certification: identify type: Hot or Cold applied?~~ ~~Does the waterproofing system require an applicator "certified" by the manufacturer? (*attach certifications)*~~ ~~Are site conditions appropriate for application of water proofing materials? (*note temperature and moisture conditions*)~~ ~~Have the correct number of water proofing layers been installed as per the approved green roof plan?~~ ~~Does the membrane reinforcement and flashing meet plan specifications? (*attach invoice and/or manufactures certifications*)~~ ~~Is protection provided for water proofing membrane? (*specify membrane type, indicate the duration between installation of membrane and media*)~~				
~~Water Test:~~ ~~Has a water test been conducted? Verify the water test is conducted according to test standards demonstrating two inches of water ponding for a 24- 48 hour period. *(attach water test report)*~~				

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~~**Green Roof Construction Inspection Report - Continued**~~

~~Project Name and Address: _____ File and WPD No_____~~

~~**Inspection Item**~~	~~**No**~~	~~**Yes**~~	~~**Remarks**~~	~~**Date**~~
~~**Green Roof Components:**~~ ~~Do the **over flow drains** meet plan specifications? Verify dimensions, materials and locations.~~ ~~Do **drain boxes, vent pipes** and **other penetrations** meet plan specifications? Verify locations, water proofing details, flashing details and finish details. Verify materials selection and construction.~~ ~~Identify if this is a tray system or a built in place system.~~ ~~Do the **root barrier, insulation, moisture retention layer, filter fabric, and drainage layers** meet plan specifications? (*attach invoice and manufactures' certifications*)~~ ~~Does the **growing media** meet plan specifications? Verify depth of growing material.~~ ~~(*attach invoice and manufactures' certifications*)~~ ~~Does the **vegetation layer** meet plan specifications? Verify **vegetation source – plugs, seeds, pre grown mat, species mixture, coverage.**~~ ~~(attach invoice and laboratory certification)~~ ~~Does the **metal curbing** and **flashing** meet plan specifications (attach invoice and manufactures' certifications)?~~ ~~Are all **seems**, **joints** and **edges** caulked and sealed with approved grade of caulk or sealant~~ ~~(Attach Invoice)?~~ ~~Do **pedestals** and **pavers** and non- vegetated areas meet plan specifications (type, and location)?~~				

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~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Green Roof Construction Inspection Report - Continued~~

~~Project Name and Address: _____ File and WPD No_____~~

~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~**Irrigation:**~~ ~~Is there an irrigation system?~~ ~~Is the system installed to plan specifications? Verify **water source, location, service access, and pressure.**~~				
~~**Plantings and Housekeeping:**~~ ~~Modular System _Vegetated Mats _Plugs_ Other_~~ ~~Do plants meet size and variety specifications?~~ ~~Are all plants installed as per plan specifications? Note the planting **distribution,** the **depth of media,** and whether or not **adequate watering** was provided.~~ ~~Is temporary netting or wind uplift protection required?~~ ~~Have all planting waste materials, and construction trash and debris been pickup and removed from the roof?~~				

~~Contractor/Engineer_____ Inspector_____ Date_____~~

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~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Rainwater Harvesting - Construction Inspection Report**~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

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~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date~~
~~**Subgrade Preparation:**~~ ~~Has the subgrade been properly prepared and tank foundation installed as shown on plans?~~				
~~**Contributing Drainage Area:**~~ ~~Does the rooftop area draining to the tank match the plans?~~				
~~**Conveyance and First Flush Diversion:**~~ ~~Do the gutters meet specifications with the correct sizing, elevation, and slope?~~				
~~Is the first flush diversion system properly sized and installed?~~				
~~Are mosquito screens properly installed on all tank openings?~~				
~~**Pump System (where Applicable):**~~ ~~The pump and piping to end uses (indoor, outdoor irrigation, or tank dewatering release) has been properly installed~~				
~~**Overflow System:**~~ ~~Overflow device is directed as shown on plans~~				
~~Catchment area and overflow area are stabilized~~				
~~Secondary stormwater treatment practice(s) (if applicable) is installed as shown on plans~~				
~~**Final Inspection:**~~ ~~Is water conveyed into tank and to end uses appropriately?~~				

~~Owner/Agent_____ Inspector_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

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~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Impervious Cover Disconnection - Construction Inspection Report~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Type of Disconnection: Simple_____ Dry Well_____ Rain Garden_____ Other_____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

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~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date Completed~~
~~**Site Preparation:**~~ ~~Have soil erosion and sediment controls been properly installed and maintained according to approved plans?~~				
~~Do site excavation and grading conform to the site plans?~~				
~~Has the pervious receiving area avoided compaction during excavation?~~				
~~**Contributing Drainage Area:**~~ ~~Does the impervious area draining to the receiving pervious area match the plans?~~				
~~**Practice Geometry:**~~ ~~Does the receiving pervious area match the dimensions and slopes shown on the plan?~~				
~~Has a secondary practice been installed according to plan (if required)?~~				
~~**Vegetation:**~~ ~~Does the pervious area vegetation comply with the approved planting plan and specification?~~				
~~Topsoil mixture, soil amendments, and soil compaction comply with plan (if required)~~				
~~**Final Inspection:**~~ ~~Have the contributing impervious area and the receiving pervious area been stabilized?~~				
~~Can water flow properly into the receiving pervious area?~~				

~~Owner/Agent~~ _____ ~~Inspector~~ _____ ~~Date~~ _____

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

~~Impervious Cover Disconnection construction inspection 03/2011~~

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WATERSHED PROTECTION DIVISION

INSPECTION AND ENFORCEMENT BRANCH

Permeable Pavement – Construction Inspection Report

Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward: _____

Contractor: _____ Telephone # _____

Engineer: _____ Telephone # _____

Responsible For Maintenance: _____ Telephone # _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Site Preparation: Have soil erosion and sediment controls been properly installed and maintained according to approved plans?				
Is stormwater runoff being diverted around the facility?				
Has the contributing drainage area been fully stabilized?				
Subgrade Preparation: Is subgrade suitable free of debris, standing water, proper grading				

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~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date~~
~~If design is for infiltration, verify soils have not been compacted.~~				
~~Excavated soil stockpile is located away from facility with soil erosion and sediment controls in place?~~				
~~**Filter Layer or Geotextile Fabric (where Applicable):**~~ ~~The filter layer and/or geotextile fabric have been installed according to the specifications.~~				
~~**Underdrain and Reservoir Layer:**~~ ~~Does the underdrain meet specifications with correct perforation pattern, elevation, and slope?~~				
~~Caps are placed on the upstream (but not the downstream) ends of the underdrains~~				
~~Does the stone reservoir meet specifications (clean, washed, free of fines) and is it installed to design depth?~~				
~~Is at least 2 inches of aggregate provided above and below the underdrains?~~				
~~**Surface Material:**~~ ~~Does the surface material meet the specification and has it been properly installed?~~				
~~Is the surface even and can runoff spread evenly across it?~~				
~~Has the surface material had adequate curing time (for porous asphalt and pervious concrete)~~				
~~Is the surface free of fines and areas of clogging?~~				
~~**Over Flow Drain (where Applicable):**~~ ~~Is overflow invert at correct elevation?~~				
~~**Final Inspection:**~~ ~~Can water infiltrate properly into the practice?~~				
~~Does the reservoir storage layer drain within 48 hours?~~				

~~Owner/Agent_____ Inspector_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

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~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Bioretention – Construction Inspection Report**~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date~~
~~**Inflow/Overflow:**~~ ~~Is overflow invert at correct elevation?~~ ~~Is inflow pipe to filter plugged with watertight seal~~ ~~(prior to stabilization)?~~				
~~**Basin and Impermeable Liner** (where applicable)**:**~~				

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~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date~~
~~Basin graded as per approved plan?~~ ~~Basin liner material and installation meets specification of approved plan? (attach labeled sample)~~				
~~**Underdrains:**~~ ~~Do collector pipes meet specifications with correct hole pattern? (attach materials invoice)~~ ~~Do collector stone and stone beneath sand meet specifications and is installed to design depth?~~				
~~**Filter Media:**~~ ~~Does filter media meet specifications? (attach lab report and material certification)~~ ~~Filter media installed to design depth and compacted on _____ (date) and refilled to designed depth?~~				

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~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Bioretention Construction Inspection Report - Continued**~~

~~Project Name and Address: _____ File and WPD No_____~~

~~**Inspection Item**~~	~~**No**~~	~~**Yes**~~	~~**Remarks**~~	~~**Date**~~
~~**Bioretention Plant Materials:**~~ ~~Do plants meet size and variety specifications?~~ ~~Are all plants installed as per landscape plan?~~ ~~Is mulch and cover crop installed as per plan specifications?~~ ~~Are plant/ trees staked as per specifications?~~ ~~Has watering of plant material been provided once a week during first two months for fourteen consecutive days after planting has been completed , then as needed during first growing season.?~~				
~~**Observation Well Inlets:**~~ ~~Is observation well free of construction debris and soil?~~				

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~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~Is outflow pipe invert at the design elevation?~~				
~~**Notes:**~~ ~~1. A qualified professional must treat disease plants.~~ ~~2. Deficient stakes and wires must be replaced.~~ ~~3. Dead plants or plants diseased beyond treatment must be replaced by plant meeting original specifications.~~ ~~3. New plants must be watered every day for the first 14 days after planting.~~				

~~Owner/Agent~~ _____ ~~Inspector~~ _____ ~~Date~~ _____

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

~~Bioretention construction inspection 03/2011~~

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~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Filtering System Construction Inspection Report**~~

~~Building Permit # _____ Plan # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Date Started: _____ Final Inspection Date: _____~~

~~Structure Type: Cast in placed ____ Prefabricated ____ Name of Plant: _____~~

~~As-Built Plan Due Date: _____~~

~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~**Subgrade:**~~ ~~Is sub-grade suitable? (free of debris, standing water)~~ ~~Is a subgrade Suitability Certification provided?~~				

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~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~Prefabricated Structure:~~ ~~Are shop drawings provided?~~ ~~Do type and location of openings meet specifications?~~				
~~Cast-In-Place Structure:~~ ~~Are structural drawings provided?~~ ~~Is a certification provided on steel placement?~~ ~~Provide load ticket showing concrete plant mix, strength certification, and load time.~~ ~~Is a certification provided for concrete placement?~~ ~~Do the 28 day break results meet design specifications?~~				
~~Access:~~ ~~Is access for each chamber provided? (manholes, doors, steps, ladder)~~				
~~Leak Test:~~ ~~Does the leak test meet specifications? (attach form)~~				

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~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Filtering System Construction Inspection Report - Continued**~~

~~Project Name and Address: _____ File and WPD No_____~~

~~**Inspection Item**~~	~~**No**~~	~~**Yes**~~	~~**Remarks**~~	~~**Date**~~
~~**Inflow Chamber:**~~ ~~Does the orifice/ submerged weir opening meet specifications of the approved plan? (dimensions)~~ ~~Is overflow/bypass installed per approved plan?~~ ~~(size, support, sealed)~~				
~~**Filter Chamber :**~~ ~~Is under drain installed per approved plan?~~ ~~(specifications, number size and spacing of holes)~~ ~~Is filter bed installed per approved plan?~~ ~~(specifications of sand, gravel and filter cloth)~~ ~~(attach materials invoice)~~				

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~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~**Outflow Chamber:**~~ ~~Dewatering valve installed per approved plan?~~ ~~Are perforated pipe openings installed?~~ ~~Sump pit required?~~				
~~**Back Fill:**~~ ~~Does backfill soil conform to specifications?~~ ~~Is a certification for lift, thickness and density test provided?~~				

~~Owner/Agent~~ _____ ~~Inspector~~ _____ ~~Date~~ _____

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

~~Sand Filter construction inspection 03/2011~~

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~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~

~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Infiltration Facility – Construction Inspection Report~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Infiltration Device Type: Dry Well _____ Infiltration Trench _____ Infiltration Basin _____ Other _____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date Completed~~
~~**Site Preparation:**~~ ~~Have soil erosion and sediment controls been properly installed and maintained according to approved plans?~~				
~~Is stormwater runoff being diverted around the facility?~~				
~~Has the contributing drainage area been fully~~				

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~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date Completed~~
~~stabilized?~~				
~~**Subgrade Preparation:**~~ ~~Is subgrade suitable? (free of debris, standing water, properly graded)~~				
~~Has compaction of the soils been avoided?~~				
~~Excavated soil stockpile is located away from facility with erosion and sediment~~soil erosion and sediment ~~controls in place?~~				
~~**Practice Bottom:**~~ ~~Has a 6 to 8 inch sand layer been installed beneath the practice according to the approved plans?~~				
~~**Geotextile Fabric:**~~ ~~Have the filter layer and/or geotextile fabric been installed on the sides of the practice only according to the specifications?~~				
~~**Stone Reservoir Layer:**~~ ~~Does the stone reservoir meet specifications (clean, washed, free of fines) and is it installed to design depth?~~				
~~**Surface Material:**~~ ~~Does the surface material meet the specification and has it been properly installed?~~				
~~Is the surface free of fines and areas of clogging?~~				

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~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Infiltration Facility Construction Inspection Report - Continued**~~

~~Project Name and Address: _____ File and WPD No_____~~

~~**Inspection Item**~~	~~**No**~~	~~**Yes**~~	~~**Remarks**~~	~~**Date**~~
~~**Pretreatment:**~~ ~~Are the pretreatment facilities installed according to the approved plans?~~				
~~**Over Flow (where Applicable):**~~ ~~Is overflow invert at correct elevation?~~ ~~Has the outfall been constructed with adequate protection as specified on the plans?~~				
~~**Final Inspection:**~~ ~~Can water infiltrate properly into the practice?~~ ~~Does the practice include an observation well?~~ ~~Does the reservoir storage layer drains within 72 hours?~~				

~~Owner/Agent_____ Inspector _____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Infiltration Facility construction inspection 03/2011~~

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~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Open Channels – Construction Inspection Report~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Type of Open Channel System : Grass Channel_____ Dry Swale_____ Wet Swale_____ Other_____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date Completed~~
~~**Site Preparation:**~~ ~~Have erosion and sediment~~soil erosion and sediment ~~controls been properly installed and maintained according to approved plans?~~				
~~Is stormwater runoff being diverted around the facility?~~				
~~Has the contributing drainage area been fully stabilized?~~				

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~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date Completed~~
~~**Practice Geometry:**~~ ~~Are the practice dimensions and longitudinal slope correct as shown on the plans?~~				
~~Are the channel side slopes no steeper than 3:1?~~				
~~Have the check dams been properly installed and to the correct elevations (where applicable)?~~				
~~**Pretreatment:**~~ ~~Are the pretreatment facilities installed according to the approved plans?~~				
~~**Vegetation:**~~ ~~Does the channel surface vegetation comply with the approved planting plan and specification?~~				
~~Topsoil mixture, soil amendments, and soil compaction comply with plan (if required)~~				
~~**Over Flow (where Applicable):**~~ ~~Is overflow invert at correct elevation?~~				
~~Has the outfall been constructed with adequate protection as specified on the plans?~~				
~~**Dry Swale Designs (where Applicable):**~~ ~~Does planting soil meet design specifications?~~				
~~Does the underdrain meet specifications with correct hole pattern, elevation, and slope?~~				
~~Are at least 2 inches of aggregate provided above and below the underdrains?~~				
~~Does the reservoir storage layer drains within 72 hours?~~				

~~Owner/Agent~~ _____ ~~Inspector~~ _____ ~~Date~~ _____

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

~~Open Channel construction inspection 03/2011~~

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~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Pond, Wetland, And Storage Practices – Construction Inspection Report~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Type of Facility: Wet Pond _____ Wetland _____ Dry Pond _____ Underground Detention _____ Other _____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date Completed~~
~~**Contributing Drainage Area:**~~ ~~Does the area draining to the practice match the plans?~~				
~~**Practice Geometry:**~~ ~~Are the practice dimensions correct as shown on the plans?~~				
~~Are the pond side slopes no steeper than 3:1?~~				

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Inspection Items	Yes	No	Remarks	Date Completed
Is a geotextitle or clay lining provided (where appropriate)?				
Is the practice installed to the proper depth as shown on the plans?				
Pretreatment: Has the forebay been properly sized and designed as according to the plans?				
Outfall: Has the outfall been constructed with adequate protection as specified on the plans?				
Is the outfall channel lined with filter cloth and is large rip-rap provided?				
Is an emergency spillway provided?				

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~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Pond, Wetland, and Storage Practices Construction Inspection Report - Continued**~~

~~Project Name and Address: _____ File and WPD No_____~~

~~**Inspection Item**~~	~~**No**~~	~~**Yes**~~	~~**Remarks**~~	~~**Date**~~
~~**Overflow and Trash Rack:**~~ ~~Has the riser or outflow structure been properly installed and to the correct elevations?~~				
~~Has a trash rank been properly installed according to the approved SWM plan?~~				
~~**Pond Buffer/Vegetation (where applicable):**~~ ~~Do the buffer dimensions match the plans?~~				
~~Is an aquatic bench properly installed?~~				
~~Does the vegetation comply with the approved planting plan and specification?~~				
~~**Final Inspection:**~~ ~~Has the contributing drainage area been properly stabilized?~~				
~~Does the site have proper maintenance and inspection access?~~				

~~Owner/Agent_____ Inspector_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Pond, Wetland, and Storage Practice construction inspection 03/2011~~

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~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Tree Planting And Preservation – Construction Inspection Report~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~**Inventory of Trees:**~~ ~~Did a licensed forester or arborist inventory existing trees?~~ ~~Were the size, species, condition, ecological value, and location of the trees recorded?~~				
~~**Identification of Trees to Preserve:**~~				

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~~Average mature spread of at least 35'?~~ ~~Were the trees selected to be conserved selected based on species, size, condition, and location?~~				
~~**Protection of Trees and Soil During Construction:**~~ ~~Did a licensed forester or arborist identify the Critical Root Zone (CRZ) around the trees?~~ ~~Were physical barriers properly installed and maintained around the CRZ?~~ ~~If excavating next to CRZ, were roots properly pruned to depth of 18"?~~				
~~**Protection of Trees and Soil After Construction:**~~ ~~Is there a Maintenance Covenant in place to protect the preserved trees?~~				

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DISTRICT DEPARTMENT OF THE ENVIRONMENT

WATERSHED PROTECTION DIVISION

INSPECTION AND ENFORCEMENT BRANCH

Tree Planting and Preservation Construction Inspection Report - Continued

Project Name and Address: _____ File and WPD No_____

Inspection Item	No	Yes	Remarks	Date
Selection of Tree Species: Does the tree species have an average mature spread of at least 35'? Are the trees container grown or ball and burlap? Do the trees have a minimum caliper size of 1.5"?				
Planting Sites: Was the appropriate tree planted in the best location based on urban planting constraints? Are clear sight lines provided along street and in parking lots? Is there enough overhead clearance for pedestrians and vehicles? Is there at least 2 cubic feet of useable soil per square foot of average mature tree canopy?				

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~~Inspection Item~~	~~No~~	~~Yes~~	~~Remarks~~	~~Date~~
~~**Planting Techniques:**~~ ~~Is the root collar exposed?~~ ~~Are erosion control blankets or other appropriate practices in place on steep slopes?~~ ~~With slopes steeper than 3:1, are trees planted on a level space on the slope?~~				
~~**Post-Planting Tree Protection:**~~ ~~Has 2–4 inches of organic mulch been spread over the soil surface out to the drip line of the tree?~~ ~~Are trees staked only if there is a concern of vandalism or windy exposure?~~				

~~Owner/Agent~~ _____ ~~Inspector~~ _____ ~~Date~~ _____

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

~~Tree Planting and Preservation construction inspection 01/2013~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Stormwater Management Facilities – Construction Inspection Report**~~

~~Building Permit # _____ Plan and File # _____ Lot: _____ Square: _____~~

~~Project Name and Address: _____ Ward: _____~~

~~Contractor: _____ Telephone # _____~~

~~Engineer: _____ Telephone # _____~~

~~Responsible For Maintenance: _____ Telephone # _____~~

~~Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____~~

~~Inspection Items~~	~~Yes~~	~~No~~	~~Remarks~~	~~Date~~
~~**Site Preparation:**~~ ~~Have erosion and sediment~~soil erosion and sediment ~~controls been properly installed and maintained according to approved plans?~~ ~~Is stormwater runoff being diverted around the facility?~~ ~~Has the contributing drainage area been fully stabilized?~~				

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~~**Structure:**~~ ~~Do type and location of openings meet plan specifications?~~ ~~Are all components installed as per plan specifications? (media cartridges, weirs, inverted pipes, tees and ports)~~				
~~**Access:**~~ ~~Access for each chamber, including inlets where applicable provided? (manholes, doors, steps, ladders)~~				
~~**Backfill :**~~ ~~Does back fill meet specifications?~~ ~~Is a certification for lift, thickness and density test provided?~~				
~~**System Cleaned:**~~				

~~Owner/Agent~~ _____ ~~Inspector~~ _____ ~~Date~~ _____

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Green Roof Construction Inspection Report

Building Permit #: _____ Plan #: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Date Started: _____ Final Inspection Date: _____

Green Roof Type: Extensive _____ Intensive _____ New Construction _____ Retrofit of Existing Roof _____

If this is a retrofit green roof, attach a copy of the Roof Structural Certification _____

As-Built Plan Due Date: _____

Inspection Item	No	Yes	Remarks	Date
Deck Preparation: Is the deck free of all trash, debris, grease, oil, water and moisture? Are all concrete surfaces properly cured, dry and free of voids, cracks, or holes? For **retrofitted** roofs, are all existing membranes and flashing removed to the bare concrete or deck? Are all expansion joints free of broken edges or loose aggregate and sealed to a depth at least twice as wide as the joint? Is a leak detection device installed? *(Include manufacturer and testing information.)*				
Water Proofing: Certification: identify type: Hot or Cold applied? Does the waterproofing system require an applicator "certified" by the manufacturer? (*Attach certifications.*) Are site conditions appropriate for application of water proofing materials? (*Note temperature and moisture conditions.*) Have the correct number of water proofing layers been installed as per the approved green roof plan? Does the membrane reinforcement and flashing meet plan specifications? (*Attach invoice and/or manufacturer's certifications.*) Is protection provided for water proofing membrane? (*Specify membrane type and indicate the duration between installation of membrane and media.*)				

Figure K.1 Green Roof Construction Inspection Report.

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~~Stormwater Management Facilities construction inspection 03/2011~~

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT
NATURAL RESOURCES ADMINISTRATION
WATERSHED PROTECTION DIVISION/INSPECTION AND ENFORCEMENT BRANCH

STORMWATER MANAGEMENT STANDARD TESTING RECORD

PLAN #_____ WPD/ FILE # _____ BUILDING PERMIT # _____

SQUARE_____ LOT _____ PARCEL_____

NAME AND LOCATION:_____

_____

TYPE OF STRUCTURE: _____

BUILT: ☐ Cast-in place ☐ Pre-Cast ☐ Other _____

METHOD OF TESTING: ☐ H_2O ☐ Visual ☐ Other _____

READINGS: Start_____

Difference_____

Allowable _____

Results _____

DURATION: (24 Hour Reading) _____ Time: _____ Date: _____

(48 Hour Reading)_____Time: _____ Date: _____

(72 Hour Reading) _____Time: _____ Date: _____

READINGS TAKEN BY:_____ DATE:_____

WITNESS: _____DATE: _____

TITLE: _____

FOR: _____

Inspector _____Owner/Agent _____ Date _____

DDOE (WHITE) OWNER/AGENT (YELLOW) INSPECTOR (PINK)

SWM STANDARD TESTING/ WPD 7/2007

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Green Roof Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Item	No	Yes	Remarks	Date
Water Test:				
Has a water test been conducted? Verify the water test is conducted according to test standards demonstrating two inches of water ponding for a 24- 48 hour period. *(Attach water test report.)*				
Green Roof Components:				
Do the over flow drains meet plan specifications? Verify dimensions, materials and locations.				
Do drain boxes, vent pipes and other penetrations meet plan specifications? Verify locations, water proofing details, flashing details and finish details. Verify materials selection and construction.				
Identify if this is a tray system or a built in place system.				
Do the root barrier, insulation, moisture retention layer, filter fabric, and drainage layers meet plan specifications? (*Attach invoice and manufactures' certifications*)				
Does the growing media meet plan specifications? Verify depth of growing material. (*Attach invoice and manufacturer's certifications.*)				
Does the vegetation layer meet plan specifications? Verify vegetation source—plugs, seeds, pre grown mat, species mixture, coverage. (*Attach invoice and laboratory certification.*)				
Does the metal curbing and flashing meet plan specifications? (*Attach invoice and manufacturer's certifications.*)				
Are all seems, joints and edges caulked and sealed with approved grade of caulk or sealant? (*Attach invoice.*)				
Do pedestals and pavers and non-vegetated areas meet plan specifications (type and location)?				
Irrigation:				
Is there an irrigation system?				
Is the system installed to plan specifications? Verify water source, location, service access, and pressure.				
Plantings and Housekeeping:				
Modular System ___ Vegetated Mats ___ Plugs___ Other___				
Do plants meet size and variety specifications?				
Are all plants installed as per plan specifications? Note the planting distribution, the depth of media, and whether or not adequate watering was provided.				
Is temporary netting or wind uplift protection required?				
Have all planting waste materials, and construction trash and debris been pickup and removed from the roof?				

Contractor/Engineer _____ Inspector _____ Date _____

Figure K.1 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Rainwater Harvesting Construction Inspection Report

Building Permit #: _____ Plan #: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Responsible for Maintenance: _____ Telephone: _____

Secondary Practice (discharging to): pervious area ____ bioretention ____ infiltration practice ____ channel or swale: ____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Subgrade Preparation: Has the subgrade been properly prepared and tank foundation installed as shown on plans?				
Contributing Drainage Area: Does the rooftop area draining to the tank match the plans?				
Conveyance and First Flush Diversion: Do the gutters meet specifications with the correct sizing, elevation, and slope?				
Is the first flush diversion system properly sized and installed?				
Are mosquito screens properly installed on all tank openings?				
Pump System (where applicable): The pump and piping to end-uses (indoor, outdoor irrigation, or tank dewatering release) has been properly installed				
Overflow System: Overflow device is directed as shown on plans?				
Catchment area and overflow area are stabilized?				
Secondary stormwater treatment practice(s) (if applicable) is installed as shown on plans?				
Final Inspection: Is water conveyed into tank and to end-uses appropriately?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.2 Rainwater Harvesting Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Impervious Surface Disconnection Construction Inspection Report

Building Permit #: _____ Plan #: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Responsible for Maintenance: _____ Telephone: _____

Disconnection Type: Simple _____ Dry Well _____ Rain Garden _____ Other _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Site Preparation: Have erosion and sediment controls been properly installed and maintained according to approved plans?				
Do site excavation and grading conform to the site plans?				
Has the pervious receiving area avoided compaction during excavation?				
Contributing Drainage Area: Does the impervious area draining to the receiving pervious area match the plans?				
Practice Geometry: Does the receiving pervious area match the dimensions and slopes shown on the plan?				
Has a secondary practice been installed according to plan (if required)?				
Vegetation: Does the pervious area vegetation comply with the approved planting plan and specification?				
Topsoil mixture, soil amendments, and soil compaction comply with plan (if required)				
Final Inspection: Have the contributing impervious area and the receiving pervious area been stabilized? Can water flow properly into the receiving pervious area?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.3 Impervious Surface Disconnection Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Permeable Pavement System Construction Inspection Report

Building Permit #: _____ Plan and File#: _____ Lot:_____ Square: _____

Project Name and Address: _____Ward_____

Contractor:_____ Telephone: _____

Engineer:_____ Telephone: _____

Responsible for Maintenance:_____ Telephone: _____

Permeable Pavement Type: Porous Asphalt _____ Pervious Concrete _____ Permeable Pavers_____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Site Preparation: Have erosion and sediment controls been properly installed and maintained according to approved plans?				
Is stormwater runoff being diverted around the practice?				
Has the contributing drainage area been fully stabilized?				
Subgrade Preparation: Is subgrade suitable free of debris, standing water, proper grading?				
If design is for infiltration, verify soils have not been compacted.				
Excavated soil stockpile is located away from practice with erosion and sediment controls in place?				
Filter Layer or Geotextile Fabric (where applicable): The filter layer and/or geotextile fabric have been installed according to the specifications?				
Underdrain and Reservoir Layer: Does the underdrain meet specifications with correct perforation pattern, elevation, and slope?				
Caps are placed on the upstream (but not the downstream) ends of the underdrains?				
Does the stone reservoir meet specifications (clean, washed, free of fines) and is it installed to design depth?				
Is at least 2 inches of aggregate provided above and below the underdrains?				

Figure K.4 Permeable Pavement Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Permeable Pavement System Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Items	Yes	No	Remarks	Date
Surface Material:				
Does the surface material meet the specification and has it been properly installed?				
Is the surface even and can runoff spread evenly across it?				
Has the surface material had adequate curing time (for porous asphalt and pervious concrete)				
Is the surface free of fines and areas of clogging?				
Over Flow Drain (where applicable):				
Is overflow invert at correct elevation?				
Final Inspection:				
Can water infiltrate properly into the practice?				
Does the reservoir storage layer drain within 48 hours?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.4 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Bioretention Construction Inspection Report

Building Permit #: _____ Plan and File#: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Responsible for Maintenance: _____ Telephone: _____

Bioretention Type: Traditional ____ Streetscape _____ Tree Pits ___ Planters: ____ Residential: _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Inflow/Overflow: Is overflow invert at correct elevation? Is inflow pipe to filter plugged with watertight seal (prior to stabilization)?				
Basin and Impermeable Liner (where applicable): Basin graded as per approved plan? Basin liner material and installation meets specification of approved plan? (*Attach labeled sample.*)				
Underdrains: Do collector pipes meet specifications with correct hole pattern? (*Attach materials invoice.*) Do collector stone and stone beneath sand meet specifications and is installed to design depth?				
Filter Media: Does the filter media meet specifications? (*Attach lab report and material certification.*) Filter media installed to design depth and compacted on _____ (date) and refilled to designed depth?				

Figure K.5 Bioretention Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Bioretention Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Item	No	Yes	Remarks	Date
Bioretention Plant Materials:				
Do plants meet size and variety specifications?				
Are all plants installed as per landscape plan?				
Is mulch and cover crop installed as per plan specifications?				
Are plant/ trees staked as per specifications?				
Has watering of plant material been provided once a week during first two months for fourteen consecutive days after planting has been completed , then as needed during first growing season.?				
Observation Well Inlets:				
Is observation well free of construction debris and soil?				
Is outflow pipe invert at the design elevation?				
Notes:				
1. A qualified professional must treat disease plants.				
2. Deficient stakes and wires must be replaced.				
3. Dead plants or plants diseased beyond treatment must be replaced by plant meeting original specifications.				
4. New plants must be watered every day for the first 14 days after planting.				

Owner/Agent _____ Inspector _____ Date _____

Figure K.5 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Filtering System Construction Inspection Report

Building Permit #: _____ Plan #: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Structure Type: Cast in Place _____ Prefabricated _____ Name of Plant _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Item	No	Yes	Remarks	Date
Subgrade: Is subgrade suitable (free of debris, standing water) ? Is a subgrade Suitability Certification provided?				
Prefabricated Structure: Are shop drawings provided? Do type and location of openings meet specifications?				
Cast-In-Place Structure: Are structural drawings provided? Is a certification provided on steel placement? Provide load ticket showing concrete plant mix, strength certification, and load time. Is a certification provided for concrete placement? Do the 28 day break results meet design specifications?				
Access: Is access for each chamber provided (manholes, doors, steps, and ladder)?				
Leak Test: Does the leak test meet specifications? (attach form)				
Inflow Chamber: Does the orifice/ submerged weir opening meet specifications of the approved plan? (dimensions) Is overflow/bypass installed per approved plan? (size, support, sealed)				

Figure K.6 Filtering System Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Filtering System Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Item	No	Yes	Remarks	Date
Inflow Chamber: Does the orifice/ submerged weir opening meet specifications of the approved plan? (dimensions) Is overflow/bypass installed per approved plan? (size, support, sealed)				
Filter Chamber: Is under drain installed per approved plan? (specifications, number size and spacing of holes) Is filter bed installed per approved plan? (specifications of sand, gravel and filter cloth) (attach materials invoice)				
Outflow Chamber: Dewatering valve installed per approved plan? Are perforated pipe openings installed? Sump pit required?				
Back Fill: Does backfill soil conform to specifications? Is a certification for lift, thickness and density test provided?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.6 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Infiltration Practice Construction Inspection Report

Building Permit #: _____ Plan and File#: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Responsible for Maintenance: _____ Telephone: _____

Infiltration Practice Type: Dry Well _____ Infiltration Trench _____ Infiltration Basin _____ Other _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Site Preparation: Have erosion and sediment controls been properly installed and maintained according to approved plans?				
Is stormwater runoff being diverted around the practice?				
Has the contributing drainage area been fully stabilized?				
Subgrade Preparation: Is subgrade suitable? (free of debris, standing water, properly graded)				
Has compaction of the soils been avoided?				
Excavated soil stockpile is located away from practice with erosion and sediment controls in place?				
Practice Bottom: Has a 6 to 8 inch sand layer been installed beneath the practice according to the approved plans?				
Geotextile Fabric: Have the filter layer and/or geotextile fabric been installed on the sides of the practice only according to the specifications?				
Stone Reservoir Layer: Does the stone reservoir meet specifications (clean, washed, free of fines) and is it installed to design depth?				

Figure K.7 Infiltration Practice Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Infiltration Practice Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Item	No	Yes	Remarks	Date
Surface Material: Does the surface material meet the specification and has it been properly installed?				
Is the surface free of fines and areas of clogging?				
Pretreatment: Are the pretreatment facilities installed according to the approved plans?				
Over Flow (where Applicable): Is overflow invert at correct elevation? Has the outfall been constructed with adequate protection as specified on the plans?				
Final Inspection: Can water infiltrate properly into the practice? Does the practice include an observation well? Does the reservoir storage layer drains within 72 hours?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.7 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Open Channel System Construction Inspection Report

Building Permit #: _____ Plan and File#: _____ Lot:_____ Square: _____

Project Name and Address: _____Ward_____

Contractor:_____ Telephone: _____

Engineer:_____ Telephone: _____

Responsible for Maintenance:_____ Telephone: _____

Open Channel System Type: Grass Channel _____ Dry Swale _____ Wet Swale _____ Other _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Site Preparation: Have erosion and sediment controls been properly installed and maintained according to approved plans?				
Is stormwater runoff being diverted around the practice?				
Has the contributing drainage area been fully stabilized?				
Practice Geometry: Are the practice dimensions and longitudinal slope correct as shown on the plans?				
Are the channel side slopes no steeper than 3:1?				
Have the check dams been properly installed and to the correct elevations (where applicable)?				
Pretreatment: Are the pretreatment facilities installed according to the approved plans?				
Vegetation: Does the channel surface vegetation comply with the approved planting plan and specification?				
Topsoil mixture, soil amendments, and soil compaction comply with plan (if required)				
Over Flow (where Applicable): Is overflow invert at correct elevation?				
Has the outfall been constructed with adequate protection as specified on the plans?				

Figure K.8 Open Channel System Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Open Channel System Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Items	Yes	No	Remarks	Date
Dry Swale Designs (where Applicable): Does planting soil meet design specifications?				
Does the underdrain meet specifications with correct hole pattern, elevation, and slope?				
Are at least 2 inches of aggregate provided above and below the underdrains?				
Does the reservoir storage layer drains within 72 hours?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.8 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Pond, Wetland, and Storage Practice Construction Inspection Report

Building Permit #: _____ Plan and File#: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Responsible for Maintenance: _____ Telephone: _____

Practice Type: Wet Pond _____ Dry Pond _____ Underground Detention _____ Other _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Contributing Drainage Area: Does the area draining to the practice match the plans?				
Practice Geometry: Are the practice dimensions correct as shown on the plans?				
Are the pond side slopes no steeper than 3:1?				
Is a geotextile or clay lining provided (where appropriate)?				
Is the practice installed to the proper depth as shown on the plans?				
Pretreatment: Has the forebay been properly sized and designed as according to the plans?				
Outfall: Has the outfall been constructed with adequate protection as specified on the plans? Is the outfall channel lined with filter cloth and is large rip-rap provided? Is an emergency spillway provided?				

Figure K.9 Pond, Wetland, and Storage Practice Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Pond, Wetland, and Storage Practice Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Item	No	Yes	Remarks	Date
Overflow and Trash Rack: Has the riser or outflow structure been properly installed and to the correct elevations?				
Has a trash rank been properly installed according to the approved SWM plan?				
Pond Buffer/Vegetation (where applicable): Do the buffer dimensions match the plans?				
Is an aquatic bench properly installed?				
Does the vegetation comply with the approved planting plan and specification?				
Final Inspection: Has the contributing drainage area been properly stabilized?				
Does the site have proper maintenance and inspection access?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.9 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Generic Construction Inspection Report

Building Permit #: _____ Plan and File#: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Responsible for Maintenance: _____ Telephone: _____

Device Type: Hydrodynamic treatment _____ Filtering treatment _____ Retention _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Items	Yes	No	Remarks	Date
Site Preparation:				
Have erosion and sediment controls been properly installed and maintained according to approved plans?				
Is stormwater runoff being diverted around the practice?				
Has the contributing drainage area been fully stabilized?				
Structure:				
Do type and location of openings meet plan specifications?				
Are all components installed as per plan specifications? (media cartridges, weirs, inverted pipes, tees and ports)				
Access:				
Access for each chamber, including inlets where applicable provided? (manholes, doors, steps, ladders)				
Backfill :				
Does back fill meet specifications?				
Is a certification for lift, thickness and density test provided?				
System Cleaned:				

Owner/Agent _____ Inspector _____ Date _____

Figure K.10 Generic Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Tree Planting and Preservation Construction Inspection Report

Building Permit #: _____ Plan and File#: _____ Lot: _____ Square: _____

Project Name and Address: _____ Ward _____

Contractor: _____ Telephone: _____

Engineer: _____ Telephone: _____

Responsible for Maintenance: _____ Telephone: _____

Tree Type(s): New _____ Preserved : _____

Date Started: _____ Final Inspection Date: _____ As-Built Plan Due Date: _____

Inspection Item	No	Yes	Remarks	Date
Inventory of Trees: Did a licensed forester or arborist inventory existing trees? Were the size, species, condition, ecological value, and location of the trees recorded?				
Identification of Trees to Preserve: Average mature spread of at least 35 feet? Were the trees selected to be conserved selected based on species, size, condition, and location?				
Protection of Trees and Soil During Construction: Did a licensed forester or arborist identify the Critical Root Zone (CRZ) around the trees? Were physical barriers properly installed and maintained around the CRZ? If excavating next to CRZ, were roots properly pruned to depth of 18 inches?				
Protection of Trees and Soil After Construction: Is there a Maintenance Covenant in place to protect the preserved trees?				
Selection of Tree Species: Does the tree species have an average mature spread of at least 35 feet? Are the trees container grown or ball and burlap? Do the trees have a minimum caliper size of 1.5 inches?				

Figure K.11 Tree Planting and Preservation Construction Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Tree Planting and Preservation Construction Inspection Report—Continued

Project Name and Address: _____ File and WPD No: _____

Inspection Item	No	Yes	Remarks	Date
Planting Sites:				
Was the appropriate tree planted in the best location based on urban planting constraints?				
Are clear sight lines provided along street and in parking lots?				
Is there enough overhead clearance for pedestrians and vehicles?				
Is there at least 2 cubic feet of useable soil per square foot of average mature tree canopy?				
Planting Techniques:				
Is the root collar exposed?				
Are erosion control blankets or other appropriate practices in place on steep slopes?				
With slopes steeper than 3:1, are trees planted on a level space on the slope?				
Post-Planting Tree Protection:				
Has 2–4 inches of organic mulch been spread over the soil surface out to the drip line of the tree?				
Are trees staked only if there is a concern of vandalism or windy exposure?				

Owner/Agent _____ Inspector _____ Date _____

Figure K.11 (continued)

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Stormwater Facility Leak Test

PLAN #_____ WPD/ FILE # _____ BUILDING PERMIT # _____

SQUARE_____ LOT _____ PARCEL_____

NAME AND LOCATION:_____

_____

TYPE OF STRUCTURE: _____

BUILT: ☐ Cast-in place ☐ Precast ☐ Other _____

METHOD OF TESTING: ☐ H2O ☐ Visual ☐ Other _____

READINGS: Start_____

Difference_____

Allowable _____

Results _____

DURATION: (24 Hour Reading) _____ Time: _____ Date: _____

(48 Hour Reading)_____Time: _____ Date: _____

(72 Hour Reading) _____ Time: _____ Date: _____

READINGS TAKEN BY:_____ DATE:_____

WITNESS: _____ DATE: _____

TITLE: _____

FOR: _____

Inspector _____Owner/Agent _____ Date _____

Figure K.12 Stormwater Facility Leak Test form.

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Appendix K Construction Inspection Checklists~~Construction Inspection Checklists~~

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~~Appendix M~~Appendix L Maintenance Inspection Checklists

It is recommended that an annual maintenance inspection and cleanup be conducted at each BMP site, particularly at large-scale applications.

This appendix includes the following maintenance inspection checklists:

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Green Roof Maintenance Inspection**~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address:_____Ward:_____~~

~~Owner / Agent:_____Telephone :_____Lot: _____ Square: _____~~

~~As-Built Plan Available Y/N Last Inspection Date: _____Last Service Date:_____ Service Contract Y/N , Type: _____~~

~~Accessibility: Public__ Private __ Maintenance Personal Only___(Number of Stories) ___Roof type: Flat___ Sloped___~~

~~List all other Stormwater Management Facilities on Site: _____~~

~~Note: Insert section to record review of on-site maintenance logs~~

~~1. Roof Condition:~~

~~Overflow Drains, Drain boxes Eves and Scuppers Condition _____Total Number ___~~

~~Membrane Condition_____ Flashing and Caulked Areas Condition_____ Roof Repair Needed ___~~

~~Debris/Sediment Accumulation _Evidence of Root Penetration___Pealing or Physical Damage___Standing Water or Seepage_~~

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~~Observations~~

~~Note: Insert measure of plant coverage~~

~~2. Vegetated Areas:~~

~~Roof Type:Intensive _Extensive _Semi-intensive _Vegetative System: Plant in place __Modular Tray System _Vegetated Mat_~~

~~Dead or diseased plants__Weeds, Moss, Invasive Plants or Pest __Thatch accumulation __Erosion or loss of media _Other_~~

~~Note: Consider clarifying this relative to the green roof design; sometimes the presence of moss is appropriate~~

~~Approximate Number of Growing Seasons _____Date of last Fertilizer, Pesticide or Top Dressing Application:__~~

~~Observations~~

~~Note Insert section to record observations of growing media that includes measure of media depth~~

~~3. Watering, Irrigation and Leak Detection:~~

~~Method of Watering : Soaker or Drip Hose_____ Sprinkler _____ Misting System_____~~

~~Hose Condition _____ Mechanical Systems Components (timers, valves, sensors and filters) _____ Last Service Date ____~~

~~Leak Detection Provided Y/N Last Service Date _____~~

~~Observations~~

~~Inspector~~ ~~Received By~~ ~~Date~~

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

~~Green Roof maintenance inspection 03/2011~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Rainwater Harvesting Maintenance Inspection**~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address:_____Ward:_____~~

~~Owner / Agent :_____Telephone :_____Lot:_____Square: _~~

~~As-Built Plan Available Y/N Last Inspection Date:_____Last Service Date:_____Service Contract Y/N, Type: _____~~

~~List all other Stormwater Management Facilities on Site:_____~~

~~1. Tank and System Condition:~~

~~Tank Condition_____Gutter and Pipe Condition_____Pump and Electrical System Functioning Properly_____~~

~~Replacement Parts Needed_____(specify components):_____~~

~~Observations_____~~

~~_____~~

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~~2. Inflow and Storage:~~

~~Debris in Gutters/ Downspouts____Debris in Prescreening Devices_____Debris in First Flush Diverters___~~

~~Mosquito Screens Inadequate__Sediment Accumulation in Tank___Inadequate Tank Drawdown___Inconsistent Reuse___~~

~~Observations _____~~

~~_____~~

~~3. Overflow:~~

~~Over flow Device Y/N , Type: _____Outlet Erosion_____ Debris/ Sediment in Overflow_____ Repair Needed ____~~

~~Observations _____~~

~~_____~~

~~Inspector_____ Received By_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Rainwater Harvesting maintenance inspection 03/2011~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Impervious Cover Disconnection Maintenance Inspection**~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address:_____Ward:_____~~

~~Owner / Agent :_____Telephone :_____ Lot: _____Square: _____~~

~~Last Inspection Date: _____Last Service Date:_____Service Contract Y/N , Type:_____~~

~~Type of Disconnection: Simple_____ Dry Well_____ Rain Garden_____~~
~~Other_____~~

~~List all other Stormwater Management Facilities on Site: _____~~

~~1. Contributing Drainage Area:~~

~~Type of Drainage Area: Rooftop_____Parking Lot_____Other_____~~

~~Observations_____~~

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~~2. Receiving Area:~~

~~Improper Conveyance to Receiving Pervious Area_____ Receiving Area Encroachment _____ Compaction Receiving Area_____~~

~~Erosion at Inflow Points_____ Erosion in Flow Path_____ Dead Vegetation_____ Exposed Soil _____ Sediment Accumulation_____~~

~~Evidence of Standing Water_____~~

~~Observations _____~~

~~_____~~

~~Inspector_____ Received By_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Impervious Cover Disconnection maintenance inspection 03/2011~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Permeable Pavement Maintenance Inspection**~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address:_____Ward:_____~~

~~Owner / Agent :_____Telephone :_____Lot:_____Square:___~~

~~As-Built Plan Available Y/N Last Inspection Date:_____Last Service Date:_____Service Contract Y/N , Type:_____~~

~~List all other Stormwater Management Facilities on Site:_____~~

~~1. Surface Condition:~~

~~Debris/ Sediment Accumulation ___Weed Accumulation_____Evidence of Surface Clogging ____Sweeping Needed_____~~

~~Surface Deformation or Spalling _____ Structural Repair Needed _____~~

~~Observations _____~~

~~_____~~

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~~2. Underdrains and Cleanouts:~~

~~Underdrains Y/N , Number: _____ Observation Wells Y/N , Number: _____~~

~~Evidence of Subsurface Clogging__ Inadequate Drawdown_____ Standing Water ____ Last Rain Event >1" +/- __Days/Hours~~

~~Observations _____~~

~~_____~~

~~3. Overflow:~~

~~Over flow Device Y/N , Type: _____Debris/ Sediment in Overflow_____ Repair Needed _____~~

~~Observations _____~~

~~_____~~

~~Inspector_____ Received By_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Permeable Pavement maintenance inspection 03/2011~~

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~~GOVERNMENT OF THE DISTRICT OF COLUMBIA~~

~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~

~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Bioretention Facility Maintenance Inspection~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address:_____Ward:_____~~

~~Owner / Agent :_____Telephone :_____ Lot:_____Square:_____~~

~~As-Built Plan Available Y/N Last Inspection Date:_____Last Service Date:_____ Service Contract Y/N , Type:_____~~

~~List all other Stormwater Management Facilities on Site:_____~~

~~1. Inlets and Drainage Area Stabilization:~~

~~Inlet Type (s)_____Total Number_____Repair Needed _____Debris/ Sediment Accumulation__~~

~~Evidence of Erosion in Drainage Area ___Area Needs Mowing or Clipping Removal____Drainage Area Debris Accumulation __~~

~~Observations_____~~

~~_____~~

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~~2. Bioretention Facility:~~

~~Sediments/Trash Accumulation___Filter Surface Clogging ___Erosion in Facility ____ Inadequate Mulch Thickness or Cover~~

~~Outlet: Condition of Outlet_____Debris/ Sediment in Overflow_____Repair Needed _____~~

~~Underdrains and Cleanouts: Underdrains Y/N , Number: _____ Observation Wells Y/N , Number: ____~~

~~Evidence of subsurface clogging___Inadequate drawdown____Standing Water ____ Last Rain Event >1" +/- ___Days/Hours~~

~~Observations _____~~

~~3. Plants:~~

~~Specific Number and Types of Plants in Place ___Dead or Diseased plants ___Stakes and Wires___Inadequate Watering ___~~

~~Observations _____~~

~~Note: A qualified professional must treat disease plants. Deficient stakes or wires must be replaced. Dead plants or plants beyond treatment must be replaced by plants meeting original specifications. New plants must be watered every day for the first 14 days after planting.~~

~~Inspector_____ Received By_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Bioretention maintenance inspection 3/2010~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Filtering System Maintenance Inspection**~~

~~Name / Address: _____ WPD No_____~~

~~Mailing Address: _____ Ward:_____~~

~~Owner / Agent : _____Telephone :_____ Lot:_____ Square: _~~

~~As-Built Plan Available Y/N Last Inspection Date: _____Last Service Date:_____ Service Contract Y/N , Type: _____~~

~~List all other Stormwater Management Facilities on Site: _____~~

~~1. Structural Components and Filter Bed:~~

~~Pretreatment Y/N , Type: _____ Condition: _____ Chambers Y/N , Number: ____ Condition: _____~~

~~Filter Bed Condition:_____ Oil/Grease Accumulation ____ Debris Accumulation____ Evidence of Bypass ___~~

~~Observation Wells Y/N , Condition: _____Maintenance Doors Y/N , Condition: _____ Manholes Y/N , Condition: ____~~

~~Valves/Drains Y/N , Condition: _____ Water Seal Y/N , Condition: _____ Other _____~~

~~Inadequate drawdown_____ Standing Water _____ Last Rain Event > 1" +/ _____ Hours/ Days~~

~~Observations~~

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2. Inlets:

Type _____ Total Number _____ Repair Needed _____ Debris/Sediment Accumulation ____

Observations _____

_____

3. Outlets

Over flow Device Y/N , Type: _____ Debris/ Sediment in Overflow ____ Repair Needed _____

Observations _____

_____

Inspector _____ Received By _____ Date _____

DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)

Sand Filter maintenance inspection 3/2010

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~~GOVERNMENT OF THE DISTRICT OF COLUMBIA~~

~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~

~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Infiltration Facility Maintenance Inspection~~

~~Name / Address: _____ WPD No_____~~

~~Mailing Address: _____ Ward:_____~~

~~Owner / Agent : _____ Telephone : _____ Lot: _____ Square: _~~

~~As-Built Plan Available Y/N Last Inspection Date: _____ Last Service Date: _____ Service Contract Y/N , Type: ___~~

~~Infiltration Device Type: Dry Well _____ Infiltration Trench_____ Other_____~~

~~List all other Stormwater Management Facilities on Site: _____~~

~~1. Inlets and Drainage Area Stabilization:~~

~~Inlet Type (s)_____ Total Number_____ Repair Needed _____ Debris/ Sediment Accumulation_____~~

~~Erosion in Drainage Area_ Area Needs Mowing/Clipping Removal_Drainage Area Debris Accumulation _Pretreatment Bypass~~

~~Observations _____~~

~~_____~~

~~2. Structural Components and Function:~~

~~Vegetation and Ground Cover Type: _____ Surface Erosion Present? Y/N~~

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~~Condition of Infiltration Area _____ Observation Wells Y/N , Number: _____ Condition: _____~~

~~Inadequate Drawdown _____ Standing Water _____ Debris/Sediment Accumulation _____ Last Rain Event >1" +/- _____ Days/Hours~~

~~Observations _____~~

~~_____~~

~~3. Overflow:~~

~~Over flow Device Y/N , Type: _____ Debris/ Sediment in Overflow _____ Repair Needed _____~~

~~Observations _____~~

~~_____~~

~~Inspector _____ Received By _____ Date _____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Infiltration Facility maintenance inspection 03/2011~~

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~~GOVERNMENT OF THE DISTRICT OF COLUMBIA~~

~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~

~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Open Channels Maintenance Inspection~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address: _____ Ward:_____~~

~~Owner / Agent : _____Telephone :_____ Lot: _____ Square: __~~

~~As-Built Plan Available Y/N Last Inspection Date: _____Last Service Date:_____ Service Contract Y/N , Type: _____~~

~~Type of Open Channel System : Grass Channel_____ Dry Swale_____ Wet Swale_____ Other_____~~

~~List all other Stormwater Management Facilities on Site: _____~~

~~1. Inlets and Drainage Area Stability:~~

~~Type _____ Total Number _____ Repair Needed_____ Clear of Debris/Sediment _____~~

~~Erosion at Inlets_____ Evidence of Pretreatment Bypass_____ Evidence of Erosion in drainage area _____~~

~~Observations _____~~

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~~2. Open Channel Facility:~~

~~Debris/ Sediment Accumulation____Erosion within Facility___Inappropriate Ponding of Water___Erosion at Outlets____~~

~~Condition of Check Dams (if applicable)_____Condition of Underdrain (if applicable)_____Condition of Outlet _____~~

~~Observations _____~~

~~_____~~

~~3. Vegetation:~~

~~Dead Vegetation_____Bare Spots_____Presence of Invasive Species_____Re-vegetation Needed_____~~

~~Observations _____~~

~~_____~~

~~Inspector_____Received By_____Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Open Channel maintenance inspection 03/2011~~

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~~GOVERNMENT OF THE DISTRICT OF COLUMBIA~~

~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~

~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Wet Ponds And Wetlands Maintenance Inspection~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address:_____Ward:_____~~

~~Owner / Agent :_____Telephone :_____Lot:_____Square:_____~~

~~As-Built Plan Available Y/N Last Inspection Date:_____Last Service Date:_____Service Contract Y/N , Type:_____~~

~~Type of Facility: Wet Pond_____Wetland_____Other_____~~

~~List all other Stormwater Management Facilities on Site:_____~~

~~1. Inlets and Drainage Area Stabilization:~~

~~Inlet Type (s)_____Total Number_____Repair Needed_____Debris/ Sediment Accumulation_____~~

~~Erosion in Drainage Area_____Drainage Area Debris Accumulation_____Pretreatment Bypass_____~~

~~Observations_____~~

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~~2. Facility Function and Structural Components:~~

~~Erosion within Facility_____ Debris/Sediment Accumulation _____ Inadequate Water Level _____ Excessive Algal Growth_____~~

~~Over flow Device Y/N , Type: _____ Debris/ Sediment in Overflow_____ Repair Needed _____~~

~~Observations _____~~

~~3. Vegetation:~~

~~Dead or Diseased plants _____ Inadequate Vegetation _____ Lack of Aquatic Bench _____ Lack of Plant Diversity_____~~

~~Observations _____~~

~~Inspector_____ Received By_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Wet Pond and Wetland maintenance inspection 03/2011~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Storage And Underground Detention Facilities Maintenance Inspection**~~

~~Name / Address:_____WPD No_____~~

~~Mailing Address:_____Ward:_____~~

~~Owner / Agent :_____Telephone :_____Lot:_____Square:_____~~

~~As-Built Plan Available Y/N Last Inspection Date:_____Last Service Date:_____Service Contract Y/N , Type:_____~~

~~Type of Storage Practice: Dry Pond_____Underground Detention_____Other_____~~

~~List all other Stormwater Management Facilities on Site:_____~~

~~1. Inlets and Drainage Area Stabilization:~~

~~Inlet Type (s)_____Total Number_____Repair Needed_____Debris/ Sediment Accumulation_____~~

~~Erosion in Drainage Area_____Drainage Area Debris Accumulation_____Pretreatment Bypass_____~~

~~Observations_____~~

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~~2. Facility Function:~~

~~Inadequate Vegetation and/or Ground Cover (if applicable)_____ Surface Erosion in Facility_____ Debris/Sediment Accumulation _____~~

~~Inadequate Drawdown_____ Standing Water _____ Last Rain Event >1" +/- _____ Days/Hours~~

~~Observations _____~~

~~3. Structural Components:~~

~~Over flow Device Y/N , Type: _____ Debris/ Sediment in Overflow_____ Repair Needed _____~~

~~Vaults/Chambers Y/N , Type: _____ Debris/ Sediment in Chambers_____ Repair Needed _____~~

~~Observations _____~~

~~Inspector _____ Received By _____ Date _____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Storage Facility maintenance inspection 03/2011~~

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~~**GOVERNMENT OF THE DISTRICT OF COLUMBIA**~~

~~**DISTRICT DEPARTMENT OF THE ENVIRONMENT**~~

~~**WATERSHED PROTECTION DIVISION**~~

~~**INSPECTION AND ENFORCEMENT BRANCH**~~

~~**Tree Planting And Preservation Maintenance Inspection**~~

~~Name / Address:_____ WPD No_____~~

~~Mailing Address:_____ Ward:_____~~

~~Owner / Agent :_____ Telephone :_____ Lot:_____ Square:_____~~

~~As-Built Plan Available Y/N Last Inspection Date:_____ Last Service Date:_____ Service Contract Y/N , Type:_____~~

~~List all other Stormwater Management Facilities on Site:_____~~

~~1. Tree Condition:~~

~~Adequately watered_____ Dead/broken/diseased branches pruned_____ Trunk protected_____ Root collar exposed_____~~

~~Mower/weed whip damage, vandal damage, animal damage_____ Insect or disease problems_____~~

~~Observations_____~~

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~~2. Mulching:~~

~~2" 4" deep mulch _____ Mulch not against trunk_____~~

~~Observations~~

~~3. Staking (if needed):~~

~~Tree age < 1 year: Stakes in place _____ Webbing or ties hampering growth of tree_____~~

~~Tree age > 1 year: Stakes removed_____~~

~~Observations~~

~~Inspector Received By Date~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Tree Planting and Preservation maintenance inspection 01/2013~~

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~~GOVERNMENT OF THE DISTRICT OF COLUMBIA~~
~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~

~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~Stormwater Management Facilities Maintenance Inspection~~

~~Name / Address: _____WPD No._____~~

~~Mailing Address: _____ Lot _____ Sq _____~~

~~Owner/ Agent: _____Telephone:_____ Ward _____~~

~~Last Inspection Date: _____Last Service Date: _____~~

~~Type of Facility: _____Other Stormwater Facilities on Site: _____~~

~~1. Inlets and Above Ground Condition:~~

~~Type _____Total Number _____Repair _____Clear of debris _____ Graded Areas _____~~

~~Observations~~

~~_____~~

~~_____~~

~~2. Structure:~~

~~Access _____Outlets _____ Elbows and Connections _____Vaults and Chambers_____ Trash Racks_____~~

~~Observations~~

~~_____~~

~~_____~~

~~3. Overall function:~~

~~Oil and Grease Accumulation _____ Sediment _____ Debris Accumulation _____ Last Rain > 1" +/ _____ Hours/Days~~

~~Observations~~

~~_____~~

~~_____~~

~~Inspector_____ Received By_____ Date_____~~

~~DDOE(WHITE) OWNER/AGENT(YELLOW) INSPECTOR (PINK)~~

~~Stormwater Management Facility/WPD/7/2007~~

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~~GOVERNMENT OF THE DISTRICT OF COLUMBIA~~
~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~
~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~STORMWATER MANAGEMENT STANDARD TESTING RECORD~~

~~PLAN #_____ WPD/ FILE # _____ BUILDING PERMIT # _____~~

~~SQUARE_____ LOT _____ PARCEL_____~~

~~NAME AND LOCATION:_____~~

~~_____~~

~~TYPE OF STRUCTURE: _____~~

~~BUILT: □ Cast in place □ Precast □ Other _____~~

~~METHOD OF TESTING: □ H_2O □ Visual □ Other _____~~

~~READINGS: Start_____~~

~~Difference_____~~

~~Allowable _____~~

~~Results _____~~

~~DURATION: (24 Hour Reading) _____ Time: _____ Date: _____~~

~~(48 Hour Reading)_____Time: _____ Date: _____~~

~~(72 Hour Reading) _____ Time: _____ Date: _____~~

~~READINGS TAKEN BY:_____ DATE:_____~~

~~WITNESS: _____ DATE: _____~~

~~TITLE: _____~~

~~FOR: _____~~

~~Inspector _____Owner/Agent _____ Date _____~~

~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

~~DDOE(WHITE)~~
~~Stormwater Management Facility/WPD/7/2007~~

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~~GOVERNMENT OF THE DISTRICT OF COLUMBIA~~
~~DISTRICT DEPARTMENT OF THE ENVIRONMENT~~

~~WATERSHED PROTECTION DIVISION~~

~~INSPECTION AND ENFORCEMENT BRANCH~~

~~MAINTENANCE SERVICE COMPLETION INSPECTION~~

~~Name / Address:~~ _____

~~Owner/Agent:~~ _____ ~~WPD No:~~ _____

~~Mailing Address:~~ _____

~~Service Providers:~~ _____

~~Maintenance Service Start Date:~~ _____

~~Maintenance Service Completion Date:~~ _____

~~Type of Stormwater Facility Serviced:~~ _____

~~Description of Work:~~ _____

_____

~~Is the maintenance service satisfactory? Yes/No If no, list items to be completed:~~ _____

_____

_____

~~Inspector~~ _____ ~~Received By~~ _____ ~~Date~~ _____

~~DDOE(WHITE)~~ ~~OWNER/AGENT(YELLOW)~~ ~~INSPECTOR (PINK)~~

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Green Roof Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent:_____ Telephone:_____ Lot:_____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Accessibility: Public _____ Private _____ Maintenance Personal Only _____ (Number of Stories) _____ Roof Type: Flat / Slope

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs:_____

1. Roof Condition:

Overflow Drains, Drain Boxes, Eves, and Scuppers Condition: _____ Total Number _____

Membrane Condition _____ Flashing and Caulked Areas Condition _____ Roof Repair Needed _____

Debris/Sediment Accumulation ____ Root Penetration ____ Peeling or Physical Damage ____ Standing Water or Seepage _____

Amount of plant coverage _____

Observations _____

_____

2. Vegetated Areas:

Roof Type:Intensive Extensive ___ Semi-intensive ___ Vegetative System: Plant-in-Place ___ Modular Tray ___ Vegetated Mat ___

Dead/diseased plants __ Weeds, Unwanted Moss, Invasive Plants, or Pests __ Thatch accumulation __ Erosion or loss of media _ Other _

Approximate Number of Growing Seasons _____Date of last Fertilizer, Pesticide or Top Dressing Application:__

Observations (include media depth, fertility, scour):_____

_____

3. Watering, Irrigation, and Leak Detection:

Method of Watering : Soaker or Drip Hose_____ Sprinkler _____ Misting System_____

Hose Condition _____ Mechanical Systems Components (timers, valves, sensors and filters) _____ Last Service Date ____

Leak Detection Provided Y/N Last Service Date _____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.1 Green Roof Maintenance Inspection Report.

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~~Maintenance Service Insp/WPD 7/2007~~

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Rainwater Harvesting Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Secondary Practice (discharging to): pervious area _____ bioretention ___ infiltration practice ____ channel or swale: _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Tank and System Condition:

Tank Condition_____ Gutter and Pipe Condition_____ Pump and Electrical System Functioning Properly _____

Replacement Parts Needed _____ (specify components): _____

Observations _____

_____

2. Inflow and Storage:

Debris in Gutters/ Downspouts ____ Debris in Prescreening Devices _____ Debris in First Flush Diverters___

Mosquito Screens Inadequate __ Sediment Accumulation in Tank ___ Inadequate Tank Drawdown ___ Inconsistent Reuse ___

Observations _____

_____

3. Overflow:

Over flow Device Y/N , Type: _____Outlet Erosion _____ Debris/ Sediment in Overflow _____ Repair Needed ____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.2 Rainwater Harvesting Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Impervious Cover Disconnection Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Type: Disconnection: Simple_____ Dry Well_____ Rain Garden _____ Other _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Contributing Drainage Area:

Type of Drainage Area: Rooftop _____ Parking Lot _____ Other _____

Observations _____

_____

2. Receiving Area:

Improper Conveyance to Receiving Pervious Area _____ Receiving Area Encroachment _____

Compaction in Receiving Area _____Erosion at Inflow Points _____ Erosion in Flow Path _____ Dead Vegetation _____

Exposed Soil _____ Sediment Accumulation _____ Evidence of Standing Water _____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.3 Impervious Cover Maintenance Inspection Report.

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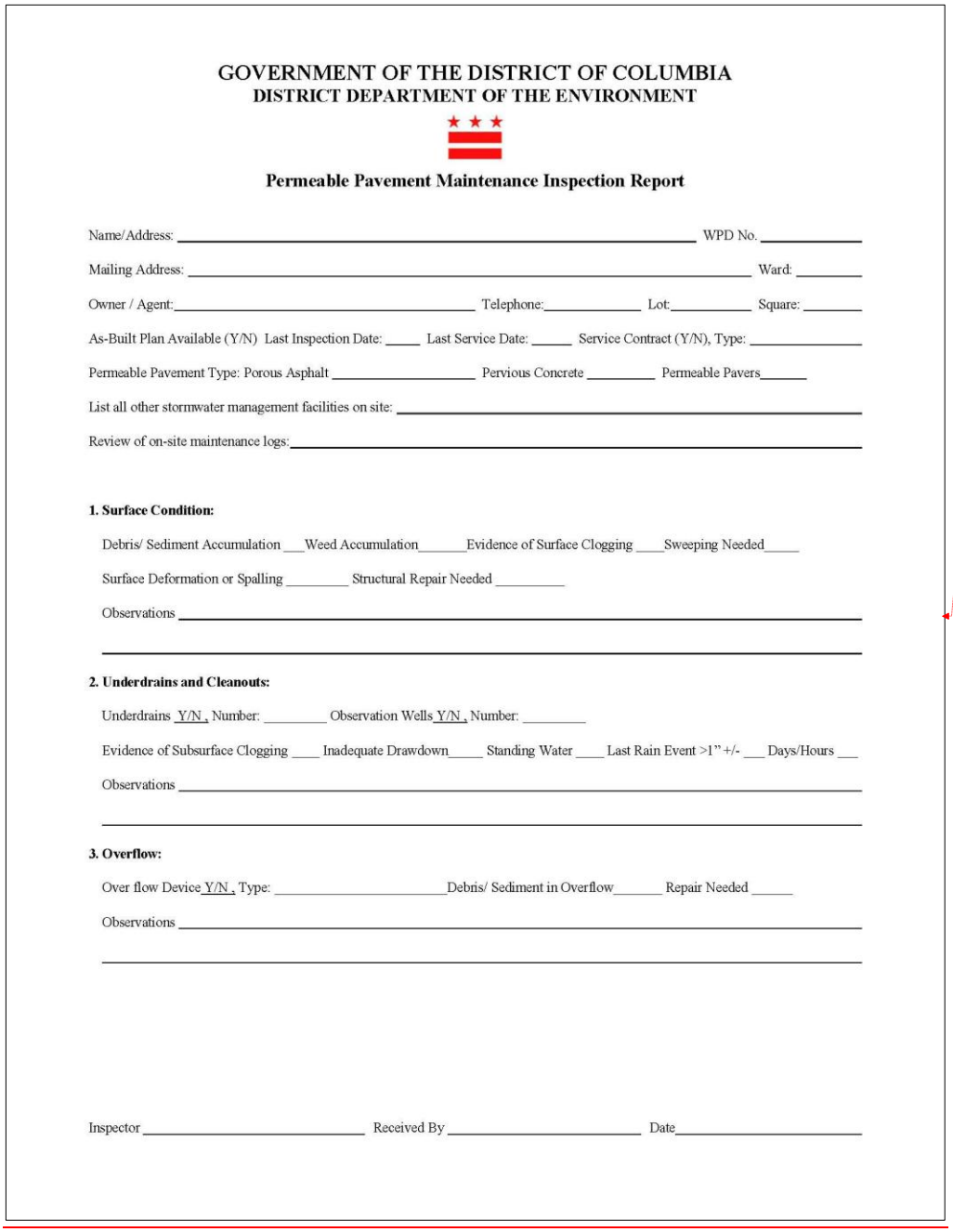

GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Permeable Pavement Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Permeable Pavement Type: Porous Asphalt _____ Pervious Concrete _____ Permeable Pavers _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Surface Condition:

Debris/ Sediment Accumulation ___ Weed Accumulation _____ Evidence of Surface Clogging ____ Sweeping Needed _____

Surface Deformation or Spalling _____ Structural Repair Needed _____

Observations _____

_____

2. Underdrains and Cleanouts:

Underdrains Y/N , Number: _____ Observation Wells Y/N , Number: _____

Evidence of Subsurface Clogging ____ Inadequate Drawdown _____ Standing Water ____ Last Rain Event >1" +/- ___ Days/Hours ___

Observations _____

_____

3. Overflow:

Over flow Device Y/N , Type: _____ Debris/ Sediment in Overflow _____ Repair Needed _____

Observations _____

_____

Inspector _____ Received By _____ Date _____

Figure L.4 Permeable Pavement Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Bioretention Practice Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Bioretention Type: Traditional ___ Streetscape ____ Tree Pits ____ Planters: _____ Residential: _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Inlets and Drainage Area Stabilization:

Inlet Type (s) _____ Total Number _____ Repair Needed _____ Debris/ Sediment Accumulation _____

Evidence of Erosion in Drainage Area ___ Area Needs Mowing or Clipping Removal ____ Drainage Area Debris Accumulation _____

Observations _____

_____

2. Bioretention Practice:

Sediments/Trash Accumulation ___ Filter Surface Clogging ___ Erosion in Practice ____ Inadequate Mulch Thickness or Cover_

Outlet: _____ Condition of Outlet _____ Debris/ Sediment in Overflow _____ Repair Needed _____

Underdrains and Cleanouts: Underdrains Y/N , Number: _____ Observation Wells Y/N , Number: ____

Evidence of subsurface clogging ___ Inadequate drawdown ____ Standing Water ____ Last Rain Event >1" +/- ___ Days/Hours _____

Observations _____

_____

3. Plants:

Specific Number and Types of Plants in Place ___ Dead or Diseased plants ___ Stakes and Wires ___ Inadequate Watering ___

Observations _____

_____

Note: A qualified professional must treat disease plants. Deficient stakes or wires must be replaced. Dead plants or plants beyond treatment must be replaced by plants meeting original specifications. New plants must be watered every day for the first 14 days after planting.

Inspector _____ Received By _____ Date _____

Figure L.5 Bioretention Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Filtering System Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Structure Type: Cast in Place ____ Prefabricated _____ Name of Plant _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Structural Components and Filter Bed:

Pretreatment (Y/N), Type: _____ Condition: _____ Chambers Y/N , Number: ____ Condition: _____

Filter Bed Condition: _____ Oil/Grease Accumulation ____ Debris Accumulation____ Evidence of Bypass _____

Observation Wells (Y/N), Condition: _____ Maintenance Doors (Y/N) , Condition: _____ Manholes (Y/N) , Condition: ____

Valves/Drains (Y/N), Condition: _____ Water Seal (Y/N), Condition: _____ Other _____

Inadequate drawdown_____ Standing Water _____ Last Rain Event > 1" +/-_____ Hours/ Days

Observations _____

_____

2. Inlets:

Type _____ Total Number _____ Repair Needed_____ Debris/Sediment Accumulation ____

Observations _____

_____

3. Outlets:

Over flow Device (Y/N), Type: _____ Debris/ Sediment in Overflow____ Repair Needed _____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.6 Filtering system Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Infiltration Practice Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent:_____ Telephone:_____ Lot:_____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Infiltration Device Type: Dry Well _____ Infiltration Trench_____ Infiltration Basin Other_____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs:_____

1. Inlets and Drainage Area Stabilization:

Inlet Type(s)_____Total Number_____ Repair Needed _____Debris/ Sediment Accumulation_____

Erosion in Drainage Area_ Area Needs Mowing/Clipping Removal_Drainage Area Debris Accumulation _Pretreatment Bypass

Observations _____

_____

2. Structural Components and Function:

Vegetation and Ground Cover Type: _____Surface Erosion Present? (Y/N)

Condition of Infiltration Area _____ Observation Wells (Y/N), Number: _____ Condition: _____

Inadequate Drawdown_____ Standing Water _____Debris/Sediment Accumulation _____

Last Rain Event >1" +/- _____ Days/Hours _____

Observations _____

_____

3. Overflow:

Over flow Device (Y/N), Type: _____Debris/ Sediment in Overflow_____ Repair Needed _____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.7 Infiltration Practice Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Open Channels Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Type of Open Channel System: Grass Channel _____ Dry Swale _____ Wet Swale _____ Other _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Inlets and Drainage Area Stability:

Type _____ Total Number _____ Repair Needed _____ Clear of Debris/Sediment _____

Erosion at Inlets _____ Evidence of Pretreatment Bypass _____ Evidence of Erosion in drainage area _____

Observations _____

_____

2. Open Channel Practice:

Debris/ Sediment Accumulation ____Erosion within Practice___ Inappropriate Ponding of Water___ Erosion at Outlets_____

Condition of Check Dams (if applicable)_____ Condition of Underdrain (if applicable)_____ Condition of Outlet _____

Observations _____

_____

3. Vegetation:

Dead Vegetation_____ Bare Spots_____ Presence of Invasive Species_____ Re-vegetation Needed_____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.8 Open Channel System Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Wet Ponds and Wetlands Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent:_____ Telephone:_____ Lot:_____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Type of Practice: Wet Pond _____ Wetland_____ Underground Detention ____Other_____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs:_____

1. Inlets and Drainage Area Stabilization:

Inlet Type(s)_____Total Number_____ Repair Needed _____ Debris/ Sediment Accumulation____

Erosion in Drainage Area_____ Drainage Area Debris Accumulation_____ Pretreatment Bypass_____

Observations _____

_____

2. Practice Function and Structural Components:

Erosion within Practice____ Debris/Sediment Accumulation ____ Inadequate Water Level _____ Excessive Algal Growth_____

Over flow Device (Y/N), Type: _____ Debris/ Sediment in Overflow_____ Repair Needed _____

Observations _____

_____

3. Vegetation:

Dead or Diseased plants _____ Inadequate Vegetation _____ Lack of Aquatic Bench _____ Lack of Plant Diversity_____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.9 Wet Ponds and Wetlands Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Storage and Underground Detention Facilities Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Type of Storage Practice: Dry Pond _____ Underground Detention _____ Other _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Inlets and Drainage Area Stabilization:

Inlet Type (s) _____ Total Number _____ Repair Needed _____ Debris/ Sediment Accumulation _____

Erosion in Drainage Area _____ Drainage Area Debris Accumulation _____ Pretreatment Bypass _____

Observations _____

_____

2. Practice Function:

Inadequate Vegetation and/or Ground Cover (if applicable) _____ Surface Erosion in Practice _____ Debris/Sediment Accumulation _____

Inadequate Drawdown _____ Standing Water _____ Last Rain Event >1" +/- _____ Days/Hours

Observations _____

_____

3. Structural Components:

Over flow Device (Y/N), Type: _____ Debris/ Sediment in Overflow _____ Repair Needed _____

Vaults/Chambers (Y/N), Type: _____ Debris/ Sediment in Chambers _____ Repair Needed _____

Observations _____

_____

Inspector _____ Received By _____ Date _____

Figure L.10 Storage and Underground Detention Facilities Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Generic Stormwater Management Facilities Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Device Type: Hydrodynamic treatment _____ Filtering treatment _____ Retention _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Inlets and Above Ground Condition:

Type _____ Total Number _____ Repair _____ Clear of debris _____ Graded Areas _____

Observations _____

_____

2. Structure:

Access _____ Outlets _____ Elbows and Connections _____ Vaults and Chambers _____ Trash Racks _____

Observations _____

_____

3. Overall Function:

Oil and Grease Accumulation _____ Sediment _____ Debris Accumulation _____ Last Rain > 1" +/- _____ Hours/Days

Observations _____

_____

Inspector _____ Received By _____ Date _____

Figure L.11 Generic Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Tree Planting and Preservation Maintenance Inspection Report

Name/Address: _____ WPD No. _____

Mailing Address: _____ Ward: _____

Owner / Agent: _____ Telephone: _____ Lot: _____ Square: _____

As-Built Plan Available (Y/N) Last Inspection Date: _____ Last Service Date: _____ Service Contract (Y/N), Type: _____

Tree Type(s): New _____ Preserved : _____

List all other stormwater management facilities on site: _____

Review of on-site maintenance logs: _____

1. Tree Condition:

Adequately watered_____ Dead/broken/diseased branches pruned_____ Trunk protected_____ Root collar exposed_____

Mower/weed whip damage, vandal damage, animal damage_____ Insect or disease problems_____

Observations _____

_____

2. Mulching:

2–4 inch deep mulch _____ Mulch not against trunk_____

Observations _____

_____

3. Staking (if needed):

Tree age < 1 year: Stakes in place _____ Webbing or ties hampering growth of tree_____

Tree age > 1 year: Stakes removed_____

Observations _____

_____

Inspector _____ Received By _____ Date_____

Figure L.12 Tree Planting and Preservation Maintenance Inspection Report.

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GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT

Maintenance Service Completion Inspection Report

Name/Address: _____

Owner/Agent: _____ WPD No: _____

Mailing Address: _____

Service Providers: _____

Maintenance Service Start Date: _____

Maintenance Service Completion Date: _____

Type of Stormwater Practice Serviced: _____

Description of Work: _____

_____

_____

Is the maintenance service satisfactory? Yes/No If no, list items to be completed: _____

_____

_____

_____

Inspector _____ Received By _____ Date_____

Figure L.13 Maintenance Service Completion Report.

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~~Appendix N~~Appendix M Tiered Risk Assessment Management: Water Quality End Use Standards

~~N.1~~M.1 Tiered Risk Assessment Management (TRAM): Water Quality End Use Standards for Harvested Stormwater for Non-Pp~~p~~otable Uses

This work was commissioned by the District of Columbia Department of the Environment (DDOE) to provide a frame work for applicants to follow when proposing a non-potable use of harvested stormwater runoff to comply with site stormwater retention regulations. Suggested water quality standards are drawn from a literature review of the field and rely largely on international guidance developed in Australia and the United Kingdom, guidance has also been drawn from the State of Texas and from the California County of Los Angeles. The proposed application process presented here requires the assessment of contaminates of concerns based on the collection surface(s), along with an assessment of the public health threat for categories of microbial and chemical contaminants. Under this scheme, an applicant is required to consider the potential risk of exposure and related magnitude of human health impacts with exposure. A tiered risk assessment-management (TRAM) approach is provided to evaluate site conditions and determine treatment level if needed. If treatment is required this guidance provides a procedure for evaluating any remaining public health risk (residual risk) at the time of the commissioning of treatment practices, as well an ongoing procedure to ensure those practices meet public health standards throughout their maintenance and operation.

~~N.2~~M.2 Health Risks

Rainwater collection systems have a long history going back as far as 3000 BC in India. It was used widely for agriculture throughout South East Asia over 2,000 years ago and in early Rome rainwater harvesting systems provided central air conditioning. Although rainwater harvesting has a significant and successful history, its popularity has declined as the large urban central water distribution system has grown. The return to rainwater harvesting in current times is driven largely by two factors, water scarcity and pollution of receiving waters. However, as we reconsider the collection of stormwater for non-potable uses, we must also recognize this can pose health risks. Health risks are due to two principal categories of contaminants—pathogenic microorganisms and toxic chemicals. Although both categories of contaminants need to be evaluated to ensure public health will be protected, microorganisms will typically pose the greatest health risk at most sites where stormwater is harvested for non-potable uses. Microbial hazards include bacteria, viruses, protozoa, and—to a lesser extent—helminthes. Chemical hazards can include inorganic and organic chemicals, pesticides, potential endocrine disruptors, pharmaceuticals, and disinfection byproducts. Proposals for stormwater harvested for non-potable uses submitted to DDOE will require an assessment of the public health threat for both categories of contaminants. This assessment starts with an analysis of the likelihood of exposure

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and can proceed through risk-based screening to determine if stormwater harvested for non-potable uses will pose a threat to public health.

DDOE cannot anticipate all site conditions within the wide spectrum of projects that may be proposed to harvest stormwater for non-potable uses to comply with District of Columbia stormwater regulations. For this reason, DDOE has developed a tiered risk assessment-management (TRAM) approach that applicants shall follow. Formal risk assessments can be costly, time consuming, and—for many stormwater projects—unnecessary. DDOE developed the TRAM approach to reduce the cost and level of effort associated with preparing the submission of a Stormwater Management Plan (SWMP) that incorporates stormwater harvesting for non-potable uses. The TRAM approach is based on the concept that increasing levels of sophistication, level of effort, and cost of a risk assessment only need to be considered as site conditions warrant. From a risk management perspective, the overarching goal in any project proposing to harvest stormwater for non-potable uses is to demonstrate that public health will be protected when the stormwater project is fully operational.

In addition to providing a cost-effective approach for making risk management decisions, the TRAM approach can be used to identify the most cost-effective risk mitigation strategy (should it be necessary). The two types of health risks planners must consider are maximum risk (posed by untreated stormwater) and residual risk (posed by treated stormwater).

Maximum risk is defined as the risk associated with maximum exposure to untreated stormwater. It is the risk posed by stormwater under the intended non-potable use prior to any preventive measure to disinfect or otherwise decontaminate stormwater. Estimating the maximum risk is necessary for DDOE to issue a permit, and it must be based on the specific exposures that are reasonably anticipated for the untreated stormwater. High-priority contaminants significantly contributing to the maximum risk should be the primary focus if a treatment plan is required. If the maximum risk is acceptable, no treatment of collected stormwater is necessary. However, if the maximum risk exceeds acceptable levels, stormwater must be treated to reduce health risks to acceptable levels.

DDOE will not be prescriptive with regard to the technology selected to protect public health. However, the threshold criterion for approving a SWMP with harvest for non-potable uses system is ensuring public health will be protected.

DDOE will make a determination on the effectiveness of the risk reduction strategy based on the magnitude of the second type of risk—namely, residual risk. Residual risk is defined as the risk remaining after stormwater has been treated based on the specific types of human exposure associated with the intended stormwater reuse.

For permitting purposes, DDOE will require proof that the residual risk from both microbial and chemical contaminants will be reduced to acceptable levels. The magnitude of residual risk is dependent on the magnitude of the maximum risk (the pretreatment risk) and the efficiency of the risk mitigation technology selected for the project.

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~~N.3~~M.3 Evaluating the Threat to Public Health

The threat to public health is a function of two site-specific criteria—namely, the likelihood of exposure and the magnitude of health risks associated with site-specific exposure conditions. ~~Table N~~Table M.1 through ~~Table N~~Table M.3 presents a useful matrix that planners can use to evaluate these two primary criteria during project planning. Proposed plans submitted to DDOE should be based on the classification scheme presented in these tables because it will streamline both the process of planning a stormwater project and DDOE's review of the submitted plans.

~~Table N~~Table M.1 presents three categories for determining the likelihood of exposure. For some stormwater programs, human exposures will only occur under unusual site conditions. For example, in closed systems where contact with collected stormwater is not anticipated (unless there is a breach in the system), the likelihood of exposure would be classified as unlikely. Under these conditions, stormwater use would not pose a health threat and a treatment system would be unnecessary.

Where exposures are classified as possible or likely, a more detailed analysis of potential maximum health risks for the untreated stormwater will be required. An applicant will identify all proposed collection surfaces to determine potential contaminates of concern (COC). If collection surfaces include any existing surfaces, i.e., contributing drainage areas that exist preproject will remain as part of the final development and will contribute to the proposed rainwater harvest system, sampling of those site conditions may be required to identify COC.

When sampling existing surfaces that are proposed to contribute to the rainwater harvesting system in the proposed development contaminant levels in these samples will be compared with risk-based levels that DDOE has derived for a select group of chemicals. Samples will also be screened for microbial threats. ~~Table N~~Table M.2 presents three categories of risks that roughly characterize maximum risk. Whether stormwater treatment is necessary will depend on the magnitude of maximum risk, which will be quantified with a risk-based screening approach. When contaminant levels are equal to or less than the risk-based levels, the maximum risk is classified as low or acceptable, and stormwater can be used without any treatment. When contaminant concentrations in stormwater are less than ten-times the risk-based concentration, the maximum risk is characterized as minor and DDOE will use its discretion to decide whether treatment is necessary.

~~Table N~~Table M.3 shows the matrix of all possible outcomes for the combined evaluation of the likelihood of exposure and magnitude of health risks. These represent the classification of the health threat. Treatment technologies will not be required for stormwater harvesting projects posing a low threat. DDOE will use professional judgment to determine if moderate threats require a treatment system. Treatment systems will be required for high threats to public health.

Finally, all proposals shall present an analysis of both intended and unintended uses and exposures. While these situations may be rare and unique, they could pose a high risk to a small number of individuals. This could include inadvertent cross connections with drinking water systems and maintenance personnel or children being unintentionally exposed to untreated stormwater. Rainwater harvest proposals must identify how those unintended uses and exposures

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will be avoided. Some examples of protective measures include backflow protectors, use of purple pipes and identification stamps, water coloring and signage.

Table M.1 Likelihood Exposure will Occur

Descriptor	Description of Likelihood
Unlikely	Exposure could occur only in unusual circumstances
Possible	Exposure might occur
Likely	Exposure will probably occur

Table M.2 Magnitude of Health Risk

Descriptor	Risk
Insignificant	Low or Acceptable Levels
Minor	Minor
Severe	Major

Table M.3 Characterizing Threat to Public Health

Likelihood of Exposure	Magnitude of Public Health Threat		
	Insignificant	Minor	Severe
Unlikely	Low	Low	Low
Possible	Low	Moderate	High
Likely	Low	Moderate	High

~~N.4~~M.4 Applying the Tiered Risk Assessment-Management Approach

DDOE's intent in developing the TRAM approach is to expedite the permitting process and keep investigative costs to a minimum. It is based on the concept that the complexity of investigations should match the complexity of the site and conditions of exposure. DDOE will only require that sufficient information be presented to satisfy the requirement that public health is protected. The level of effort necessary to verify this threshold will depend on site-specific characteristics, which will vary from site to site.

The TRAM approach is presented in a risk assessment-management decision-making framework. Although there are a total of nine steps in this process, proposed plans need only present sufficient analyses to demonstrate public health will be protected. For many sites, the entire nine-step process will not be needed to demonstrate exposure to treated or untreated stormwater will pose low risks. A determination regarding the appropriate course of action can often be made in the first four steps. DDOE believes that the most cost-effective approach for project teams is to follow the TRAM, so the complexity, level of effort, and costs of investigation will be a direct function of the site-specific conditions instead of a one-size-fits-all prescribed approach.

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Figure 1 presents the TRAM decision-making framework. There are two important features of this framework that make it cost effective. First, investigative costs (including sampling and analysis) can be minimal for sites where there will be no human exposures to stormwater. Second, there are several exit points in the nine-step process at which investigations can be terminated and the proposed plan submitted to DDOE. The overall goal of the TRAM approach is to identify priorities as early as possible in the process to ensure public health will be protected. This requires the following:

- Identifying and documenting contaminant hazards and hazardous events;
- Estimating the likelihood that a hazardous event will occur;
- Estimating the consequences of the hazardous event occurring; and
- Characterizing the overall risk by combining the hazards and hazardous events with their likelihood and consequence.

Depending on the complexity of the site, these requirements may necessitate the following assessments:

- Initial screening-level risk assessment;
- An assessment of the maximum risk (in the absence of preventive measures); and
- An assessment of the residual risk (in the presence of preventive measures).

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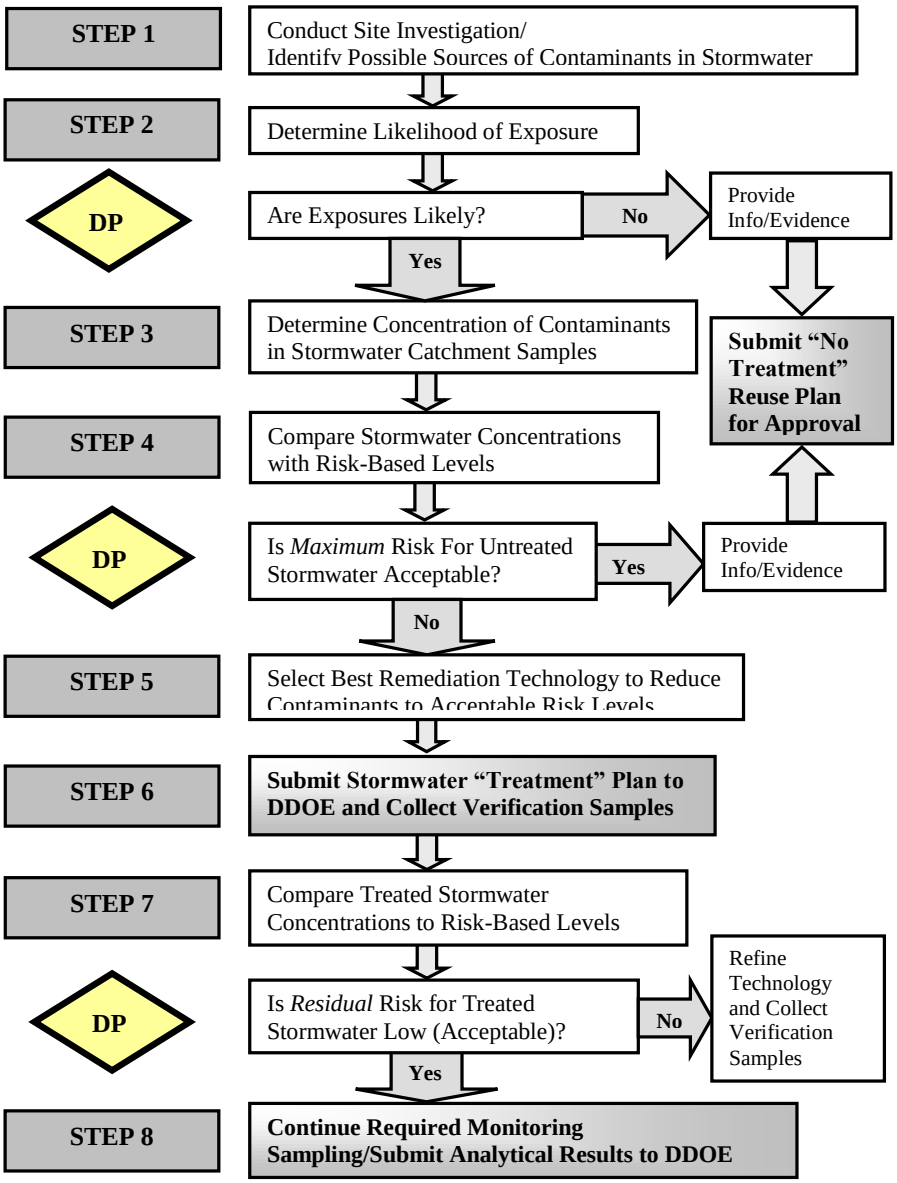

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Step 1: **Conduct Site Investigation.**

The goal of the initial site investigation is to identify potential contaminants that could enter the stormwater catchment and to characterize potential human exposures. This information will be used as the baseline investigation for subsequent steps in the TRAM approach. At minimum, the proposed plan must provide a general description of the site and any potential chemical or microbial contamination that may be present. Information should include:

- Site location and map showing all the properties within the proposed stormwater catchment system, in the simplest scenario this identification is the proposed roof area
- Zoning classification of all properties contributing to the stormwater catchment
- Total acreage of the stormwater catchment for the stormwater project
- Description of site property and surrounding areas based on available data and information. In the simplest scenario this is limited to an identification of the proposed roof materials and roof characteristics
- Description of any portion of the site regulated under the Resource Conservation and Recovery Act (RCRA), Superfund Program, or any other environmental investigation by the District of Columbia or the Environmental Protection Agency
- The current status of any ongoing or unresolved Consent Orders, Compliance Agreements, Notices of Violation (NOV), or other activities
- Schematic showing the location of sewer manholes
- Location of any obvious chemical spill residue (e.g., discolored soil, die-back of vegetation, etc.)
- Location of all aboveground or underground storage tanks
- Planned future uses of the site

If the site is zoned industrial, and the proposed catchment area contains surfaces other than the a proposed roof area, it will be necessary to conduct a more robust baseline investigation than for other types of properties to determine if chemical or microbial contamination is present. For sites zoned industrial, all potential chemical contaminants that were used, stored, or released on the property must be identified.

On sites where the catchment area includes surfaces beyond a proposed roof the receiving environment for all stormwater in the catchment must be characterized. All sources of variation due to seasonal and diurnal effects, as well as major rain events, must be characterized. This baseline information is very important because it provides a point of reference for evaluating untreated stormwater. It will also be important to determine whether validation and/or verification sampling or monitoring is warranted.
Stormwater contaminants detected in catchment can be due to both roof water runoff and contamination of soil within the area stormwater will be collected. Therefore, when existing roof areas and other existing surfaces will contribute to the proposed rainwater harvest system the existing roof systems must be inspected, and land use must be characterized as part of the proposal process.

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Some of the important roof characteristics include the following:

- Whether vehicular traffic is allowed (i.e., parking structures)
- Whether there are overflow or bleed-off pipes from roof-mounted appliances, such as air conditioning units, hot water services, and solar heaters that will contribute to the collection area
- Whether any flues or smoke stacks from heaters, boilers, or furnaces could have contaminated roof surfaces
- Whether the roof is covered with lead flashing or exposed areas painted with lead-based paints
- Whether the roof is covered with a vegetated roof system

A short narrative of how the property has historically been used must also be provided if the proposed collection areas include existing land surfaces and information is available. This land use description is very important because some land uses have been shown to be associated with high contaminant levels. Land uses of particular interest include the following:

- Industrial land uses can result in either widespread or point sources of contamination due to organic compounds and/or inorganic metals
- Runoff from major roads and freeways with high traffic volumes can contain relatively high levels of hydrocarbons and metals (particularly, lead)
- Residential areas that experience frequent sewer overflows

Plans must describe how the stormwater will be collected, stored, and used. This will provide important exposure information necessary to estimate potential threats to public health. At minimum, the plan must provide:

- How stormwater will be collected
- The total amount of stormwater that will be collected from each source (roof water, parking lots, etc.)
- How stormwater will be stored (aboveground cistern, belowground storage tank, etc.)
- Description of the end use(s) of stormwater (municipal irrigation, spray fountain, pool, etc.)
- List of all types of individuals who could potentially be exposed to stormwater under the intended use(s) (e.g., landscapers, maintenance workers, children, joggers, etc.)
- Age groups for all types of exposed individuals (e.g., children, adults, elderly)
- Estimated time (e.g., hours, days, years) each type of individual could be exposed to stormwater under its intended use
- List of activities the exposed individuals will be engage in on site (recreational, sports, gardening, etc.)

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- Type and routes of exposures for all exposed individuals (ingestion of sprays during irrigation, ingestion during car wash, ingestion of fruit and vegetables irrigated with stormwater, etc.)
- List of potential exposures associated with unintended stormwater uses (system malfunction, cross plumbing, etc.)
- List of sensitive populations that may be exposed (children, infirm, invalid, etc.)

The above information will form the basis for determining the likelihood of exposure in the next step and will also be used to characterize specific exposure conditions and routes of exposure in subsequent steps.

Step 2: **Determine Likelihood of Exposure.**

One of the basic tenets of risk assessment states that, "Where there is no exposure, there is no risk." This truism is applicable even for sites where chemical or microbial contamination is elevated. Accordingly, the first step in the investigation for all stormwater projects is to determine the likelihood of exposure. As was indicated in ~~Table N~~Table M.1, exposures can be characterized as unlikely, possible, or likely based on reasonable assumption. That is, DDOE's threshold will not be based on the possibility that exposures could occur, but rather on whether it is plausible exposures will occur. Information presented in Step 1 should form the basis for this determination. Making a determination that exposures are unlikely in this step is very important because no stormwater decontamination or disinfection will be required for those projects where exposure is unlikely. Untreated stormwater can be used as it was collected in these cases.

To make a determination that exposures are "unlikely" requires an evaluation of both intended and ~~non-~~unintended exposures. An example of unlikely exposure conditions would be a closed system with no intended exposures and less than approximately 50 unintended exposure events per year involving less than 1 milliliter exposure per isolated event. System malfunctions (breaches in the system, pipe bursts per year, tank leakage, cross connections, etc.) are the most likely types of unintended exposures. Likelihood of exposure should be based on the specific end use and the types of individuals who will visit the site.

DECISION POINT 1: **Are Exposures Likely?**

If the information submitted to DDOE is sufficient to support a determination that exposures are "unlikely," no further study or analysis is required. This is the first exit point in the TRAM process (as was indicated in Figure 1). On the other hand, if exposure is "likely" or "possible," the investigation must proceed to the next step.

Step 3: **Determine Concentration of Contaminants in Stormwater.**

When human exposures are likely or possible, the maximum risk must be evaluated based on the concentration of both chemicals and pathogenic organisms. The maximum risk represents the threat to public health associated with potential exposures to untreated stormwater.

All chemicals identified and qualitatively evaluated in Step 1 should be targets in the sampling plan. If the catchment area in which stormwater will be collected is zoned industrial, it is possible that those chemicals identified in the baseline investigation may have contaminated roof

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water, surface soil, or pavement. For areas considered open space or recreational properties, sampling for chemical contamination can be limited to pesticides.

~~Table N~~Table M.4 lists chemicals typically associated with industrial operations, as well as common pesticides. Pathogenic microbes may also be present in collected stormwater, and Table 4 lists the three primary categories of microbial threats to human health, which are bacteria, viruses, and protozoa. Stormwater samples collected in this step should represent the conditions that will occur during a major rain event. Note, however, that the concentrations of chemicals and microbes will be lower after a major rain event compared with a minor rain event due to the dilution effect. Planning for the stormwater sampling event should take into account roof, soil, and solid surface contributions to the stormwater catchment system. All samples submitted for laboratory testing should represent, as closely as possible, the conditions in which untreated stormwater will be stored and used at the site. For example, if collected stormwater will be stored in a cistern shielded from light for several days before it is used, the samples sent for laboratory analysis must be stored under the same conditions (i.e., same temperature under dark conditions to assess growth of microbial pathogens). After replicating site storage conditions, all samples must be sent to an EPA-approved laboratory for analysis of all chemicals of interest identified in the baseline investigation.

The sampling locations and number of samples collected at this stage should be based on the size of the catchment area and sources of potential contamination. For example, a non-industrial site totaling 2 to 3 acres with only one storage cistern could be adequately represented by taking a minimum of three samples at timed intervals over a holding time of 4 to 5 days. At the other end of the spectrum, a 10-acre site located in an industrial area with several storage cisterns spread out over the site may require sampling from each cistern after moderate and major storm events. Regardless of the type of site, DDOE encourages implementation of the most cost-effect approach as the goal is not to fully characterize the site for potential contamination, but rather to determine if the contaminants in collected stormwater pose a health threat.

Sampling results generated in this step should be evaluated in the risk-based screening comparison described in the next step.

Table M.4 Chemicals of Interest for Baseline Investigations

Inorganic Metals		
Aluminum	Chromium	Selenium
Arsenic	Iron	Silver
Barium	Manganese	Tin
Beryllium	Mercury	Zinc
Bromate	Molybdenum	
Cadmium	Nickel	
Organic Compounds		
Acrylamide	Hexachlorobutadiene	Trichloroethylene
Benzene	Polyaromatic hydrocarbons	Trichloroethane
Carbon tetrachloride	Polybrominated biphenyls	Trichloroethene

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Chlorobenzene	Polychlorinated biphenyls	Vinyl chloride monomer
Benzo[a]pyrene	Tetrachloroethene	Xylene
Epichlorohydrin	Toluene	
Ethylbenzene	Trichlorobenzenes	
Pesticides		
Aldicarb	Chlordane	
Aldrin	Diazinon	
Atrazine	Heptachlor	
Pathogenic Microbes		
Bacterium: *E. coli*		
Protozoan: *Cryptosporidium parvum*		

Step 4: Compare Stormwater Concentrations with Risk-Based Levels.

To determine whether exposure to untreated stormwater is a public health threat, maximum risk must be assessed. Determining whether stormwater exposures will pose a threat does not require that a formal risk assessment be conducted. Risk assessments can be costly and time consuming to prepare. Instead, it will only be necessary to apply risk-based screening, and DDOE has even simplified this step. Screening involves a simple comparison of the chemical and/or microbial concentrations detected in untreated stormwater (in the previous step) with acceptable risk-based screening levels. Risk-based concentrations represent safe exposure levels for chemical or microbial contaminants. They are derived based on the frequency of exposure, amount ingested, and the inherent toxicity of each contaminant.

~~Table N~~Table M.5 lists different types of stormwater use that DDOE anticipates in the District. For each stormwater use, there could be several types of exposure conditions that vary in exposure intensity and duration. For example, individuals engaged in high-intensity sports (e.g., baseball, football, soccer, etc.) would have greater exposures to contaminants in stormwater used for irrigation at a municipal park than would someone walking a pet.

Table M.5 Types of Stormwater Use and Routes of Exposure

Stormwater Use	Route of Exposure	General Description of Exposure Conditions
Home lawn or garden spray irrigation	Ingestion of aerosol spray	Typical watering every other day during half year
	Ingestion after contact with plants/grass	Routine indirect ingestion via contact with plants, lawns, etc.
	Accidental ingestion of stormwater	Infrequent inadvertent ingestion.
Open space or municipal park drip or spray irrigation	Ingestion via casual contact (picnic, walking pet)	Infrequent contact with wet grass, picnic tables
	Ingestion via low-intensity sports (golf, Frisbee)	Typical contact with irrigated plants/grasses
	Ingestion via high-intensity sports (baseball, soccer)	Frequent contact with irrigated sports field

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Stormwater Use	Route of Exposure	General Description of Exposure Conditions
	Ingestion by child on playground	Frequent contact with wet surfaces and frequent hand-to-mouth activity
	Public fountain with spray element	Indirect and infrequent ingestion of spray
	Public fountain with standing pool	Infrequent ingestion of pool water during hot days
Home garden drip or spray irrigation	Ingestion of irrigated vegetables and fruit	Typical ingestion of small home garden seasonal produce
Commercial farm produce drip or spray irrigation	Ingestion of irrigated vegetables and fruit	Typical ingestion of regional commercial produce
Home car wash spray application	Ingestion of water and spray	Once a week car wash for 6 months
Commercial car wash spray	Ingestion of water and spray	Car wash operator exposed 5 days per week
Toilet	Ingestion of aerosol spray	Flushing 3 times per day
Washing machine use	Ingestion of sprays	Ingestion from 1 load per day
Fire fighting	Ingestion of water and spray	Firefighter assumed exposed 50 events per year

~~Table N~~Table M.6 lists the exposure assumptions that represent different types of stormwater use and the corresponding typical exposure conditions for each use. Project planners should identify the appropriate exposure conditions in this table that most closely match site-specific conditions. Stormwater use and the site-specific exposure conditions correspond to specific assumptions regarding how individuals will come in contact with untreated stormwater. The two most important criteria are the number of days contact is expected to occur and the volume of stormwater that will be ingested on each of those days.

For example, the first row indicates that an individual watering a lawn or garden is assumed to do so every other day for 6 months and will ingest 0.1 mL of stormwater each time the lawn is watered. While DDOE anticipates that these exposure assumptions will represent the majority of sites, a small number of reuse projects may be unique, and DDOE should be contacted to discuss unique sites. For these projects, planners should either contact DDOE directly to discuss alternative exposure assumptions or select an exposure scenario that is intentionally conservative. Although this may be an overly protective approach, such a comparison would be sufficient proof for DDOE that public health will be protected if the site passed the risk-based screen test.

Table M.6 Exposure Assumptions Based on Stormwater Use and Exposure Conditions

Stormwater Use	Route of Exposure	Exposure Assumptions	
		Volume Ingested (mL)	Days (per year)
Home lawn or garden	Ingestion of aerosol spray	0.1	90

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Stormwater Use	Route of Exposure	Exposure Assumptions	
		Volume Ingested (mL)	Days (per year)
spray irrigation	Ingestion after contact with plants/grass	1	90
	Accidental ingestion of stormwater	100	1
Open space, municipal park drip, or spray irrigation	Ingestion with casual contact-picnic, walking pet	0.1	32
	Ingestion with low intensity sports-golf, Frisbee	1	32
	Ingestion high intensity sports-baseball, soccer	2.5	16
	Ingestion child playground	4	130
	Public fountain with spray element	0.1	130
	Public fountain with standing pool	4	130
Home garden drip or spray irrigation	Ingestion of irrigated vegetables and fruit	7	50
Commercial farm produce drip or spray irrigation	Ingestion of irrigated vegetables and fruit	10	140
Home car wash spray application	Ingestion of water and spray	5	24
Commercial car wash spray	Ingestion of water and spray	3	250
Toilet	Ingestion of aerosol spray	0.01	1100
Washing machine use	Ingestion of sprays	0.01	365
Fire fighting	Ingestion of water and spray	20	50
Swimming pool	Ingestion of water	200	90

It should be stressed that although EPA and several state regulatory agencies have developed RSLs (EPA RSLs available at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/equations.htm), these should not be used for stormwater projects. These RSLs apply only to potable drinking water and, because they are overly conservative, many stormwater projects would fail the screen. Stormwater collected in the District must never intentionally or unintentionally be used as a potable drinking water source. Therefore, EPA's RSLs for drinking water, which are based on the assumption that a child and an adult will drink 1 and 2 liters of water per day, respectively, are not applicable to stormwater reuse projects. Furthermore, the drinking water RSL assumes an individual will drink the water 350 days per year for 30 years. This corresponds to 350 to 700 liters of water consumed per year, which is 500 to 1,000 times the amount of stormwater that will be ingested for most projects (as shown in ~~Table N~~Table M.6). Clearly, drinking water exposure assumptions do not represent typical stormwater reuse exposures and should not be used to screen for the maximum risk.

DDOE has made the risk-based screening step easy to use by evaluating the exposure conditions presented in ~~Table N~~Table M.6, ranking the intensity of each type of exposure and grouping exposures with similar intensity into one of four categories: severe, high, medium, or low. The exposure scenarios (listed in ~~Table N~~Table M.6) for each of these categories are presented in ~~Table N~~Table M.7.

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Table M.7 Categorizing Exposures Based on Stormwater Use: Severe, High, Medium, and Low

Exposure Classification	Exposure Classification	Route of Exposure
Severe	Swimming pools	Ingestion of water
High	Commercial farm produce drip or spray irrigation	Ingestion of irrigated vegetables and fruit
	Fire fighting	Ingestion of water and spray
	Commercial car wash	Ingestion of water and spray
Medium	Open space or municipal park drip or spray irrigation	Ingestion by child on playground
	Open space or municipal park drip or spray irrigation	Public fountain with standing pool
	Home garden drip or spray irrigation	Ingestion of irrigated vegetables and fruit
	Home car wash spray application	Ingestion of water and spray
	Home lawn or garden spray irrigation	Accidental ingestion of stormwater
	Home lawn or garden spray irrigation	Ingestion after contact with plants/grass
Low	Open space or municipal park drip or spray irrigation	Ingestion via high-intensity sports—baseball, soccer
	Open space or municipal park drip or spray irrigation	Ingestion via low-intensity sports—golf, Frisbee
	Open space or municipal park drip or spray irrigation	Public fountain with spray element
	Toilet	Ingestion of aerosol spray
	Home lawn or garden spray irrigation	Ingestion of aerosol spray
	Washing machine use	Ingestion of sprays
	Open space or municipal park drip or spray irrigation	Ingestion with casual contact—picnic, walking pet

Project planners should select one of these four categories that best represent site-specific conditions. The selection should be based on how stormwater will be used, who will contact the stormwater, and by what route of exposure. For example, stormwater used to fill a swimming pool is ranked "severe" because the frequency of exposure combined with the high rate of ingestion of pool water while swimming is considerably greater than all other exposures. It should be noted that exposure assumptions for formal risk assessments are typically established with worst possible exposure assumptions. While the worst exposure may be hypothetically possible, DDOE expects projects to rely on realistic and common sense expectations. For this reason, detailed and complex "future exposure analyses" are unnecessary. Proposals need only

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submit sufficient information to allow DDOE to convey to the public that a thorough analysis has been performed and that public health is being protected.

Although exposure assumptions are typically based on broad "what if" hypothetical scenarios in formal risk assessments, DDOE encourages proposals that are based on realistic expectations to determine the most likely threats to public health. DDOE recognizes that, in many cases, the anticipated exposure conditions will be based on subjective judgment rather than on a detailed complex "future hypothetical exposure" analysis. Accordingly, proposals need only submit sufficient information to show that all potential exposures have at least been considered. This will allow DDOE to convey to the public that a thorough analysis has been performed and that public health is being protected.

In addition to the obvious and planned stormwater use, proposals must also consider inadvertent or unauthorized use of stormwater. That is, while the major focus should be on the intended uses, it is important to consider exposures that could result from inadvertent use of untreated stormwater as it may result in higher-than-intended exposure to humans and the receiving environment. For example, even though the intended use of stormwater ~~may be for~~is for purposes other than ~~non-~~drinking ~~purposes~~, such as irrigation of parks and gardens, people may occasionally drink from a recycled ~~-~~-water tap by accident. Obviously, a failsafe system must be put in place to prevent this from occurring. However, preventive measures can sometimes be circumvented, and the plan should evaluate the exposure as a low-probability event to determine the magnitude of the potential threat to public health in the event of occurrence.

DDOE has derived RSLs for all the chemicals that are routinely detected in environmental media, particularly at industrial sites, which were presented in ~~Table N~~Table M.4. It is impractical to derive RSLs for all possible combinations of chemicals and for all stormwater uses and exposure conditions, but this list should be the starting point for sampling efforts. However, if the baseline investigation provides sufficient evidence that chemical contamination at the site is unlikely, sampling may be unnecessary. DDOE recognizes that sampling and laboratory analyses can be expensive and time consuming and may not be warranted. For example, if the property is currently and has always been zoned for residential use, there may be no reason to suspect a chemical release has occurred. In this situation, the planner could submit the baseline investigation and justification for a waiver to sample, which DDOE would review and consider.

The RSLs that should be used for risk-based screening are presented in ~~Table N~~Table M.8. These levels represent the acceptable concentrations corresponding to either a cancer risk of 1E-6 or non-cancer hazard index of 1.0. They correspond to the site-specific end use of the stormwater and exposure conditions as discussed previously. EPA's risk management framework states that a risk level between 1E-6 and 1E-4 is a discretionary range. The reason DDOE selected a risk-based screening level for cancer risk of 1E-6 is that it is likely that multiple chemicals will be detected for some projects. DDOE will use discretion in setting the acceptable "cumulative" risk level for projects where the individual contaminant levels slightly exceed the concentrations presented in ~~Table N~~Table M.8.

To use the table, planners only need to identify the column that matches the site-specific exposure category and identify the row corresponding to the chemical of interest. That sample concentration is then compared with the RSL. If the sample concentration is below the RSL, it

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can be concluded stormwater does not pose a threat to human health, and no further action is necessary. If the sample concentration exceeds the RSL, the analysis must continue on to the next step in the TRAM process as described in the next section.

Table M.8 Risk-based Chemical Concentrations for Sites Categorized as Severe, High, Medium, and Low Exposures

Chemical (µg/L)	Drinking Water	Exposure Category			
		Severe	High	Medium	Low
Acrylamide	4.3E-02	1.6E+00	2.2E+01	5.8E+01	6.3E+02
Aldicarb	3.7E+01	1.3E+03	1.8E+04	4.9E+04	5.3E+05
Aldrin	4.0E-03	1.5E-01	2.0E+00	5.4E+00	5.8E+01
Aluminum	3.7E+04	1.3E+06	1.8E+07	4.9E+07	5.3E+08
Arsenic, Inorganic	4.5E-02	1.6E+00	2.3E+01	6.1E+01	6.6E+02
Atrazine	2.9E-01	1.1E+01	1.5E+02	3.9E+02	4.2E+03
Barium	7.3E+03	2.7E+05	3.7E+06	9.8E+06	1.1E+08
Benzene	4.1E-01	1.5E+01	2.1E+02	5.5E+02	6.0E+03
Benzo[a]pyrene	2.0E-01	7.3E+00	1.0E+02	2.7E+02	2.9E+03
Beryllium	7.3E+01	2.7E+03	3.7E+04	9.8E+04	1.1E+06
Bromate	9.6E-02	3.5E+00	4.8E+01	1.3E+02	1.4E+03
Cadmium	1.8E+01	6.7E+02	9.1E+03	2.5E+04	2.7E+05
Carbon Tetrachloride	4.4E-01	1.6E+01	2.2E+02	5.9E+02	6.4E+03
Chlordane	1.9E-01	6.9E+00	9.5E+01	2.6E+02	2.8E+03
Chlorobenzene	9.1E+01	2.7E+04	3.7E+05	9.8E+05	1.1E+07
Chromium	4.3E-02	4.0E+03	5.5E+04	1.5E+05	1.6E+06
Diazinon	2.6E+01	9.3E+02	1.3E+04	3.4E+04	3.7E+05
Epichlorohydrin	2.1E+00	8.0E+03	1.1E+05	2.9E+05	3.2E+06
Ethylbenzene	1.5E+00	5.5E+01	7.5E+02	2.0E+03	2.2E+04
Heptachlor	1.5E-02	5.5E-01	7.5E+00	2.0E+01	2.2E+02
Hexachlorobutadiene	8.6E-01	3.1E+01	4.3E+02	1.2E+03	1.3E+04
Iron	2.6E+04	9.3E+05	1.3E+07	3.4E+07	3.7E+08
Manganese	8.8E+02	3.2E+04	4.4E+05	1.2E+06	1.3E+07
Mercury	1.1E+01	4.0E+02	5.5E+03	1.5E+04	1.6E+05
Molybdenum	1.8E+02	6.7E+03	9.1E+04	2.5E+05	2.7E+06
Nickel	1.8E+03	6.7E+04	9.1E+05	2.5E+06	2.7E+07
Polybrominated Biphenyls	2.2E-03	8.0E-02	1.1E+00	3.0E+00	3.2E+01
Polychlorinated Biphenyls	5.0E-01	1.8E+01	2.5E+02	6.7E+02	7.3E+03
Selenium	1.8E+02	6.7E+03	9.1E+04	2.5E+05	2.7E+06
Silver	1.8E+02	6.7E+03	9.1E+04	2.5E+05	2.7E+06
Tetrachloroethylene	1.1E-01	4.0E+00	5.5E+01	1.5E+02	1.6E+03
Tin	2.2E+04	8.0E+05	1.1E+07	2.9E+07	3.2E+08
Toluene	2.3E+03	1.1E+05	1.5E+06	3.9E+06	4.3E+07

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Chemical (µg/L)	Drinking Water	Exposure Category			
		Severe	High	Medium	Low
Trichlorobenzene	2.3	8.4E+01	1.2E+03	3.1E+03	3.4E+04
Trichloroethane	2.4E-01	8.8E+00	1.2E+02	3.2E+02	3.5E+03
Trichloroethane	9.1E+03	2.7E+06	3.7E+07	9.8E+07	1.1E+09
Trichloroethylene	2.0	7.3E+01	1.0E+03	2.7E+03	2.9E+04
Vinyl Chloride	1.6E-02	5.8E-01	8.0E+00	2.2E+01	2.3E+02
Xylene	2.0E+02	2.7E+05	3.7E+06	9.8E+06	1.1E+08
Zinc	1.1E+01	4.0E+02	5.5E+03	1.5E+04	1.6E+05

Stormwater projects must also include an evaluation of threats from microbial pathogens. Although this can be a complex investigation (there are many hundreds of different microbial pathogens), DDOE has developed a tiered approach to reduce time and costs based on the indicator pathogens *Escherichia coli* (*E. coli*) and *Cryptosporidium parvum* (*C. parvum*). With this approach, planners should first monitor for *E. coli* because it is less expensive to analyze than Cryptosporidium. *E. coli* is termed a reference or indicator microbe because it is associated with human and wildlife fecal waste (it should be noted, however, that no simple statistical correlation exists between *E. coli* and human pathogen concentrations in stormwater). *C. parvum*, however, causes gastrointestinal illness that may be severe and sometimes fatal for people with weakened immune systems (which may include infants, the elderly, and individuals who have AIDs). It will only be necessary to monitor for *C. parvum* if the *E. coli* results exceed the RSLs presented in ~~Table N~~Table M.9, if the stormwater storage system is large and at ground level, or stormwater is stored in a reservoir.

~~Table N~~Table M.9 presents RSLs for *E. coli* that are based on EPA guidance for swimming and wading (Ambient Water Quality Criteria for Bacteria (EPA440/5-84-002 January 1986). The current level that is acceptable for swimming and wading is 160 CFU/100 mL, which corresponds to a risk of developing gastroenteritis of 8 in 1000 and is generally accepted as a safe level by regulatory agencies. This formed the basis for the "severe" category and was also used to derive the RSL for the three other categories using the attenuated exposure assumptions presented in ~~Table N~~Table M.6. For sites classified as severe exposures, the RSL should be interpreted to mean that when the site sample concentration for *E. coli* < 160 CFU/100 mL, the stormwater is safe for swimming or wading, and no further action is necessary for microbial contaminants. If this RSL is exceeded, however, samples must be collected for the next tier, which involves analyzing for *C. parvum*.

Unlike *E. coli*, no regulatory agency has yet to develop a safe level for *C. parvum* exposure. Although the EPA's recently revised new Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule; EPA 815-R06-006 February 2006) stresses the importance of monitoring for *C. parvum* to protect drinking water sources, no exposure-specific RSL is available. It should be noted, however, that DDOE's approach for monitoring microbial contaminants is similar to the strategy in the LT2 rule, because DDOE concurs with EPA that a tiered monitoring approach based on *E. coli* and *C. parvum* is the most cost-effective strategy for protecting the public from gastrointestinal illness.

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~~Table N~~Table M.9 presents RSLs for each exposure category for *C. parvum*. These levels were developed based on the WHO approach using Disability Adjusted Life Years (DALYs); they are also consistent with the tolerable levels developed in Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Stormwater Harvesting And Reuse (July 2009) and are set at 1E-6 risk level.

Table M.9 Risk-Based Microbial Levels for Sites Categorized As Severe, High, Medium, and Low Exposures

Microbial Pathogen	Swimming	Exposure Category			
		Severe	High	Medium	Low
Escherichia coli (CFU/100 mL)	126[1]	126	1714	4615	50000
Cryptosporidium [2] (oocysts/L)	NA	0.001	0.016	0.033	0.320

[1] Ambient Water Quality Criteria for Bacteria (EPA440/5-84-002 January 1986). RSLs correspond to a risk level of 8 in 1,000 of developing a gastrointestinal disease.
[2] Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Stormwater Harvesting and Reuse. July 2009. RSLs correspond to a 1E-6 risk level of developing a gastrointestinal disease.

The risk-based screening results for both chemicals and microbes are considered in the next step.

DECISION POINT 2: **Is Maximum Risk for Untreated Stormwater Acceptable?**

This step represents the important risk management decision point in the TRAM approach and it is dependent on the previous risk-screening comparison. The comparison of chemical and microbiological contaminant levels with RSLs is the only criteria needed to make this determination. This is a pivotal decision, since if the maximum risk is acceptable, no further investigation is necessary, stormwater treatment will not be required, and the proposed plan for no treatment can be submitted to DDOE for review. This represents the second exit point from the TRAM process.

On the other hand, if one or more contaminants fail the risk-based screen, action will generally be necessary to lower risks to an acceptable level. The magnitude of the exceedance will be the primary determinant for making risk management decisions. If the exceedance is less than one or two orders of magnitude, DDOE can exercise its discretion about the best path forward and whether a treatment system is necessary. DDOE will rely on factors such as availability of treatment systems, severity of the toxic effect, probability of exposures, and whether measures can be implemented to prevent exposures. DDOE's determination will ultimately be based on a cost-benefit evaluation, and the most effective remedy with the lowest cost will be selected.

If the appropriate remedy is treatment, planning should proceed to the next step.

Step 5: **Select Appropriate Treatment Technology to Reduce Contaminants to Acceptable Risk Levels.**

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Selecting the appropriate remedy will depend on the type(s) of contaminant(s) posing the health threat. For microbial pathogens in small-to-medium sized stormwater projects, ultraviolet (UV) disinfection is the most practical and cost effect approach. Although chlorination may also be suitable, protozoa such as *C. parvum* will require a higher Ct value (disinfectant concentration × contact time) because inactivation is more difficult to achieve compared with that for bacteria and viruses.

If chemical contaminants pose an unacceptable risk, it must be determined whether they are soluble or are bound to particles. If they are particulate-bound, it may be necessary to reduce their concentration with filtration, flocculation, or other treatments that reduce suspended solids.

Proposed plans must present the type of treatment selected that will target specific chemical and/or microbial risks. Planning should proceed to the next step.

Step 6: **Submit Stormwater "Treatment" Plan to DDOE and Collect Verification Samples.**

Proposed plans must provide a full description of the treatment system that is selected to reduce contaminant levels. The operating efficiency and specifications are necessary because verification samples will be used to validate the system is operating as designed.

The design of a monitoring program will be specific to each project, but it must take into account both peak and average rainfall. The point of compliance will be the stormwater in the catchment rather than separate points across the property because the catchment water represents the average of all contributions because it is likely that one or more individual samples will fail risk-based screening. The extent of sampling required to verify the system is functioning properly will be project-specific with more extensive sampling required for projects where a greater number of individuals are exposed to chemicals that are considered more toxic. As a rule of thumb, projects classified as "severe" and "high" will require a slightly more complex sampling design. Also, projects that require a higher log reduction of contaminant levels will receive a greater degree of scrutiny.

Step 7: **Compare Treated Stormwater Concentrations with Risk-Based Levels**

The log reduction necessary to achieve acceptable risk levels represents the difference between the maximum (untreated stormwater) and residual (treated stormwater) risk. Sample concentrations should be < the target concentrations corresponding to the intended use and exposures, and those target goals are the same RSLs that were presented in Tables N.8 and N.9.

DECISION POINT 3: **Residual Risk for Treated Stormwater Acceptable?**

This ~~step~~ point requires that a decision be made as to whether the treatment system efficiently reduced contaminant levels to acceptable concentrations. If the verification samples indicate the treatment system is performing as designed, the proposal must include the results and conclusions and proceed to the next step. As noted previously, DDOE will use discretion in determining whether the project meets the acceptable "cumulative" risk level for projects where the individual contaminant levels slightly exceed the concentrations presented in ~~Table N~~Table M.8. For example, DDOE may determine that exceedances do not rise to a level requiring action if the number of potentially exposed individuals is very small. Additionally, DDOE may use its

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discretion to waive action when an exceedance is less than an order of magnitude above risk-based screening levels.

If the treatment system fails to meet the design specifications and cannot achieve the required risk-based acceptable concentrations, the investigation must go back to Step 7 and repeat the subsequent steps of the TRAM process. This requires that either the selected treatment system be modified or an alternate technology selected.

Step 8: **Continue Required Monitoring Sampling/Submit Analytical Results to DDOE.**

The purpose of a monitoring program is to confirm continued compliance with the required end use water standards. The applicant will submit a post-construction monitoring program that will access the ongoing lifecycle compliance including annual verification of performance as well as performance verification after significant maintenance or modifications to the treatment system. Monitoring assesses:

- Overall performance of the systems harvesting stormwater for non-potable uses;
- Quality of the harvested stormwater being supplied or discharged;
- Changes in the receiving environment or exposed populations.

Ultimately, the goal of monitoring is to provide continued assurance that the treatment system is operating at levels specified in the permit and public health is being protected. For example, systems relying on UV radiation for disinfection would need to replace the UV source at ~~pre-~~ manufacturer specified intervals, and monitoring should be conducted soon after the unit is replaced. The original proposal must present a detailed monitoring plan that anticipates routine maintenance or major modification to treatment systems. As a rule of thumb, greater emphasis on monitoring will be necessary for those projects where the exposed population is significant and/or the maximum risks associated with untreated stormwater are significantly above risk-based levels. This monitoring program will be part of the approved SWMP and detailed in the deed of covenants as part of the BMP's long term maintenance obligations.

~~Appendix O~~Appendix N Land Cover Designations

~~O.1~~N.1 General Notes

The retention standard approach taken in this guidance manual for on-site stormwater management recognizes the ability of pervious land covers to manage some, or all, of the rainwater that falls on it. This is termed "land abstraction" in this appendix. The concept is discussed as "existing retention" in chapters and appendices ~~on~~ related to the off-site retention program. To facilitate the design, review, construction, and enforcement of site ~~–~~designated land cover, land abstraction has been divided into two types of land covers~~,~~ : natural cover and compacted cover. ~~In this guidance manual t~~The preservation ~~of existing land covers in either of these designation, as well as~~and the creation of land covers with either of these designations~~,~~ are treated equally in this guidance manual. The designation of natural cover assumes these lands will generate zero stormwater runoff for a design rain event. The designation of compacted cover assumes these lands will generate 25 percent stormwater runoff for a design rain event. The minimum area threshold for the natural cover designation is 1,500 square feet, with a minimum ~~shortest~~ length of 30 feet. All land cover designations must be recorded in the declaration of covenants.

~~O.2~~N.2 Existing Natural Cover Requirements

A site claiming natural cover based on the preservation of existing conditions must ensure conditions remain undisturbed to preserve hydrologic properties equal to or better than meadow in good condition. Preservation areas for natural cover may include the following:

- Portions of residential yards in forest cover that will not be disturbed during construction~~.~~
- Community open space areas that will not be mowed routinely, but left in a natural vegetated state (can include areas that will be rotary mowed no more than two times per year)
- Utility rights-of-way that will be left in a natural vegetated state (can include areas that will be rotary mowed no more than two times per year)
- Other areas of existing forest and/or open space that will be protected during construction and that will remain undisturbed

~~O.3~~N.3 Planting Requirements for the Creation of Natural Cover

- Every 1,500 square feet of created natural area shall be vegetated according to the following options of plant material quantity:
  - ~~▪~~ ♦ 1 native shade tree: 1.5 inch caliper (minimum), or
  - ~~▪~~ ♦ 2 native ornamental trees: 6 foot height (minimum), or
  - ~~▪~~ ♦ 6 native shrubs: 5 gallon container size (minimum), or

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- 50 native perennial herbaceous plants: 1 gallon container size (minimum), or
- 1 native ornamental tree: 6- to 10-foot height (minimum), and 25 native perennial herbaceous plants: 1 gallon container size (minimum), or
- 3 native shrubs: 5 gallon container size (minimum), and 25 native perennial herbaceous plants: 1 gallon container size (minimum), or
- Steep slope greater than 6 percent grade will require additional plantings, soil stabilization, or a terracing system.

- Whip and seedling stock may be used (when approved by DDOE) as a site's natural cover creation if a stream bank stabilization opportunity falls within the site's footprint. In this instance, whips or seedlings must be planted at a minimum density of 700 plants per acre, and at least 55 percent of these plants must remain at the end of the 2-year management period.
- Using nNatural regeneration, (i.e., allowing volunteer plants to propagate from surrounding natural cover as a cover creation technique,) may be allowed by DDOE, when 75 percent of the proposed planting area is located within 25 feet of adjoining forest, and the adjoining forest contains less than 20 percent cover of invasive exotic species. In this case, supplemental planting must ensure a density of 400 seedlings per acre.
- All plant materials used must be native to the mid-Atlantic region and must be installed in areas suitable for their growth. Lists of native species of shrubs, grasses, and wildflowers are published in the US Fish and Wildlife Service, 2009, Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed. There are several websites that may be consulted to select the most appropriate plantings for the District;
  - http://www.wildflower.org/collections/collection.php?collection=DC
  - http://www.nps.gov/plants/pubs/nativesMD/pdf/MD-CoastalPlain.pdf
  - http://www.nps.gov/plants/pubs/nativesMD/pdf/MD-Piedmont.pdf
- Plants can be irrigated until established.

O.4N.4 Stormwater Management Plans and Natural Cover

Sites using preservation of existing areas for the natural cover designation shall include on their Stormwater Management Plan (SWMP) a tree and vegetation survey, identification of location, and extent of preservation areas. Depending on the extent of the preservation area DDOE may require the SWMP include a more detailed schedule for retained trees noting tree species, tree size, tree canopy, tree condition, and tree location.

The SWMP will include the identification of material and equipment staging areas, and parking areas. Material and equipment staging areas and parking areas must be sufficiently offset for preservation areas to ensure no adverse impacts.

For areas maintained as meadow in good conditions, the SWMP shall document either the preservation of existing conditions or the creation of meadow conditions. A pPlan submission claiming meadow preservation will note the existing meadow boundaries; and include a field

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survey of the richness and diversity of existing plant species richness and diversity, and the existing soil conditions. A pPlan submission claiming meadow creation will note the proposed meadow boundaries, the planting and/or seeding species methods, and provide a soil amendments plan following as specified in Appendix KAppendix J.

O.5N.5 Construction Requirements for Natural Cover Designation

The preservation of lands designated as natural cover, such as undisturbed portions of yards, community open space, and any other areas designated on a site's Stormwater Management Plan (SWMP) as preserved natural cover, must be shown outside the limits of disturbance on the site's Soil Erosion and Sediment Control Plan. These areas must be (SESCP) and clearly demarked demarcated with signage prior to commencement of construction on the site on the site during construction and with fencing during constructionand signage prior to commencement of construction.

The creation of lands designated as natural cover as part of a public right-of-way (PROW) project and on sites where soils were not protected from compaction during construction the soils must be conditioned prior to planting with soil compost amendments as prescribed in Appendix KAppendix J.

For maximum survivability, planting of trees and, shrubs, and herbaceous vegetation for the creation of natural cover should occur only during the fall and early spring (September–November and March–May). The work should be done only under the supervision of someone qualified and skilled in landscape installation (see Section 3.14 Tree Planting and Preservation and Appendix J for details on qualifications). Proper maintenance of the materials after installation will be a key in ensuring whether the plants survivale. Prior to inspection, all trees and shrubs planted must be alive and in good health;, and native grass and wildflower seeds must have been sown at adequate densities and at the right time of year for each species.

Once a "natural cover" designation has been assigned to a portion of regulated development site, that area will need to be recorded in the declaration of covenants, documented at the site prior to construction activities, protected during construction activities, and permanently protected/maintained for the life of the regulated site.

Root pruning and fertilizing are examples of preconstruction activities. These measures aim to increase the wellbeing of trees and prepare them for higher stress. Prior to beginning construction, temporary devices such as fences or sediment controls are installed and remain throughout the construction phase. Some devices, like retaining walls and root aeration systems may stay for goodremain permanently. For example, if part of a root system is collapsed by a built road, permanent aeration may be necessary for the tree to remain healthy.

O.6N.6 Maintenance Requirements for Natural Cover Designation

All areas that will be considered natural cover for stormwater purposes must have documentation that prescribes that the area will remain in a natural, vegetated state. Appropriate documentation includes: subdivision covenants and restrictions,; deeded operation and/ and maintenance agreements and plans,; parcels of common ownership with maintenance plans,; third-party

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protective easement~~,~~ s within PROW or ~~easement with~~p maintenance plans~~,~~ ; or other documentation approved by DDOE. Natural c~~C~~over designation must be identified in the site's declaration of covenants.

While the goal is to have natural cover areas remain undisturbed, some activities may be prescribed in the appropriate documentation, as approved by DDOE, such as forest management, control of invasive species, replanting and revegetation, passive recreation (e.g., trails), limited bush hogging to maintain desired vegetative community, etc.

~~O.7~~N.7 Compacted Cover Designation

The compacted cover designation can apply to all site areas that are disturbed and/or graded for eventual use as managed turf or landscaping. Examples of compacted cover include lawns~~,~~ ; portions of residential yards that are graded or disturbed~~,~~ and maintained as turf, including yard areas~~,~~ ; residential utility connections~~,~~ ; and ~~public right of way~~PROW. Landscaping areas intended to be maintained ~~in~~ as vegetation other than turf within residential, commercial, industrial, and institutional settings are also considered compacted cover if regular maintenance practices are employed.

~~Appendix P~~Appendix O Geotechnical Information Requirements for Underground BMPs

~~P.1~~O.1 General Notes Pertinent to All Geotechnical Testing

A geotechnical report is required for all underground stormwater b~~B~~est m~~M~~anagement p~~P~~ractices (BMPs), including infiltration-based practices, filtering systems, and storage practices, as well as stormwater ponds and wetlands. The following must be taken into account when producing this report.

- Testing is to be conducted by a qualified professional. This professional shall either be a registered professional engineer, soils scientist, or geologist and must be licensed in the District of Columbia.
- Soil boring or test pit information is to be obtained from at least one location on the site. However, the location, number, and depth of borings or test pits shall be determined by a qualified professional, and be sufficient to accurately characterize the site soil conditions.
- Depth to the ground water table and estimated depth to the seasonally high ground water table must be included in the boring logs/geotechnical report.
- Laboratory testing must include grain size analysis. Additional tests such as liquid limit and plastic limit tests, consolidation tests, shear tests and permeability tests may be necessary based on the discretion of the qualified professional.
- The geotechnical report must include soil descriptions from each boring or test pit, and the laboratory test results for grain size. Based upon the proposed development, the geotechnical report may also include evaluation of settlement, bearing capacity and slope stability of the proposed structures.
- All soil profile descriptions should provide enough detail to identify the boundary and elevations of any problem (boundary/restrictions) conditions such as fills and seepage zones, type and depth of rock, etc.

In addition to the testing requirements described above, infiltration tests must be performed for all BMPs in which infiltration will be relied upon, including permeable pavement systems, bioretention, infiltration, and dry swales. Specific requirements for infiltration testing are discussed below.

~~P.2~~O.2 Initial Feasibility Assessment

The feasibility assessment is conducted to determine whether full-scale infiltration testing is necessary, screen unsuitable sites, and reduce testing costs. However, a designer or landowner

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may opt to skip the initial feasibility assessment at his or her discretion, and begin with soil borings.

The initial feasibility assessment typically involves existing data, such as the following:

- On-site septic percolation testing, which can establish initial rate, water table, and/or depth to bedrock;
- Previous geotechnical reports prepared for the site or adjacent properties.; or
- Natural Resources Conservation Service (NRCS) Soil Mapping.

If the results of initial feasibility assessment show that a suitable infiltration rate (typically greater than 0.5 inches per hour) is possible or probable, then test pits must be dug or soil borings drilled to verify the infiltration rate.

~~P.3~~O.3 Test Pit/Boring Requirements for Infiltration Tests

a. Excavate a test pit or drill a standard soil boring to a depth of 2 feet below the proposed facility bottom.

b. Determine depth to groundwater table (if within 2 feet of proposed bottom), and the estimated seasonally high groundwater table.

c. Determine Unified Soil Classification (USC) System textures at the proposed bottom and 4 feet below the bottom of the BMP.

d. Determine depth to bedrock (if within 2 feet of proposed bottom).

e. The soil description must include all soil horizons. If any of the soil horizons below the proposed bottom of the infiltration practice appear to be a confining layer, additional infiltration tests must be performed on this layer (or layers), following the procedure described below.

f. The location of the test pits or borings shall correspond to the BMP locations; test pit/soil boring stakes are to be left in the field for inspection purposes and shall be clearly labeled as such.

At least 1 test pit must be dug or encased soil boring drilled for each proposed infiltration-based BMP. For larger practices, additional test pits or soil borings are required for infiltration testing, as described in ~~Table P~~Table O.1 below.

Table O.1 Number of Infiltration Tests Required per BMP

Area of Practice (ft^2)	Minimum Number of Test Pits/Soil Borings
< 1,000	1
1,000–1,999	2
2,000–9,999	3
≥ 10,000	Add 1 test pit/soil boring for each additional 5,000 ft^2 of BMP.

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When more than one test pit or boring is necessary for a single BMP, the pit or boring locations must be equally spaced throughout the proposed area of the practice, as directed by the qualified professional. The reported infiltration rate for a BMP shall be the median or geometric mean of the observed results from the soil boring/test pit locations.

~~P.4~~O.4 Infiltration Testing Requirements

The following tests are acceptable for use in determining soil infiltration rates. The geotechnical report shall include a detailed description of the test method and published source references:

- Well Permeameter Method (USBR 7300-89)
- Tube Permeameter Method (ASTM D 2434);
- Double-Ring Infiltrometer (ASTM D 3385);
- Other constant head permeability tests that utilize in-situ conditions and are accompanied by a recognized published source reference.

An infiltration test does not require ground water quality protection approval if

- the test is conducted to a depth of fifteen feet or less below the ground surface, and
- a Professional Engineer licensed in the District of Columbia certifies the infiltration rate and that the test was carried out in compliance with this guidance and accepted professional standards.

Note: If the infiltration testing procedure reveals smells or visual indications of soil or groundwater contamination then the boring or test hole must be filled in accordance with wellhead protection best practices, unless laboratory analysis determines groundwater or soil is not contaminated, as defined in the District of Columbia Brownfield Revitalization Act of 2000, as amended (D.C. Official Code §§ 8-631 et seq).

~~P.5~~O.5 Infiltration Restrictions

If a Phase I Environmental Site Assessment determines that site contamination is likely, or if DDOE is aware of the presence of a brownfield or historic hotspot uses, such as current or previously existing leaking underground storage tanks (LUSTs), gas stations, or asphalt plants, an impermeable liner must be used for BMPs, and infiltration is restricted. If a Phase II Environmental Site Assessment is performed, and a qualified professional determines that the use of infiltration-based practices will not increase the likelihood of groundwater contamination, infiltration is not restricted. If there is no evidence of a history of contamination, impermeable liners are not required, and infiltration is not restricted.

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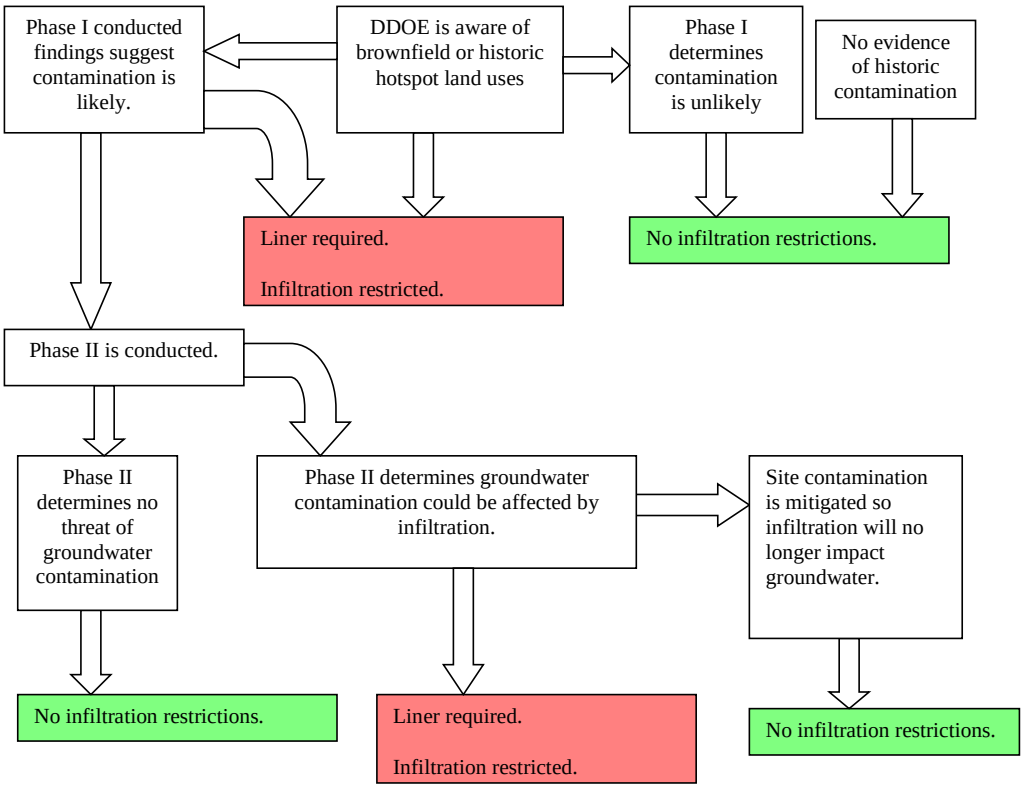

~~Appendix Q~~Appendix P Stormwater Hotspots

~~Q.1~~P.1 Stormwater Hotspots

Stormwater hotspots are defined as commercial, industrial, institutional, municipal, or transport-related operations that produce higher levels of stormwater pollutants, and/or present a higher potential risk for spills, leaks or illicit discharges. The following operations are classified as stormwater hotspots operations in the District of Columbia:

H-1 Vehicle Maintenance and Repair

H-2 Vehicle Fueling

H-3 Vehicle Washing

H-4 Vehicle Storage

H-5 Loading and Unloading

H-6 Outdoor or Bulk Material Storage

If any of the above operations are expected to occur on the proposed site for which a Stormwater Management Plan (SWMP) is required, the Stormwater Hotspot Cover Sheet must be completed. Further, if a Construction General Permit Stormwater Pollution Prevention Plan ($SWPPP_{CGP}$) was not required or the $SWPPP_{CGP}$ does not cover operational pollution prevention practices, then the *Stormwater Hotspot Checklist* must be submitted with the SWMP.

This appendix contains the following information:

- Stormwater Hotspot Cover Sheet
- Stormwater Hotspot Checklist
- Hotspot operation pollution prevention profile sheets for operations H-1 through H-6

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~~Q.2~~P.2 Stormwater Hotspot Cover Sheet

GOVERNMENT OF THE DISTRICT OF COLUMBIA
District Department of the Environment
1200 First Street NE, Fifth Floor, Washington DC 20002

Stormwater Hotspot Cover Sheet

Project Name: _____

Applicant Name: _____

Date: _____

Please indicate the appropriate hotspot operations for your project (check all that apply). If none apply check N/A.

Hotspot Operations:

___ Vehicle Maintenance and Repair (H-1)

___ Vehicle Fueling (H-2)

___ Vehicle Washing (H-3)

___ Vehicle Storage (H-4)

___ Loading and Unloading (H-5)

___ Outdoor or Bulk Material Storage (H-6)

___ N/A

If "N/A" is checked, please include this sheet only with plan submittal.

Otherwise, please indicate which of the following items are being included with the submittal of the Stormwater management Plan (SWMP). ***Note: If a SWPPP$_{CGP}$ has not been completed or the SWPPP$_{CGP}$ does not cover operational pollution prevention practices, then the Stormwater Hotspot Checklist must be completed for the SWMPsubmittal to be considered complete.***

___ A completed Construction General Permit Stormwater Pollution Prevention Plan (SWPPP$_{CGP}$)

___ A completed ***Stormwater Hotspot Checklist***

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~~Q.3~~P.3 Stormwater Hotspot Checklist

Stormwater Hotspot Checklist

Instructions: *Complete the following site information:*

	Requirement	*Description*
Site Description	List the type of facility and facility address	
Site Operations	Describe the operations to be conducted on-site.	
Receiving Waters	Name(s) of the receiving water(s). If drains to a municipal storm sewer system, include ultimate receiving waters.	
Site Materials	Significant materials to be stored on site (specify indoor or outdoor storage)	
Stormwater Management Practices	List the stormwater management practices being used to treat runoff from the site. Where appropriate, include description of design modifications appropriate for treatment of hotspot runoff (i.e., bioretention area with impermeable liner and underdrain)	
Spill Prevention and Response	Describe methods to prevent spills along with clean-up and notification procedures.	
Employee Education Program	Description of employee orientation and education program.	

Instructions: *Fill in the appropriate page number(s) from the site plans where the following site elements are clearly indicated.*

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Site elements	Site Plan Sheet Number(s)	Check if N/A	Approved (for official use only)
Material loading and access areas			
Material storage and handling areas			
Cleaning and maintenance areas			
Vehicle or machinery storage areas			
Vehicle or machinery maintenance/service areas			
Treatment or disposal areas for significant materials			
Hazardous waste storage areas			
Areas of outdoor manufacturing			
Stormwater management calculations			
Drainage area outline for each stormwater inlet or structure			
Stormwater management practices			
Stormwater management maintenance inspection agreements			
Spill Prevention and Response Kits			
Facility inspection agreements for inspections of areas where potential spills of significant materials or industrial activities can impact stormwater			

For official use only:		
Date of Submission: _____ ***Date Received:*** _____	***Reviewed by:*** _____ ***Reviewed on:*** _____	***Plan Accepted:*** ***Y / N***

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Instructions: *Complete this table only if operation H-1 was checked on Page Q.2.*

H-1 Vehicle Maintenance and Repair Operations			
Description of Operation			
Requirement	**Description of pollution prevention mechanism or BMP to be implemented**	**Site Plan Sheet Number(s)**	**Approved (for official use only)**
Provide locations for recycling collection of used antifreeze, oil, grease, oil filters, cleaning solutions, solvents, batteries, hydraulic and transmission fluids			
Cover all vehicle and equipment repair areas with a permanent roof of canopy.			
Connect outdoor vehicle storage areas to a separate stormwater collection system with an oil/grit separator or sand filter.			
Designate a specific location for outdoor maintenance activities that is designed to prevent stormwater pollution (paved, away from storm drains, and with stormwater containment measures)			
Stencil or mark storm drain inlets with "No Dumping, Drains to _____" message			

For official use only:		
Date of Submission: _____ ***Date Received: _____***	***Reviewed by: _____*** ***Reviewed on: _____***	***Plan Accepted: Y / N***

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Instructions: *Complete this table only if operation H-2 was checked on Page Q.2.*

H-2 Vehicle Fueling			
Description of Operation			
Requirement	**Description of pollution prevention mechanism or BMP to be implemented**	**Site Plan Sheet Number(s)**	**Approved (for official use only)**
Cover fueling stations with a canopy or roof to prevent direct contact with rainfall			
Design fueling pads to prevent the run-on of stormwater and pretreat any runoff with an oil/grit separator or a sand filter			
Locate storm drain inlets away from the immediate vicinity of the fueling area			
Stencil or mark storm drain inlets with "No Dumping, Drains to _____" message			
Pave fueling stations with concrete rather than asphalt			

For official use only:		
Date of Submission: _____ ***Date Received: _____***	***Reviewed by: _____*** ***Reviewed on: _____***	***Plan Accepted: Y / N***

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Instructions: *Complete this table only if operation H-3 was checked on Page F.2.*

H-3 Vehicle Washing			
Description of Operation			
Requirement	**Description of pollution prevention mechanism or BMP to be implemented**	**Site Plan Sheet Number(s)**	**Approved (for official use only)**
Include flow-restricted hose nozzles that automatically turn off when left unattended.			
a containment system for washing vehicles such that wash water does not flow into storm drain system.			
orm drain inlets with "No Dumping, Drains to _____" signs to deter disposal of wash water in the storm drain system			
Design facilities with designated areas for indoor vehicle washing where no other activities are performed (e.g., fluid changes or repair services)			

For official use only:		
Date of Submission: _____ ***Date Received: _____***	***Reviewed by: _____*** ***Reviewed on: _____***	***Plan Accepted: Y / N***

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Instructions: *Complete this table only if operation H-4 was checked on Page Q.2.*

H-4 Vehicle Storage			
Description of Operation			
Requirement	**Description of pollution prevention mechanism or BMP to be implemented**	**Site Plan Sheet Number(s)**	**Approved (for official use only)**
Label storm drain inlets with "No Dumping, Drains to _____" message			
All stormwater runoff from the fleet storage area must receive pretreatment via an oil/grit separator or sand filter.			
Untreated stormwater from the fleet storage area may not be discharged off site.			
Connect outdoor vehicle storage areas to a separate stormwater collection system with an oil/grit separator or sand filter.			

For official use only:		
Date of Submission: _____ ***Date Received: _____***	***Reviewed by: _____*** ***Reviewed on: _____***	***Plan Accepted: Y / N***

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Instructions: *Complete this table only if operation H-5 was checked on Page Q.2.*

H-5 Loading and Unloading			
Description of Operation			
Requirement	**Description of pollution prevention mechanism or BMP to be implemented**	**Site Plan Sheet Number(s)**	**Approved (for official use only)**
Design liquid storage areas with impervious surfaces and secondary containment			
Minimize stormwater run-on by covering storage areas with a permanent canopy or roof			
Slope containment areas to a drain with a positive control (lock, valve, or plug) that leads to the sanitary sewer (if permitted) or to a holding tank			
Provide permanent cover for building materials stored outside			
Direct runoff away from building material storage areas			
Install a high-level alarm on storage tanks to prevent overfilling			
For official use only:			
Date of Submission: _____ ***Date Received: _____***	***Reviewed by: _____*** ***Reviewed on: _____***	***Plan Accepted: Y / N***	

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Instructions: *Complete this table only if operation H-6 was checked on Page Q.2.*

H-6 Outdoor or Bulk Material Storage			
Description of Operation	(include methods of storage, usage, treatment, and disposal).		
Requirement	**Description of pollution prevention mechanism or BMP to be implemented**	**Site Plan Sheet Number(s)**	**Approved (for official use only)**
Grade the designated loading/unloading to prevent run-on or pooling of stormwater			
Cover the loading/unloading areas with a permanent canopy or roof			
Install an automatic shutoff valve to interrupt flow in the event of a liquid spill			
Install a high-level alarm on storage tanks to prevent overfilling			
Pave the loading/unloading area with concrete rather than asphalt			
Position roof downspouts to direct stormwater away from loading/unloading areas			

For official use only:		
Date of Submission: _____ ***Date Received: _____***	***Reviewed by: _____*** ***Reviewed on: _____***	***Plan Accepted: Y / N***

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~~Q.4~~P.4 Hotspot Operation Pollution Prevention Profile Sheets

The following profile sheets include:

H-1 Vehicle Maintenance and Repair

H-2 Vehicle Fueling

H-3 Vehicle Washing

H-4 Vehicle Storage

H-5 Loading and Unloading

H-6 Outdoor or Bulk Material Storage

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H-1	Hotspot Source Area: Vehicles	
	VEHICLE MAINTENANCE AND REPAIR	

Description

Vehicle maintenance and repair operations can exert a significant impact on water quality by generating toxins such as solvents, waste oil, antifreeze, and other fluids. Often, vehicles that are wrecked or awaiting repair can be a stormwater hotspot if leaking fluids are exposed to stormwater runoff (Figure 1). Vehicle maintenance and repair can generate oil and grease, trace metals, hydrocarbons, and other toxic organic compounds. Table 1 summarizes a series of simple pollution prevention techniques for vehicle maintenance and repair operations that can prevent stormwater contamination. You are encouraged to consult the Resources section of this sheet to get a more comprehensive review of pollution prevention practices for vehicle maintenance and repair operations.

Figure 1: Junkyard and Potential Source of Stormwater Pollution

Application

Pollution prevention practices should be applied to any facility that maintains or repairs vehicles in a subwatershed. Examples include car dealerships, body shops, service stations, quick lubes, school bus depots, trucking companies, and fleet maintenance operations at larger industrial, institutional, municipal or transport-related operations. Repair facilities are often clustered together, and are a major priority for subwatershed pollution prevention.

Table 1: Pollution Prevention Practices for Vehicle Maintenance and Repair Activities
▪ Avoid hosing down work or fueling areas ▪ Clean all spills immediately using dry cleaning techniques ▪ Collect used antifreeze, oil, grease, oil filters, cleaning solutions, solvents, batteries, hydraulic and transmission fluids and recycle with appropriate agencies ▪ Conduct all vehicle and equipment repairs indoors or under a cover (if done outdoors) ▪ Connect outdoor vehicle storage areas to a separate stormwater collection system with an oil/grit separator that discharges to a dead holding tank, the sanitary sewer or a stormwater treatment practice ▪ Designate a specific location for outdoor maintenance activities that is designed to prevent stormwater pollution (paved, away from storm drains, and with stormwater containment measures) ▪ Inspect the condition of all vehicles and equipment stored outdoors frequently ▪ Use a tarp, ground cloth, or drip pans beneath vehicles or equipment being repaired outdoors to capture all spills and drips ▪ Seal service bay concrete floors with an impervious material so cleanup can be done without using solvents. Do not wash service bays to outdoor storm drains ▪ Store cracked batteries in a covered secondary containment area until they can be disposed of properly ▪ Wash parts in a self-contained solvent sink rather than outdoors

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Primary Training Targets
Owners, fleet operation managers, service managers, maintenance supervisors, mechanics and other employees are key targets for training.

Feasibility
Pollution prevention techniques for vehicle repair facilities broadly apply to all regions and climates. These techniques generally rely on changes to basic operating procedures, after an initial inspection of facility operations. The inspection relies on a standard operations checklist that can be completed in a few hours.

Implementation Considerations
Employee training is essential to successfully implement vehicle repair pollution prevention practices. The connection between the storm drain system and local streams should be emphasized so that employees understand why any fluids need to be properly disposed of. It is also important to understand the demographics of the work force; in some communities, it may require a multilingual education program.

Cost - Employee training is generally inexpensive, since training can be done using posters, pamphlets, or videos. Structural practices can vary based on what equipment is required. For instance, solvent sinks to clean parts can cost from $1,500 to $15,000, while spray cabinets may cost more than $50,000. In addition, proper recycling/disposal of used or spilled fluids usually requires outside contractors that may increase costs.

Resources
Stormwater Management Manual for Western Washington: Volume IV -- Source Control BMPs.
http://www.ecy.wa.gov/biblio/9914.html

California Stormwater Quality Association. 2003 California Stormwater BMP Handbook: Industrial and Commercial.
http://www.cabmphandbooks.com/

Coordinating Committee For Automotive Repair (CCAR) Source: US EPA CCAR-*Green*Link®, the National Automotive Environmental Compliance Assistance Center CCAR-*Green*Link® Virtual Shop
http://www.ccar-greenlink.org/

Auto Body Shops Pollution Prevention Guide. Peaks to Prairies Pollution Prevention Information Center.
http://peakstoprairies.org/p2bande/autobody/abguide/index.cfm

Massachusetts Office of Technical Assistance (OTA). Crash Course for Compliance and Pollution Prevention Toolbox
http://www.mass.gov/eea/grants-and-tech-assistance/education-and-training/education-and-outreach/ota-publications/guidance-docs/crash-course.html

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities.
http://www.swrcb.ca.gov/water_issues/programs/stormwater/murp.shtml

US EPA. Facility Regulatory Tour: Vehicle Maintenance.https://www.fedcenter.gov/assistance/facilitytour/vehicle/

City of Santa Cruz. Best Management Practices for Vehicle Service Facilities (in English and Spanish).
http://www.cityofsantacruz.com/Modules/ShowDocument.aspx?documentid=5989

City of Los Angeles Bilingual Poster of BMPs for Auto Repair Industry
http://www.lastormwater.org/wp-content/files_mf/bmp_auto_poster_8.5x14.pdf

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H-2	Hotspot Source Area: Vehicles	
	VEHICLE FUELING	

Description

Spills at vehicle fueling operations have the potential to directly contribute oil, grease, and gasoline to stormwater, and can be a significant source of lead, copper and zinc, and petroleum hydrocarbons. Delivery of pollutants to the storm drain can be sharply reduced by well-designed fueling areas and improved operational procedures. The risk of spills depends on whether the fueling area is covered and has secondary containment. The type, condition, and exposure of the fueling surface can also be important. Table 1 describes common pollution prevention practices for fueling operations.

Application

These practices can be applied to any facility that dispenses fuel. Examples include retail gas stations, bus depots, marinas, and fleet maintenance operations (Figure 1). In addition, these practices also apply to temporary above-ground fueling areas for construction and earthmoving equipment. Many fueling areas are usually present in urban subwatersheds, and they tend to be clustered along commercial and highway corridors. These hotspots are often a priority for subwatershed source control.

Figure 1: Covered Retail Gas Operation Without Containment for Potential

Table 1: Pollution Prevention Practices For Fueling Operation Areas
▪ Maintain an updated spill prevention and response plan on premises of all fueling facilities (see Profile Sheet H-7)
▪ Cover fueling stations with a canopy or roof to prevent direct contact with rainfall
▪ Design fueling pads for large mobile equipment to prevent the run-on of stormwater and collect any runoff in a dead-end sump
▪ Retrofit underground storage tanks with spill containment and overfill prevention systems
▪ Keep suitable cleanup materials on the premises to promptly clean up spills
▪ Install slotted inlets along the perimeter of the "downhill" side of fueling stations to collect fluids and connect the drain to a waste tank or stormwater treatment practice. The collection system should have a shutoff valve to contain a large fuel spill event
▪ Locate storm drain inlets away from the immediate vicinity of the fueling area
▪ Clean fuel-dispensing areas with dry cleanup methods. Never wash down areas before dry cleanup has been done. Ensure that wash water is collected and disposed of in the sanitary sewer system or approved stormwater treatment practice
▪ Pave fueling stations with concrete rather than asphalt
▪ Protect above ground fuel tanks using a containment berm with an impervious floor of Portland cement. The containment berm should have enough capacity to contain 110 percent of the total tank volume
▪ Use fuel-dispensing nozzles with automatic shutoffs, if allowed
▪ Consider installing a perimeter sand filter to capture and treat any runoff produced by the station

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Primary Training Targets
Training efforts should be targeted to owners, operators, attendants, and petroleum wholesalers.

Feasibility
Vehicle fueling pollution prevention practices apply to all geographic and climatic regions. The practices are relatively low-cost, except for structural measures that are installed during new construction or station remodeling.

Implementation Considerations
Fueling Area Covers - Fueling areas can be covered by installing an overhanging roof or canopy. Covers prevent exposure to rainfall and are a desirable amenity for retail fueling station customers. The area of the fueling cover should exceed the area where fuel is dispensed. All downspouts draining the cover or roof should be routed to prevent discharge across the fueling area. If large equipment makes it difficult to install covers or roofs, fueling islands should be designed to prevent stormwater run-on through grading, and any runoff from the fueling area should be directed to a dead-end sump.

Surfaces - Fuel dispensing areas should be paved with concrete; the use of asphalt should be avoided, unless the surface is sealed with an impervious sealant. Concrete pads used in fuel dispensing areas should extend to the full length that the hose and nozzle assembly can be pulled, plus an additional foot.

Grading - Fuel dispensing areas should be graded with a slope that prevents ponding, and separated from the rest of the site by berms, dikes or other grade breaks that prevent run-on of urban runoff. The recommended grade for fuel dispensing areas is 2–4 percent (CSWQTF, 1997).

Cost - Costs to implement pollution prevention practices at fueling stations will vary, with many of the costs coming upfront during the design of a new fueling facility. Once a facility has implemented the, ongoing maintenance costs should be low.

Resources
Best Management Practice Guide – Retail Gasoline Outlets. Prepared by Retail Gasoline Outlet Work Group.
http://www.waterboards.ca.gov/rwqcb4/water_issues/programs/stormwater/municipal/los_angeles_ms4/tentative/rgo%20bmp%20guide_03-97_.pdf

Stormwater Management Manual for Western Washington: Volume IV -- Source Control BMPs.
http://www.ecy.wa.gov/biblio/9914.html

California Stormwater Quality Association. 2003 California Stormwater BMP Handbook: New Development and Redevelopment.
http://www.cabmphandbooks.com/

City of Los Angeles, CA Best Management Practices for Gas Stations
http://www.lacitysan.org/watershed_protection/pdfs/gasstation.pdf

City of Dana Point Tips for the Automotive Industry
http://www.danapoint.org/Modules/ShowDocument.aspx?documentid=3309

*Alachua County, FL Best Management Practices for Controlling Runoff from Gas Stations*http://www.alachuacounty.us/Depts/EPD/Documents/WaterResources/Gas%20Stations.pdf

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California Stormwater Regional Control Board Retail Gasoline Outlets: New Development Design Standards For Mitigation Of Stormwater Impacts
http://www.waterboards.ca.gov/rwqcb4/water_issues/programs/stormwater/municipal/los_angeles_ms4/tentative/rgopaper.pdf

http://www.waterboards.ca.gov/rwqcb4/water_issues/programs/stormwater/municipal/los_angeles_ms4/tentative/rgopapersupplement_12-01_.pdf

Canadian Petroleum Products Institute Best Management Practices Stormwater Runoff from Petroleum Facilities
http://canadianfuels.ca/userfiles/file/CPPI%20-%20BMP%20Stormwater%20runoff%20-%20March-04.pdf

City of Monterey (CA). Posters of Gas Station BMPs.

Pinole County, CA Typical Stormwater Violations Observed in Auto Facilities and Recommended Best Management Practices (BMPs)
http://www.ci.pinole.ca.us/publicworks/downloads/AutoStormwater.pdf

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H-3	Hotspot Source Area: Vehicles	
	VEHICLE WASHING	

Description
Vehicle washing pollution prevention practices apply to many commercial, industrial, institutional, municipal and transport-related operations. Vehicle wash water may contain sediments, phosphorus, metals, oil and grease, and other pollutants that can degrade water quality. When vehicles are washed on impervious surfaces such as parking lots or industrial areas, dirty wash water can contaminate stormwater that ends up in streams.

Application
Improved washing practices can be used at any facility that routinely washes vehicles. Examples include commercial car washes, bus depots, car dealerships, rental car companies, trucking companies, and fleet operations. In addition, washing dump trucks and other construction equipment can be a problem. Washing operations tend to be unevenly distributed within urban subwatersheds. Vehicle washing also occurs in neighborhoods, and techniques to keep wash water out of the storm drain system are discussed in the car washing profile sheet (N-11). Table 1 reviews some of the pollution prevention techniques available for hotspot vehicle washing operations.

Primary Training Targets
Owners, fleet managers, and employees of operations that include car washes are the primary training target.

Feasibility
Vehicle washing practices can be applied to all regions and climates. Vehicle washing tends to occur more frequently in summer months and in drier regions of the country. Sound vehicle washing practices are not always used at many sites because operators are reluctant to change traditional cleaning methods. In addition, the cost of specialized equipment to manage high volumes of wash water can be too expensive for small businesses.

Improved vehicle washing practices are relatively simple to implement and are very effective at preventing stormwater contamination. Training is essential to get owners and employees to adopt these practices, and should be designed to overcome cultural and social barriers to improved washing practices.

Table 1: Pollution Prevention Practices for Vehicle Washing

- Wash vehicles at indoor car washes that recycle, treat or convey wash water to the sanitary sewer system
- Use biodegradable, phosphate-free, water-based soaps
- Use flow-restricted hose nozzles that automatically turn off when left unattended
- Wash vehicles on a permeable surface or a washpad that has a containment system
- Prohibit discharge of wash water into the storm drain system or ground by using temporary berms, storm drain covers, drain plugs or other containment system
- Label storm drains with “No Dumping” signs to deter disposal of wash water in the storm drain system
- Pressure and steam clean off site to avoid runoff with high pollutant concentrations
- Obtain permission from sewage treatment facilities to discharge to the sanitary sewer

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Implementation Considerations

The ideal practice is to wash all vehicles at commercial car washes or indoor facilities that are specially designed for washing operations. Table 2 offers some tips for indoor car wash sites. When washing operations are conducted outside, a designated wash area should have the following characteristics:

- Paved with an impervious surface, such as Portland cement concrete
- Bermed to contain wash water
- Sloped so that wash water is collected and discharged to the sanitary sewer system, holding tank or dead-end sump
- Operated by trained workers to confine washing operations to the designated wash area

Table 2: Tips for Indoor Car Wash Sites *(Adapted from U.S. EPA, 2003)*

- Facilities should have designated areas for indoor vehicle washing where no other activities are performed (e.g., fluid changes or repair services)
- Indoor vehicle wash areas should have floor drains that receive only vehicle washing wastewater (not floor washdown or spill removal wash waters) and be connected to a holding tank with a gravity discharge pipe, to a sump that pumps to a holding tank, or to an oil/grit separator that discharges to a municipal sanitary sewer
- The floor of indoor vehicle wash bays should be completely bermed to collect wash water
- Aromatic and chlorinated hydrocarbon solvents should be eliminated from vehicle-washing operations
- Vehicle-washing operations should use vehicle rinse water to create new wash water through the use of recycling systems that filter and remove grit.

Outdoor vehicle washing facilities should use pressurized hoses without detergents to remove most dirt and grime. If detergents are used, they should be phosphate-free to reduce nutrient loading. If acids, bases, metal brighteners, or degreasing agents are used, wash water should be discharged to a treatment facility, sanitary sewer, or a sump. In addition, waters from the pressure washing of engines and vehicle undercarriages must be disposed of using the same options.

Discharge to pervious areas may be an option for washing operations that generate small amounts of relatively clean wash water (water only - no soaps, no steam cleaning). The clean wash water should be directed as sheet flow across a vegetated area to infiltrate or evaporate before it enters the storm drain system. This option should be exercised with caution, especially in environmentally sensitive areas or protected groundwater recharge areas.

The best way to avoid stormwater contamination during washing operations is to drain the wash water to the sanitary sewer system. Operations that produce high volumes of wash water should consider installing systems that connect to the sewer. Other options for large and small operations include containment units to capture the wash water prior to transport away for proper disposal (Figure 1). If vehicles must be washed on an impervious surface, a storm drain filter should be used to capture solid contaminants.

Cost - The cost of using vehicle-washing practices can vary greatly and depends on the size of the operation (Table 3). The cost of constructing a commercial grade system connected to the sanitary sewer can exceed $100,000. Disposal fees and frequency of washing can also influence the cost. Training costs can be minimized by using

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Figure 1: Containment System Preventing Wash Water from Entering the Storm Drain

educational materials available from local governments, professional associations or EPA's National Compliance Assistance Centers (http://www.assistancecenters.net/). Temporary, portable containment systems can be shared by several companies that cannot afford specialized equipment independently.

Table 3: Sample Equipment Costs for Vehicle Washing Practices

Item	Cost
Bubble Buster	$2,000–$2,500*
Catch basin insert	$65*
Containment mat	$480–$5,840**
Storm drain cover (24-in. drain)	$120 **
Water dike/ berm (20 ft)	$100.00 **
Pump	$75–$3,000**
Wastewater storage container	$50–$1,000+**
*Source: *U.S. EPA, 1992 **Robinson, 2003*	

Resources

EPA FedSite Facility Regulatory Tour: http://www.fedcenter.gov/assistance/facilitytour/vehicle/washing/

Alachua County BMP for Outdoor Car Washing. http://www.alachuacounty.us/Depts/EPD/WaterResources/StormwaterPollutionAndSolutions/Reducing%20Stormwater%20Pollution%20Documents/Carwash%20BMP.pdf

Kitsap County Sound Car Wash Program. http://www.kitsapgov.com/sswm/carwash.htm.

Robinson, C., Proprietor, "Latimat" portable wastewater containment system. Personal Communication June 2, 2003. http://www.latimat.com

Washington Department of Ecology. 1995. Vehicle and Equipment Wash Water Discharges: Best Management Practices Manual. Olympia, Washington. http://www.ecy.wa.gov/pubs/95056.pdf

U.S. Environmental Protection Agency. Pollution Prevention/Good Housekeeping for Municipal Operations. http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/poll_18.cfm

U.S. EPA. 1992. Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. US EPA Office of Wastewater Management. Washington, D.C. EPA 832-R-92-006.

California Stormwater Quality Association. 2003 California Stormwater BMP Handbook: Industrial and Commercial. http://www.cabmphandbooks.com/

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H-4	Hotspot Source Area: Vehicles	
	VEHICLE STORAGE	

Description

Parking lots and vehicle storage areas can introduce sediment, metals, oil and grease, and trash into stormwater runoff. Simple pavement sweeping, litter control, and stormwater treatment practices can minimize pollutant export from these hotspots. Table 1 provides a list of simple pollution prevention practices intended to prevent or reduce the discharge of pollutants from parking and vehicle storage areas.

Application

Pollution prevention practices can be used at larger parking lots located within a subwatershed. Examples include regional malls, stadium lots, big box retail, airport parking, car dealerships, rental car companies, trucking companies, and fleet operations (Figure 1). The largest, most heavily used parking lots with vehicles in the poorest condition (e.g., older cars or wrecked vehicles) should be targeted first.

This practice is also closely related to parking lot maintenance source controls, which are discussed in greater detail in profile sheet H-11.

Primary Training Targets

Owners, fleet operation managers, and property managers that maintain parking lots are key training targets.

Figure 1: Retail Parking Lot

Table 1: Pollution Prevention Practices for Parking Lot and Vehicle Storage Areas

Parking Lots

- Post signs to control litter and prevent patrons from changing automobile fluids in the parking lot (e.g., changing oil, adding transmission fluid, etc.)
- Pick up litter daily and provide trash receptacles to discourage littering
- Stencil or mark storm drain inlets with "No Dumping, Drains to _____" message
- Direct runoff to bioretention areas, vegetated swales, or sand filters
- Design landscape islands in parking areas to function as bioretention areas
- Disconnect rooftop drains that discharge to paved surfaces
- Use permeable pavement options for spillover parking (Profile sheet OS-11 in Manual 3)
- Inspect catch basins twice a year and remove accumulated sediments, as needed
- Vacuum or sweep large parking lots on a monthly basis, or more frequently
- Install parking lot retrofits such as bioretention, swales, infiltration trenches, and stormwater filters (Profile sheets OS-7 through OS-10 in Manual 3)

Vehicle Storage Areas

- Do not store wrecked vehicles on lots unless runoff containment and treatment are provided
- Use drip pans or other spill containment measures for vehicles that will be parked for extended periods of time
- Use absorbent material to clean up automotive fluids from parking lots

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Feasibility
Sweeping can be employed for parking lots that empty out on a regular basis. Mechanical sweepers can be used to remove small quantities of solids. Vacuum sweepers should be used on larger parking lot storage areas, since they are superior in picking up deposited pollutants (see Manual 9). Constraints for sweeping large parking lots include high annual costs, difficulty in controlling parking, and the inability of current sweeper technology to remove oil and grease. Proper disposal of swept materials might also represent a limitation.

Implementation Considerations
The design of parking lots and vehicle storage areas can greatly influence the ability to treat stormwater runoff. Many parking areas are landscaped with small vegetative areas between parking rows for aesthetic reasons or to create a visual pattern for traffic flow. These landscaped areas can be modified to provide stormwater treatment in the form of bioretention (Figure 2).

Figure 2: Parking Lot Island Turned Bioretention

Catch basin cleanouts are also an important practice in parking areas. Catch basins within the parking lot should be inspected at least twice a year and cleaned as necessary. Cleanouts can be done manually or by vacuum truck. The cleanout method selected depends on the number and size of the inlets present (see Manual 9).

Most communities have contractors that can be hired to clean out catch basins and vacuum sweep lots. Mechanical sweeping services are available, although the cost to purchase a new sweeper can exceed $200,000. Employee training regarding spill prevention for parking areas is generally low-cost and requires limited staff time.

Resources
California Stormwater Quality Association. 2003 California Stormwater BMP Handbook: Industrial and Commercial
http://www.cabmphandbooks.com/

Stormwater Management Manual for Western Washington: Volume IV -- Source Control BMPs. WA Dept. of Ecology
http://www.ecy.wa.gov/biblio/9914.html

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H-5	Hotspot Source Area: Outdoor Materials	
	LOADING AND UNLOADING	

Description
Outdoor loading and unloading normally takes place on docks or terminals at many commercial, industrial, institutional, and municipal operations. Materials spilled or leaked during this process can either be carried away in stormwater runoff or washed off when the area is cleaned. As a result, many different pollutants can be introduced into the storm drain system, including sediment, nutrients, trash, organic material, trace metals, and an assortment of other pollutants. A number of simple and effective pollution prevention practices can be used at loading/unloading areas to prevent runoff contamination, as shown in Table 1.

Application
While nearly every commercial, industrial, institutional, municipal and transport-related site has a location where materials or products are shipped or received, the risk of stormwater pollution is greatest for operations that transfer high volumes of material or liquids, or unload potentially hazardous materials. Some notable examples to look for in a subwatershed include distribution centers, grocery stores, building supply outlets, lawn and garden centers, petroleum wholesalers, warehouses, landfills, ports, solid waste facilities, and maintenance depots (Figure 1). Attention should also be paid to industrial operations that process bulk materials and any operations regulated under industrial stormwater NPDES permits.

Primary Training Targets
Owners, site managers, facility engineers, supervisors, and employees of operations with loading/unloading facilities are the primary training target.

Table 1: Pollution Prevention Practices for Loading and Unloading Areas

- Avoid loading/unloading materials in the rain
- Close adjacent storm drains during loading/unloading operations
- Surround the loading/unloading area with berms or grading to prevent run-on or pooling of stormwater. If possible, cover the area with a canopy or roof
- Ensure that a trained employee is always present to handle and cleanup spills
- Inspect the integrity of all containers before loading/unloading
- Inspect equipment such as valves, pumps, flanges, and connections regularly for leaks, and repair as needed
- Install an automatic shutoff valve to interrupt flow in the event of a catastrophic liquid spill
- Install a high-level alarm on storage tanks to prevent overfilling
- Pave the loading/unloading area with concrete rather than asphalt
- Place drip pans or other temporary containment devices at locations where leaks or spills may occur, and always use pans when making and breaking connections
- Position roof downspouts to direct stormwater away from loading/unloading areas and into bioretention areas
- Prepare and implement an Emergency Spill Cleanup Plan for the facility (see Profile Sheet H-7)
- Sweep loading/unloading area surfaces frequently to remove material that could otherwise be washed off by stormwater
- Train all employees, especially fork lift operators, on basic pollution prevention practices and post signs
- Use seals, overhangs, or door skirts on docks and terminals to prevent contact with rainwater

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Feasibility
Loading/unloading pollution prevention practices can be applied in all geographic and climatic regions, and work most effectively at preventing sediment, nutrients, toxic materials, and oil from coming into contact with stormwater runoff or runon. Few impediments exist to using this practice, except for the cost to retrofit existing loading and unloading areas with covers or secondary containment.

Implementation Considerations
Loading/unloading pollution prevention practices should be integrated into the overall stormwater pollution prevention plan for a facility. Employee training should focus on proper techniques to transfer materials, using informational signs at loading docks and material handling sites and during routine safety meetings.

Cost - Costs to implement loading/unloading pollution prevention practices consist of one-time construction costs to retrofit new or existing loading areas, but annual maintenance costs are relatively low thereafter. Exceptions include industries that elect to use expensive air pressure or vacuum systems for loading/unloading facilities, which can also be expensive to maintain (U.S. EPA, 1992). Ongoing costs include employee training and periodic monitoring of loading/unloading activities.

Figure 1: Loading/Unloading Area of Warehouse

Resources
California Stormwater Quality Association. 2003 California Stormwater BMP Handbook: Industrial and Commercial.
http://www.cabmphandbooks.com/

Stormwater Management Manual for Western Washington: Volume IV -- Source Control BMPs. WA Dept. of Ecology 99-14
http://www.ecy.wa.gov/biblio/9914.html

Ventura County Flood Control District Clean Business Program Fact Sheet

http://www.vcstormwater.org/index.php/clean-business-fact-sheets

Business Best Management Practices Stormwater Bmp #3 - Shipping/Receiving/Loading Docks

City of Los Angeles, CA Reference Guide For Stormwater Best Management Practices
http://www.lacitysan.org/watershed_protection/pdfs/bmp_refguide.pdf

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H-6	Hotspot Source Area: Outdoor Materials	
	OUTDOOR STORAGE	

Description

Protecting outdoor storage areas is a simple and effective pollution prevention practice for many commercial, industrial, institutional, municipal, and transport-related operations. The underlying concept is to prevent runoff contamination by avoiding contact between outdoor materials and rainfall (or runoff). Unprotected outdoor storage areas can generate a wide range of stormwater pollutants, such as sediment, nutrients, toxic materials, and oil and grease (Figure 1).

Materials can be protected by installing covers, secondary containment, and other structures to prevent accidental release. Outdoor storage areas can be protected on a temporary basis (tarps or plastic sheeting) or permanently through structural containment measures (such as roofs, buildings, or concrete berms). Table 1 summarizes pollution prevention practices available for outdoor storage areas.

Figure 1: Mulch Stored Outdoors at a Garden Center

Application

Many businesses store materials or products outdoors. The risk of stormwater pollution is greatest for operations that store large quantities of liquids or bulk materials at sites that are connected to the storm drain system. Several notable operations include nurseries and garden centers, boat building/repair, auto recyclers/body shops, building supply outlets, landfills, ports, recycling centers, solid waste and composting facilities, highway maintenance depots, and power plants. Attention should also be paid to industrial operations that process bulk materials, which are often regulated under industrial stormwater NPDES permits.

Primary Training Targets

Owners, site managers, facility engineers, supervisors, and employees of operations with loading/unloading facilities are the primary training target.

Feasibility

Outdoor storage protection can be widely applied in all regions and climate zones, and requires routine monitoring by employees. Most operations have used covering as the major practice to handle outdoor storage protection (U.S. EPA, 1999). The strategy is to design and maintain outdoor material storage areas so that they:

- Reduce exposure to stormwater and prevent runon
- Use secondary containment to capture spills
- Can be regularly inspected
- Have an adequate spill response plan and cleanup equipment

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Table 1: Pollution Prevention Practices for Protecting Outdoor Storage Areas
• Emphasize employee education regarding storage area maintenance • Keep an up-to-date inventory of materials stored outdoors, and try to minimize them • Store liquids in designated areas on an impervious surface with secondary containment • Inspect outdoor storage containers regularly to ensure that they are in good condition • Minimize stormwater run-on by enclosing storage areas or building a berm around them • Slope containment areas to a drain with a positive control (lock, valve, or plug) that leads to the sanitary sewer (if permitted) or to a holding tank • Schedule regular pumping of holding tanks containing stormwater collected from secondary containment areas

Implementation Considerations

Covers - The use of impermeable covers is an effective pollution prevention practice for non-hazardous materials. Covers can be as simple as plastic sheeting or tarps, or more elaborate roofs and canopies. Site layout, available space, affordability, and compatibility with the covered material all dictate the type of cover needed for a site. In addition, the cover should be compatible with local fire and building codes and OSHA workplace safety standards. Care should be taken to ensure that the cover fully protects the storage site and is firmly anchored into place.

Secondary Containment - Secondary containment is designed to contain possible spills of liquids and prevent stormwater run-on from entering outdoor storage areas. Secondary containment structures vary in design, ranging from berms and drum holding areas to specially designed solvent storage rooms (Figure 2).

Secondary containment can be constructed from a variety of materials, such as concrete curbs, earthen berms, plastic tubs, or fiberglass or metal containers. The type of material used depends on the substance contained and its resistance to weathering. In general, secondary containment areas should be sized to hold 110 percent of the volume of the storage tank or container unless other containment sizing regulations apply (e.g., fire codes).

Figure 2: Secondary Containment of Storage Drums Behind a Car Repair Shop

If secondary containment areas are uncovered, any water that accumulates must be collected in a sanitary sewer, a stormwater treatment system, or a licensed disposal facility. Water quality monitoring may be needed to determine whether the water is contaminated and dictate the method of disposal. If the stormwater is clean, or an on-site stormwater treatment practice is used, a valve should be installed in the containment dike so that excess stormwater can be drained out of the storage area and directed either to the storm drain (if clean) or into the stormwater treatment system (if contaminated). The valve should always be kept closed except when stormwater is drained, so that any spills that occur can be effectively contained. Local sewer authorities may not allow discharges from a large containment area into the sewer system, and permission must be obtained

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Table 2: Sample Equipment Costs for Outdoor Storage Protection	
Storage Protection Device	**Cost**
Concrete Slab (6")	$3.50 to $5.00 per ft^2
Containment Pallets	$50 to $350 based on size and # of barrels to be stored
Storage buildings	$6 to $11 per ft^2
Tarps & Canopies	$25 to $500 depending on size of area to cover
Sources: Costs were derived from a review of Ferguson et al., *1997 and numerous websites that handle proprietary spill control or hazardous material control products*	

sanitary sewer system are prohibited, containment should be provided, such as a holding tank that is regularly pumped out.

Employee training on outdoor storage pollution prevention should focus on the activities and site areas with the potential to pollute stormwater and the proper techniques to manage material storage areas to prevent runoff contamination. Training can be conducted through safety meetings and the posting of on-site informational signs. Employees should also know the on-site person who is trained in spill response.

Cost - Many storage protection practices are relatively inexpensive to install (Table 2). Actual costs depend on the size of the storage area and the nature of the pollution prevention practices. Other factors are whether practices are temporary or permanent and the type of materials used for covers and containment. Employee training can be done in connection with other safety training to reduce program costs. Training costs can also be reduced by using existing educational materials from local governments, professional associations or from EPA's National Compliance Assistance Centers (http://www.assistancecenters.net).

Resources

California Stormwater Quality Association. 2003 California Stormwater BMP Handbook: Industrial and Commercial. http://www.cabmphandbooks.com/

Rouge River National Wet Weather Demonstration Project. Wayne County, MI. http://www.rougeriver.com/proddata/catalog7ad4.html?category=overview#PI-PAPER-01.00

Storm Water Management Fact Sheet: Coverings. USEPA, Office of Water, http://water.epa.gov/scitech/wastetech/upload/2002_06_28_mtb_covs.pdf

EPA Office of Wastewater Management Storm Water Management Fact Sheet: Coverings http://www.epa.gov/owm/mtb/covs.pdf

Ferguson, T., R. Gigac, M. Stoffan, A. Ibrahim, and H. Aldrich. 1997. Rouge River National Wet Weather Demonstration Project. Wayne County, MI.

California Stormwater Quality Association Factsheet: Outdoor Storage of Raw Materials http://www.cabmphandbooks.com/Documents/Municipal/SC-33.pdf

Alameda Countywide Clean Water Program Outdoor Storage of Liquid Materials http://www.cityofalamedaca.org/getdoc.cfm?id=123

Washtenaw County, MI Community Partners for Clean Streams Fact Sheet Series #1: Housekeeping Practices http://www.ewashtenaw.org/government/drain_commissioner/dc_webWaterQuality/dc_cpcs/cpcs-handbook/cpcs-series-1-housekeeping-practices.pd

~~Appendix R~~Appendix Q Pollution Prevention Through Good Housekeeping

~~R.1~~Q.1 Pollution Prevention

This appendix is meant to complement ~~Appendix Q~~Appendix P Stormwater Hotspots and an Erosion and Sediment Control Plan (ESCP), but not reiterate EPA's Construction General Permit requirements. These notes shall appear as stamped notes on Stormwater Management Plans (SWMPs) where land disturbance is greater than 5,000 square feet and less than one acre. These notes shall constitute a minimum Stormwater Pollution Prevention Plan (SWPPP_{min}) and provide guidance on good housekeeping practices to prevent potential construction-site pollutants from interacting with stormwater.

~~R.2~~Q.2 Stormwater Management Plan (SWMP) Good Housekeeping Stamp Notes

Fuels and Oils. On-site refueling will be conducted in a dedicated location away from access to surface waters. Install containment berms and, or secondary containments around refueling areas and storage tanks. Spills will be cleaned up immediately and contaminated soils disposed of in accordance with all federal and District of Columbia regulations. Petroleum products will be stored in clearly labeled tightly sealed containers. All vehicles on site will be monitored for leaks and receive regular preventive maintenance activities. Any asphalt substances used on site will be applied according to manufacturer's recommendations. Spill kits will be included with all fueling sources and maintenance activities.

Solid Waste. No solid materials shall be discharged to surface water. Solid materials including building materials, garbage and paint debris shall be cleaned up daily and deposited into dumpsters, which will be periodically removed and deposited into a landfill.

Abrasive Blasting. Water blasting, sandblasting, and other forms of abrasive blasting on painted surfaces built prior to 1978 may only be performed if an effective containment system prevents dispersal of paint debris.

Fertilizer. Fertilizers will be applied only in the minimum amounts recommended by the manufacturer, worked into the soil to limit exposure to stormwater, and stored in a covered shed. Partially used bags will be transferred to a sealable bin to avoid spills.

Paint and Other Chemicals. All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharges to the storm sewers, but will be properly disposed of according to manufacturer's recommendations. Spray guns will be cleaned on a removable tarp. Chemicals used on site are kept in small quantities and in closed containers undercover and kept out of direct contact with stormwater. As with fuels and oils, any

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inadvertent spills will be cleaned up immediately and disposed of according federal and District of Columbia regulations.

Concrete. Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash on site, except in a specially designated concrete disposal area. Form release oil for decorative stone work will be applied over a pallet covered with an absorbent material to collect excess fluid. The absorbent material will be replaced and disposed of properly when saturated.

Water Testing. When testing and, or cleaning water supply lines, the discharge from the tested pipe will be collected and conveyed to a completed stormwater conveyance system for ultimate discharge into a stormwater best management practice (BMP).

Sanitary Waste. Portable lavatories located on site will be services on a regular basis by a contractor. Portable lavatories will be located in an upland area away from direct contact with surface waters. Any spills occurring during servicing will be cleaned immediately and contaminated soils disposed of in accordance with all federal and District of Columbia regulations.

~~Appendix S~~Appendix R Integrated Pest Management

~~S.1~~R.1 Integrated Pest Management

This appendix is in support of the District of Columbia's legislation B19-745, The Anacostia Waterfront Environmental Standards Amendment Act of 2012. This legislation requires regulated projects in the AWDZ governed by this legislation to receive a DDOE approved Integrated Pest Management Plan

Integrated Pest Management (IPM) is an approach that applies biological, cultural, mechanical, and chemical controls to manage pests at acceptable levels. The following are general guidelines to encourage more-considered use of fertilizers, herbicides, and pesticides.

~~S.2~~R.2 Components of an Integrated Pest Management Plan

1. Identification. Identify the Pest and Understand its Life Cycle. Correctly identify the pest to determine an appropriate control strategy. For assistance with pest identification, contact the Maryland Home & Garden Information Center at Maryland Cooperative Extension.
2. When to take Action. Insects are an integral part of the local ecology and thus their presence alone should not be reason for taking action. First, monitor pest numbers and determine if preventative maintenance measures can be employed to remediate the situation. Take action when alternative preventative methods are no longer feasible and when pest activity threatens the long-term health of the plant.
3. Prevention in Design,
   (a) Choose the right plant for the right location.
   (b) This means assessing species suitability to site soils, moisture, wind, and sun exposure. Well-selected species require less maintenance.
   (c) Select plant species and cultivars resistant to disease.
   (d) Select a diverse plant palate to ensure on-going survival of remaining plant material.
   (e) Inspect delivered plant material prior to installation.
   (f) Material delivered from the nursery may carry pathogens or insects. Inspect all plant material at the nursery and again prior to installation. Reject any material that is diseased.
4. Prevention in Maintenance and Construction. Proper cultural management practices can reduce plant stress and thus decrease their susceptibility to pests. Prior to applying pesticide or herbicides, consider your current landscape management practices. Soils are the foundation for healthy plants. As such, it is important to provide: the proper moisture, fertility, organic matter, and drainage.
   (a) Soil testing. Submit a soil sample to a soil testing laboratory for analysis. The results determine the appropriate soil amendments to be applied.

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(b) Fertilizers. Organic fertilizers are derived natural sources such as: cottonseed meal, blood meal, fish emulsion, and manure. Slow-release inorganic fertilizers supply nutrients over the growing season with less nutrient loss than quick-release fertilizers. Fertilizer grade and rate should be selected and applied only as test results indicate. Do not apply fertilizer prior to a heavy rainfall event and do not apply between December and February.

(c) Trees and shrubs. Place mulch underneath the root zone of trees and shrubs to reduce competition with turf and weeds for water and nutrients. Topdress planting beds with compost to improve soil structure, biological activity, and fertility.

(d) Lawn areas. Increased mowing height can reduce weed germination, as less sunlight reaches the soil level. Topdressing with organic matter increases soil moisture and enables turf to withstand drought conditions. Regular monitoring and over-seeding of bare spots prevents weed establishment. After mowing, grass clippings should be left in-place. These above-mentioned strategies will reduce symptoms of disease and weed pressure, thus decreasing herbicide and fertilizer usage.

5. Develop a Treatment Plan. When pest activity exceeds acceptable levels, choose a control method appropriate to observed conditions. This may include biological, cultural, mechanical, and chemical controls.

(a) Biological control. Uses the introduction of a predator. Introduce additional natural predators where existing populations are too few to effectively control pests. Consult with your local Cooperative Extension office.

(b) Cultural control. Use pruning and removal of Prune and remove diseased branches. Sanitize all tools after use. Properly amend soils and irrigate plantings as necessary.

(c) Mechanical control. Conduct weeding by hand, tool, or heat solarization. Remove insect pests by hand or using traps.

(d) Chemical control. Uses non-toxic, non-residual pesticide or herbicide products where necessary.

- Narrow-spectrum contact pesticides target the pest directly and preserve beneficial predator species. Broad-spectrum pesticides also eliminate beneficial predators and thus the natural controls on pest populations. Only certified individuals can apply restricted-use pesticides.
- Insecticidal soap and horticultural oils. Insecticidal soaps are used to penetrate the insect's outer covering, causing the cells to collapse. Horticultural oils, on the other hand, coat and suffocate the offending insect.
- Application timing is used to maximize effectiveness, apply pesticides at the appropriate life cycle for the pest. Herbicide application also requires consideration for the seasonal growth pattern for the targeted weed.

~~S.3~~R.3 Sample Form for an Integrated Pest Management Plan

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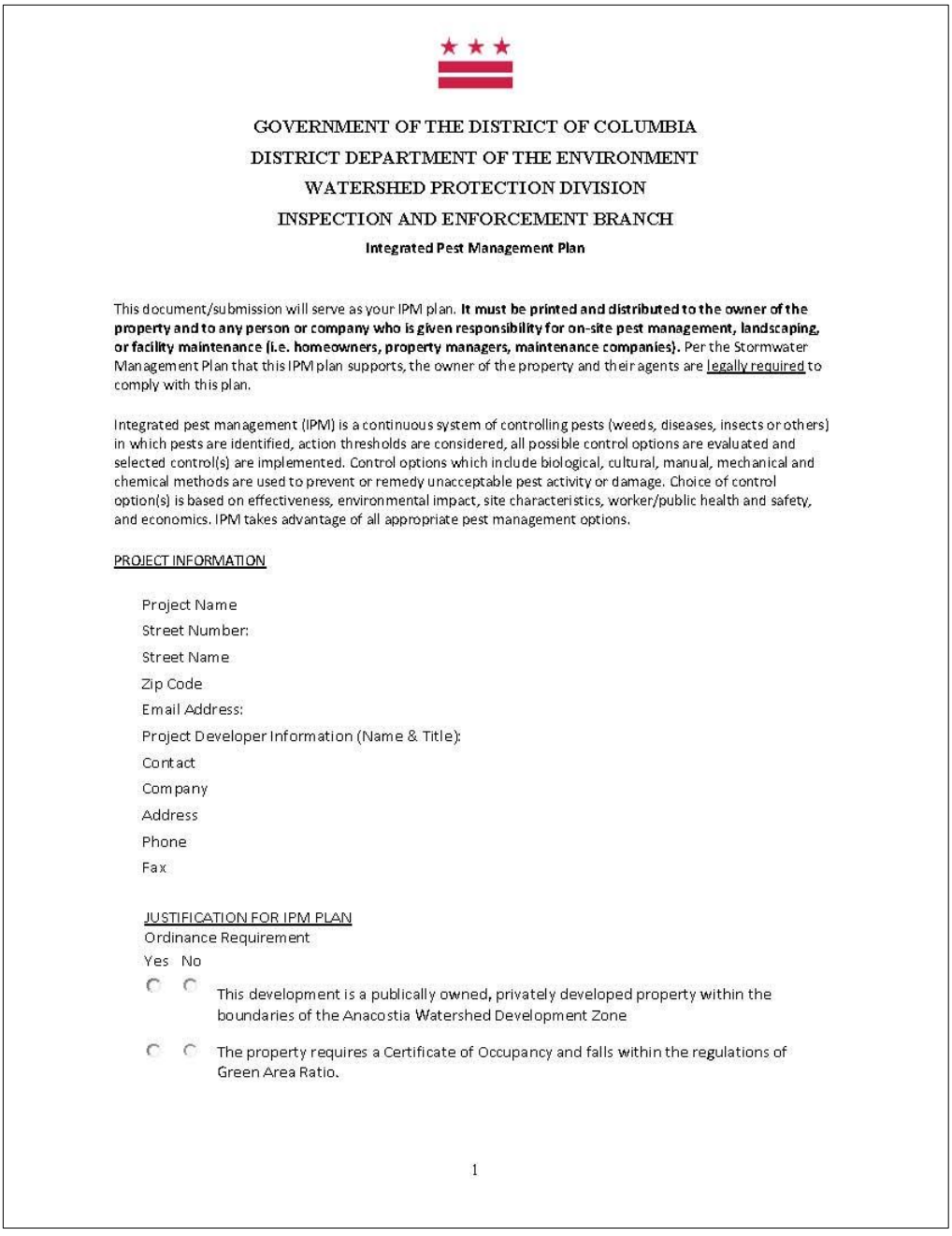

GOVERNMENT OF THE DISTRICT OF COLUMBIA
DISTRICT DEPARTMENT OF THE ENVIRONMENT
WATERSHED PROTECTION DIVISION
INSPECTION AND ENFORCEMENT BRANCH

Integrated Pest Management Plan

This document/submission will serve as your IPM plan. **It must be printed and distributed to the owner of the property and to any person or company who is given responsibility for on-site pest management, landscaping, or facility maintenance (i.e. homeowners, property managers, maintenance companies).** Per the Stormwater Management Plan that this IPM plan supports, the owner of the property and their agents are legally required to comply with this plan.

Integrated pest management (IPM) is a continuous system of controlling pests (weeds, diseases, insects or others) in which pests are identified, action thresholds are considered, all possible control options are evaluated and selected control(s) are implemented. Control options which include biological, cultural, manual, mechanical and chemical methods are used to prevent or remedy unacceptable pest activity or damage. Choice of control option(s) is based on effectiveness, environmental impact, site characteristics, worker/public health and safety, and economics. IPM takes advantage of all appropriate pest management options.

PROJECT INFORMATION

Project Name
Street Number:
Street Name
Zip Code
Email Address:
Project Developer Information (Name & Title):
Contact
Company
Address
Phone
Fax

JUSTIFICATION FOR IPM PLAN
Ordinance Requirement
Yes No

- This development is a publically owned, privately developed property within the boundaries of the Anacostia Watershed Development Zone
- The property requires a Certificate of Occupancy and falls within the regulations of Green Area Ratio.

1

Figure R.1~~R.1~~ Sample form for an Integrated Pest Management Plan.

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Environmental Criteria Manual requirement
(If site has existing or planned LID stormwater management structures, please refer to the DDOE Stormwater Guidebook for maintenance requirements)

Critical Environmental Features and Buffers (List any that exist - must be shown on the site plan)

Yes	No	
○	○	Streambank
○	○	Wetland
Other		

ANTICIPATED LANDSCAPE PESTS and SOLUTIONS
The Maryland Home and Garden Information Center offers regionally appropriate guidelines for preventative landscape maintenance and control of landscape pests. Refer to the following guidelines in the **Maryland Home & Garden Information Center**: http://extension.umd.edu/hgic.

Check all boxes to indicate you have read the guidelines in the Maryland Home & Garden Information Center website.

- ☐ Insects
- ☐ Invasives
- ☐ Lawns
- ☐ Plant Diagnostics
- ☐ Soils
- ☐ Trees & Shrubs
- ☐ Weeds

ADDITIONAL IPM SUBMITTAL REQUIREMENTS – SITES WITH GREEN AREA RATIO OBLIGATION
Where applicable to Green Area Ratio requirements, submit the IPM plan within Green Area Ratio drawings for review by DDOE. Include the following in your submitted plans:

- Seasonal schedule of all landscape management activities for the below categories.
- A paragraph for each category describing: materials, methods, preventative maintenance, and pest management practices as applies to each CATEGORY listed below. To protect our water resources, you are required to start with the least toxic options before using chemical treatment applications.

CATEGORIES required for submittal in IPM plan:

- Soil preparation
- Use of compost
- Plant replacement
- Irrigation
- Weed control
- Insect/disease control
- Control of noxious or invasive species

2

Figure ~~RS~~.1 (continued)

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MAINTENANCE DOCUMENTATION

The property owner will maintain records of all Service Provider visits and pest control treatments for at least three (3) years. Information regarding pest management activities will be made available to the public at the property owner's administrative office. Requests to be notified of pesticide applications may also be made to this office. All guardians will be informed of their option to receive notification of all pesticide applications at enrollment and once annually.

Maintain the following records for all pesticide, herbicide, and fertilizer application.

- For pesticide and herbicide application:
  - Target pest and description of infestation severity
  - Prevention activities and non-chemical methods applied prior to chemical control
  - Type and quantity of pest/weed control used
  - Location of pesticide or herbicide application
  - Date of treatment application
  - Name and certification number of pesticide applicator
  - Application equipment used
  - Summary of results
- For fertilizer application:
  - Landscape type (lawn, ornamental planting beds, trees, other)
  - Location of fertilizer application within site
  - Soil report from lab with nutrient analysis and application recommendations
  - Fertilizer product description, including: product name, grade
  - Application rate (lb/1000 ft^2)
  - Date of fertilizer application
  - Name of individual applicator and associated landscape business
  - Summary of results

PROGRAM OUTREACH TO PROPERTY OWNER

☐ Developer agrees to inform the owner(s) of the property that they are required to apply less-toxic, non-chemical pest management options as described by the Maryland Home & Garden Information Center. IPM guidelines can be found at http://extension.umd.edu/hgic.

☐ As the person preparing the IPM Plan, I am aware that this IPM plan is required to be filed as an exhibit in the declaration of covenants. If this is a government property where covenants are not filed then this IPM plan must be an element included in the projects SWMP maintenance partnership agreement or memorandum of understanding. These are legal instruments requiring the use of IPM on this site.

By checking all boxes, I certify that I have read the requirements listed here and agree to carry out an Integrated Pest Management strategy for the above-listed property

Signature _____ Date: _____

3

Figure R~~S~~.1 (continued)

~~Appendix T~~Appendix S Proprietary Practices Approval Process

~~T.1~~S.1 Proprietary Practice Consideration Overview

This appendix provides details on the ~~information required to achieve~~ DDOE approval process for the use of a proprietary s~~S~~tormwater b~~B~~est m~~M~~anagement p~~P~~ractice (BMP). If a proposed BMP is not listed in Chapter 3 of the DDOE Stormwater Management Guidebook, or deviates significantly from the specifications listed in this Guidebook, an application with ~~accompanying monitoring data~~ or prior certified approvals sufficient to demonstrate compliance with the ~~general~~ stormwater performance ~~goals~~ standards of the District's stormwater program must be submitted to DDOE. To differentiate between a traditional stormwater BMP, ~~and~~ a proprietary practice, or manufactured BMP, the term Manufactured Treatment Device (MTD) will be utilized for the class of practices that require an approval from DDOE.

~~An applicant seeking to use an MTD as part of their Stormwater Management Plan (SWMP) may consult DDOE for a list of existing approved MTDs. If the proposed MTD is not on an existing approved list, the applicant will be required to file a MTD application to document the pollutant removal performance of the proposed practice and obtain DDOE approval prior to use.~~

DDOE recognizes the value of innovative stormwater pollutant removal technologies, especially in the ultra-urban landscape of the District, where available site area is limited and often constrained by utilities and other factors. However, DDOE also acknowledges that the resources required to develop and implement a testing program for the purposes of evaluating the performance of new MTDs are beyond the current capacity of DDOE's Stormwater Management Division. Further, DDOE recognizes that there are other state and potentially national programs being developed to provide for this testing. Therefore, until such time that DDOE develops a MTD performance testing and verification program, DDOE will accept performance testing and compliance with the New Jersey Department of Environmental Protection's (NJDEP) Protocol for Total Suspended Solids Removal as outlined in this Appendix.

~~T.2~~S.2 Types of Manufactured Treatment Devices

There are numerous MTDs currently available. The various configurations and stormwater treatment objectives represented by this general category of stormwater BMPs will continue to evolve and expand along with stormwater regulations and land development trends. It is not expected that a standard categorization of MTDs here can accommodate this growing industry. However, in order to best address the current regulations and foreseeable regulatory framework, the following represents the types of MTDs and performance goals that will be considered by DDOE's stormwater program:

- **Hydrodynamic Treatment Devices.** The term "hydrodynamic" has been used to describe a family of MTDs that rely on a wet chamber or manhole to encourage gravity separation or

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dynamic settling of solids during flow conditions (as opposed to quiescent settling within vaults or chambers sized comparably to wet ponds). In most cases the total area of the wet chamber has been reduced through the application of dynamic settling, or vortex (as borrowed from technology applied to remove coarse solids from combined sewer overflows). The term "hydrodynamic" has therefore been loosely applied to the entire category of practices that are designed to achieve physical settling within a small treatment area, with or without a vortex component. DDOE considers these practices to be applicable as pretreatment devices to be placed in series upstream of a primary (filtering) MTD or a retention or pollutant removal practice included in Chapter 3 of this Guidebook. Pretreatment is typically an essential element of the primary BMP's performance and designed maintenance interval and therefore no additional retention or pollutant removal credit is awarded.

- **Filtering Treatment Devices.** A broad category of MTDs utilize a filter media contained within an engineered structure. In some cases, the filter media itself may be the proprietary product, while others may also include the media container (cartridges, tubes, etc.), and/or the overall structure geometry and hydraulic components as the proprietary product. When necessary, DDOE will determine if the design, sizing, filter media, or other characteristics deviate significantly from the specifications listed in this Guidebook and therefore requires an approval.
- **Retention Devices.** The current category of retention devices is limited to storage chambers, vaults, perforated pipes, and other forms of supplemental storage volume. These devices generally serve to supplement a primary retention practice such as infiltration, bioretention, etc., by providing additional storage within or adjacent to the practice. Alternatively, these devices may also supplement a pollutant removal practice by creating additional runoff storage volume. In either case, the devices are not considered treatment MTDs. Rather, these storage elements allow the primary BMP to capture and retain or treat a larger volume of runoff and are therefore considered part of the primary BMP, and not an additional treatment mechanism. Therefore, no additional pollutant removal is credited.

~~T.3~~S.3 Proprietary Practice Approval Process – Background

DDOE has reviewed different testing protocols and state sponsored MTD performance verification programs. In general, the evaluation and approval of MTD performance has traditionally been based on a combination of field monitoring and a rigorous review of the resulting data. While the consensus is that there is no substitute for field monitoring through the seasonal variations in rainfall, pollutant loading, temperature, and other factors to evaluate the performance of a stormwater BMP, there is anecdotal evidence that these studies can take a long time, be very expensive, and in some cases, be inconclusive.

The process and experience in New Jersey was derived from a multi-state testing protocol and reciprocity agreement: The Technology Acceptance Reciprocity Partnership (TARP 2003). TARP refers to a testing protocol that outlines the standard methods and procedures to be employed when testing a stormwater MTD. The concept was based on the belief that if a manufacturer followed the TARP protocol to test the MTD, then the data would be acceptable to all the partner states. The New Jersey Department of Environmental Protection (NJDEP), in partnership with the New Jersey Corporation for Advanced Technology (NJCAT), is ~~the only~~a

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TARP member state ~~to have~~that has developed a formal evaluation and acceptance process for MTDs. Unfortunately, the "reciprocity" element of the process did not evolve primarily due to the different partner states having established different treatment objectives and performance goals. The New Jersey program established TSS as the treatment objective, while other states included nutrients or other parameters in addition to TSS.

~~Through implementing t~~The MTD performance certification program in New Jersey, implemented by NJDEP and NJCAT, provides a ~~have continually~~ continuous ~~evaluated~~ evaluation of the effectiveness of the testing and verification protocol and, in an effort to establish a more reliable and consistent process, are currently transitioning to a prescriptive laboratory testing protocol. The laboratory testing of filter products may be supplemented by optional field testing to demonstrate system longevity and corresponding expected maintenance intervals.

The new protocol, entitled "New Jersey Department of Environmental Protection Process for Approval of Use for Manufactured Treatment Devices January 25, 2013" (NJDEP 2013a), requires that MTD's obtain Verification through NJCAT. The NJCAT Verification process, entitled "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from

New Jersey Corporation for Advanced Technology January 25, 2013" (NJCAT 2013), and the NJDEP protocol can be found on NJDEP's website, http://www.njstormwater.org/treatment.html ~~;~~.

~~ and t~~The new protocol includes a formal transition process that recognizes existing MTD certification and allows sufficient time for recertification under the new protocol. In addition, the new NJ protocol remains consistent with the DDOE stormwater program's treatment objectives (TSS) and performance goals (80 percent reduction). ~~Therefore, in order t~~To allow for the use of effective MTDs in the District immediately and include an opportunity to transition to a more reliable and consistent testing protocol, DDOE will accept the existing NJDEP certifications, and implement the same expiration schedule of those existing certifications and accompanying verification/certification renewal as required by NJDEP's new protocol. DDOE will apply the District's SWRv treatment requirements (1.2-inch rainfall, or when over-treating, up to 1.7-inch rainfall) to the specific MTD unit sizing formula as verified and certified by NJCAT and NJDEP, respectively.

~~T.4~~S.4 MTD Current Approval Status

DDOE will accept MTDs for use in the District that have a current NJDEP verification/certification as conditioned upon those items referenced in Transition for Manufactured Treatment Devices dated July 15, 2011 (NJDEP 2011) as follows:

- All MTDs that have a MTD Laboratory Test Certification for 80 percent TSS removal will be approved for use by DDOE until the NJDEP published certification expiration date (determined in conjunction with NJDEP's January 25, 2013 adoption of the new testing protocols; NJDEP 2013b);

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- All MTD's that have a MTD Laboratory Test Certification for 50 percent TSS removal will be approved for use by DDOE for pretreatment upstream of MTDs and, on a case by case basis, upstream of applicable practices listed in Chapter 3 until the NJDEP published certification expiration date (determined in conjunction with NJDEP's January 25, 2013 adoption of the new testing protocols; NJDEP 2013c);
- All MTDs that have a MTD Field Test Certification for 80 percent TSS removal will be approved for use by DDOE until the NJDEP published certification expiration date (determined in conjunction with NJDEP's January 25, 2013 adoption of the new testing protocols; NJDEP 2013b).

All manufacturers seeking acceptance for use in the District based on certification by NJDEP must submit evidence of NJDEP Verification/Certification (Certification Letter) and documentation representing how the MTD design and sizing is affected by the application of the District's ~~Water Quality Design S~~stormwater performance standards ~~design peak flow rate or runoff volume from the contributing drainage area~~ as detailed in Chapter 2~~(~~ and as compared to that of the NJDEP~~)~~. The application of a specific MTD sizing criteria or model on a given development site must be rated for a Treatment Flow Rate (as defined by the new 2013 protocol) equal to or greater than the Districts Stormwater Retention Volume (SWRv) design storm peak flow rate. Refer to Appendix H for guidance on the computational methodology for computing the District's SWRv design peak flow rate. Developers and consultants may review available products that have been certified by the NJDEP and select the one most appropriate for their site. For most recent MTD approvals consult NJDEP website http://www.njstormwater.org/treatment.html.

~~T.5 Nutrient Reduction Performance~~

~~When a MTD is seeking to comply with the nutrient reduction provisions of the Chesapeake Bay Total Maximum Daily Load, the nutrient load reduction performance must be verified through the Virginia Technology Acceptance Protocol (VTAP) implemented by the Virginia Department of Environmental Quality and can be found at the Virginia BMP Clearinghouse Website: http://vwrrc.vt.edu/SWC/EvalCert.html.~~

~~T.6~~S.5 MTD Approval Status Renewal

Prior to the expiration of the NJDEP verification/certification, as noted in Section ~~T~~S.4, all MTDs that wish to continue to be accepted for water quality treatment in the District shall formally request acceptance by DDOE and submit ~~one of the following:~~

~~1.~~ e~~E~~vidence of approval through NJDEP's 2013 MTD Laboratory Test Certification/Verification process~~; or~~.

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~~2. The results of field testing as conducted in accordance with all the requirements of the Virginia Technology Acceptance Protocol (VTAP) and corresponding review and approval documentation.~~

~~T.7~~S.6 MTD Application Fees

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Submission of evidence of verification/certification through NJDEP's MTD Certification Program ~~or the VTAP program~~ does not require a review fee. However, any requests for acceptance of an MTD for other treatment parameters, including but not limited to pathogens, metals, oil and grease, or runoff volume may be subject to alternate submittal requirements and a review fee commensurate with the services required for reviewing and approving the MTD.

~~T.8~~S.7 References

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~~Appendix U~~Appendix T ~~References~~Resources

The following documents provide more detailed information on many aspects of BMP design than is found in this Guidebook. These resources may be useful for those looking to develop greater understanding of individual BMPs or stormwater design in general. Recommendations in these resources may be used to inform BMP designs; however, where conflicts occur between these resources and the Guidebook, the requirements of the Guidebook prevail.

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~~Appendix V~~Appendix U Definitions

Anacostia Waterfront Development Zone (AWDZ) - the following areas of the District of Columbia, as delineated on a map in the DDOE's Stormwater Management Guidebook (Figure 2.1):

(a) Interstate 395 and all rights-of-way of Interstate 395, within the District, except for the portion of Interstate 395 that is north of E Street, S.W., or S.E.;

(b) All land between that portion of Interstate 395 that is south of E Street, S.W., or S.E., and the Anacostia River or Washington Channel;

(c) All land between that portion of Interstate 695, and all rights of way, that are south of E Street, S.W. or S.E., and the Anacostia River;

(d) The portion of Interstate 295 that is north of the Anacostia River, within the District, and all rights-of-way of that portion of Interstate 295;

(e) All land between that portion of Interstate 295 that is north of the Anacostia River and the Anacostia River;

(f) The portions of:

- The Anacostia Freeway that is north or east of the intersection of the Anacostia Freeway and Defense Boulevard and all rights-of-way of that portion of the Anacostia Freeway;
- Kenilworth Avenue that extend to the northeast from the Anacostia Freeway to Eastern Ave; and
- Interstate 295, including its rights-of-way, that is east of the Anacostia River and that extends to the southwest from the Anacostia Freeway to Defense Boulevard.

(g) All land between those portions of the Anacostia Freeway, Kenilworth Avenue, and Interstate 295 described in ~~paragraph 6 of this section~~ (f) and the Anacostia River;

(h) All land that is adjacent to the Anacostia River and designated as parks, recreation, and open space on the District of Columbia Generalized Land Use Map, dated January 2002, except for the land that is:

- North of New York Avenue, N.E.;
- East of the Anacostia Freeway, including rights-of-way of the Anacostia Freeway;
- East of the portion of Kenilworth Avenue that extends to the northeast from the Anacostia Freeway to Eastern Avenue;
- East of the portion of Interstate 295, including its rights-of-way, that is east of the Anacostia River and that extends to the southwest from the Anacostia Freeway to Defense Boulevard, but excluding the portion of 295 and its rights-of-way that go to the northwest across the Anacostia River;

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- Contiguous to that portion of the Suitland Parkway that is south of Martin Luther King, Jr. Avenue; or
- South of a line drawn along, and as a continuation both east and west of the center line of the portion of Defense Boulevard between Brookley Avenue, S.W., and Mitscher Road, S.W.;

(i) All land, excluding Eastern High School, that is:

- Adjacent to the land described in ~~paragraph 8 of this section~~(h);
- West of the Anacostia River; and
- Designated as a local public facility on the District of Columbia Generalized Land Use Map, dated January 2002;

(j) All land that is:

- South or east of that portion of Potomac Avenue, S.E., between Interstate 295 and 19th Street, S.E.; and
- West or north of the Anacostia River;

(k) The portion of the Anacostia River within the District; and

(l) The Washington Channel.

Anacostia Waterfront Development Zone Site - A site within the Anacostia Waterfront Development Zone (AWDZ) that undergoes a major regulated project that is publicly owned or publicly financed.

Animal confinement area - An area, including a structure, used to stable, kennel, enclose, or otherwise confine animals, not including confinement of a domestic animal on a residential property.

Applicant - A person or their agent who applies for approval pursuant to this chapter.

As-built plan - A set of architectural, engineering, or site drawings, which sometimes include~~ing~~ specifications~~,~~ that certify~~ies~~, describe~~s~~, delineate~~s~~, ~~and~~ or present~~s~~ details of a completed construction project.

Best m~~M~~anagement p~~P~~ractice (BMP) - Structural or non-structural practice that minimizes the impact of stormwater runoff on receiving waterbodies and other environmental resources, especially by reducing runoff volume and the pollutant loads carried in that runoff.

Buffer - An area along a stream, river, or other natural feature that provides protection for that feature.

Building permit - Authorization for construction activity issued by the District of Columbia Department of Consumer and Regulatory Affairs.

Clearing - The removal of trees and brush from the land excluding the ordinary mowing of grass, pruning of trees or other forms of long-term landscape maintenance.

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Common plan of development - Multiple, separate, and distinct land-disturbing, substantial improvement, or other construction activities taking place under, or to further, a single, larger plan, although they may be taking place at different times on different schedules.

Compacted cover - An area of land that is functionally permeable, but where permeability is impeded by increased soil bulk density as compared to natural cover, such as through grading, construction, or other activity and will require regular human inputs such as periodic planting, irrigation, mowing, or fertilization. Examples include landscaped planting beds, lawns, or managed turf.

Conservation area – area with a natural cover designation set aside to receive stormwater runoff as part of an impervious surface disconnection practice.

Construction - Activity conducted for the:

(a) Building, renovation, modification, or razing of a structure; or

(b) Movement or shaping of earth, sediment, or a natural or built feature

Control measure - Technique, method, device, or material used to prevent, reduce, or limit discharge.

Critical area stabilization - Stabilization of areas highly susceptible to erosion, including down-slopes and side-slopes, through the use of brick bats, straw, erosion control blanket mats, gabions, vegetation, and other control measures.

Cut - An act by which soil or rock is dug into, quarried, uncovered, removed, displaced, or relocated and the conditions resulting from those actions.

Demolition - The removal of part or all of a building, structure, or built land cover.

Department - The District Department of the Environment or its agent.

Dewatering - Removing water from an area or the environment using an approved technology or method, such as pumping.

Director - The Director of the District Department of the Environment.

District - The District of Columbia.

Drainage area - Area contributing runoff to a single point.

Easement - A right acquired by a person to use another person's land for a special purpose.

Electronic media - Means of communication via electronic equipment, including the internet.

Erosion - The process by which the ground surface, including soil and deposited material, is worn away by the action of wind, water, ice, or gravity.

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Excavation - An act by which soil or rock is cut into, dug, quarried, uncovered, removed, displaced or relocated and the conditions resulting from those actions.

Existing retention - Retention on a site, including by each existing bBest mManagement pPractice (BMP) and land cover, before retrofit of the site with installation of a new BMP or land cover.

Exposed area - Land that has been disturbed or land over which unstabilized soil or other erodible material is placed.

Grading - Causing disturbance of the earth, including excavating, filling, stockpiling of earth materials, grubbing, root mat or topsoil disturbance, or any combination of them.

Green Area Ratio (GAR) - The ratio of the weighted value of landscape elements to land area, as it relates to an increase in the quantity and quality of environmental performance of the urban landscape as defined in the Zoning regulation (Title 11 DCMR) Chapter 34. Details are provided under a separate and unique DDOE guidance manual.

Impervious cover - A surface area which has been compacted or covered with a layer of material that impedes or prevents the infiltration of water into the ground, examples include conventional streets, parking lots, rooftops, sidewalks, pathways with compacted sub-base, and any concrete, asphalt, or compacted gravel surface and other similar surfaces.

Infiltration - The passage or movement of surface water through the soil profile.

Land cover - Surface of land that is impervious, compacted, or natural.

Land-cover change - Conversion of land cover from one type to another, typically in order to comply with a requirement of this chapter or to earn certification of a Stormwater Retention Credit.

Land-disturbing activity - Movement of earth, land, or sediment and related use of land to support that movement. This includes stripping, grading, grubbing, trenching, excavating, transporting, and filling of land, as well as the use of pervious adjacent land for movement and storage of construction vehicles and materials.

Low iImpact dDevelopment (LID) - A land–planning and engineering–design approach to manage stormwater runoff within a development footprint. It emphasizes conservation, the use of on-site natural features, and structural best management practices to store, infiltrate, evapotranspire, retain, and detain rainfall as close to its source as possible with the goal of mimicking the runoff characteristics of natural cover.

Maintenance agreement – See Section 5.4.2 Maintenance Agreement.

Maintenance contract – See "maintenance agreement."

Maintenance responsibility – See Section 5.4.1 Maintenance Responsibility.

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Maintenance plan – Planned scheduled maintenance for the life of the BMP.

Maintenance schedule – See "maintenance plan".

Maintenance standards – Detailed maintenance plan laid out in Exhibit C within Declaration of Covenants.

Major land-disturbing activity - Activity that disturbs, or is part of a common plan of development that disturbs, five thousand square feet (5,000 ft^2) or greater of land area, except that multiple distinct projects that each disturb less than 5,000 ft^2 of land and that are in separate, non-adjacent sites do not constitute a major land-disturbing activity.

Major regulated project - A major land-disturbing activity or a major substantial improvement activity.

Major substantial improvement activity - Substantial improvement activity and associated land-disturbing activity, including such activities that are part of a common plan of development, for which the combined footprint of improved building and land-disturbing activity is 5,000 square feet or greater. A major substantial improvement activity may include a substantial improvement activity that is not associated with land disturbance.

Market value of a structure - Assessed value of the structure for the most recent year, as recorded in the real property assessment database maintained by the District of Columbia's Office of Tax and Revenue.

Natural cover - Land area that is dominated by vegetation and does not require regular human inputs such as irrigation, mowing, or fertilization to persist in a healthy condition. Examples include forest, meadow, or pasture.

Non-structural BMP - A land use, development, or management strategy that minimizes the impact of stormwater runoff, including conservation of natural cover or disconnection of impervious surface.

Off-site retention - Use of a Stormwater Retention Credit or payment of in-lieu fee in order to achieve an Oo~~o~~ff-Ss~~s~~ite Rr~~r~~etention Vv~~v~~olume under these regulations.

Off-Site Retention Volume (Offv) - A portion of a required Ss~~s~~tormwater Rr~~r~~etention Vv~~v~~olume or required Water Quality Treatment Volume that is not retained on site.

On-site retention - Retention of a site's stormwater on that site or via conveyance to a shared best management practice on another site.

On-site stormwater management - Retention, detention, or treatment of stormwater on site or via conveyance to a shared best management practice.

Original Stormwater Retention Credit (SRC) owner – A person who is indicated as the proposed SRC owner in an application to the Department for the certification of an SRC. The

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proposed SRC owner becomes the original SRC owner upon the Department's certification of the SRC.

Owner - The person who owns real estate or other property, or that person's agent.

Peak discharge - The maximum rate of flow of water at a given point and time resulting from a storm event.

Person - A legal entity, including an individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, cooperative, the District Government of the District of Columbia and its agencies, and the federal government and its agencies.

Pervious Area – area with a compacted cover designation set aside to receive stormwater runoff as part of an impervious surface disconnection practice.

Post-development - Describing conditions that may be reasonably expected to exist after completion of land development activity on a site.

Practice - A system, device, material, technique, process, or procedure that is used to control, reduce, or eliminate an impact from stormwater; except where the context indicates its more typical use as a term describing a custom, application, or usual way of doing something.

Preconstruction meeting - The mandatory meeting occurring prior to any construction, including the owner, the designer, the installer, and the DDOE inspector. This meeting must contain an on-site component to evaluate the SWMP against existing site conditions. This should include, at a minimum, a visual examination of land cover types, the tree preservation plan, boundaries of the contributing drainage area(s), the existing inlet elevation(s) to ensure they conform to original design.

Predevelopment - Describing conditions of meadow land and its relationship to stormwater before human disturbance of the land.

Preproject - Describing conditions, including land covers, on a site that exist at the time that a stormwater management plan is submitted to DDOE.

Publicly owned or publicly financed project - PA project:

(a) That is District-owned or District-instrumentality owned;

(b) Where at least fifteen percent (15%) of a project's total cost is District-financed or District-instrumentality financed; or

(c) That includes a gift, lease, or sale from District-owned or District instrumentality-owned property to a private entity.

Public right-of-way (PROW) - The surface, the air space above the surface (including air space immediately adjacent to a private structure located on public space or in a public right-

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of-way), and the area below the surface of any public street, bridge, tunnel, highway, lane, path, alley, sidewalk, or boulevard.

Public sSpace - All the publicly owned property between the property lines on a street, park, or other public property as such property lines are shown on the records of the District, and includes any roadway, tree space, sidewalk, or parking between such property lines.

Raze - The complete removal of a building or other structure down to the ground.

Responsible person - Construction personnel knowledgeable in the principles and practices of soil erosion and sediment control and certified by a Department-approved soil erosion and sedimentation control training program to assess conditions at the construction site that would impact the effectiveness of a soil--erosion or sediment--control measure on the site.

Retention - Keeping a volume of stormwater runoff on site through infiltration, evapo-transpiration, storage for non-potable use, or some combination of these.

Retention capacity - The volume of stormwater that can be retained by a best management practice or land cover.

Retention failure - Failure to retain a volume of stormwater for which there is an obligation to achieve retention, including retention that an applicant promises to achieve in order to receive Department-certified Stormwater Retention Credits (SRCs). Retention failure may result from a failure in construction, operation, or maintenance; a change in stormwater flow; or a fraud, misrepresentation, or error in an underlying premise in an application.

Retrofit - A best management practice or land cover installed in a previously developed area to improve stormwater quality or reduce stormwater quantity relative to current conditions.

Runoff - That portion of precipitation (including snow-melt) which travels over the 1and surface, and also from rooftops, either as sheetflow or as channel flow, in small trickles and streams, into the main water courses.

Sediment - Soil, including soil transported or deposited by human activity or the action of wind, water, ice, or gravity.

Sedimentation - The deposition or transportation of soil or other surface materials from one place to another as a result of an erosion process.

Shared bBest mManagement pPractice (S-BMP) - A bBest mManagement pPractice (BMP), or combination of BMPs, providing stormwater management for stormwater conveyed from another site or sites.

Site - A tract, lot or parcel of 1and, or a combination of tracts, 1ots, or parcels of land for which development is undertaken as part of a unit, sub-division, or project. The mere divestiture of ownership or control does not remove a property from inclusion in a site.

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Site dDrainage aArea (SDA) - The area that drains to a point on a site from which stormwater discharges. Throughout this guidance and in accompanying calculator spreadsheets this is referred to as the drainage area(s) within the limits of disturbance. The use of DA to indicate SDA, or a subset of SDA, is common.

Soil - All earth material of whatever origin that overlies bedrock and may include the **decomposed zone of bedrock which can be readily excavated by mechanical equipment.**

Soil Erosion and Sediment Control Plan - A set of drawings, calculations, specifications, details, and supporting documents related to minimizing or eliminating erosion and off-site sedimentation caused by stormwater on a construction site. It includes information on construction, installation, operation, and maintenance.

Soils report - A geotechnical report addressing all soil erosion and sediment control-related soil attributes, including but not limited to site soil drainage and stability.

Storm sewer - A system of pipes or other conduits which carries or stores intercepted surface runoff, street water, and other wash waters, or drainage, but excludes domestic sewage and industrial wastes.

Stormwater - Flow of water that results from runoff, snow melt runoff, and surface runoff and drainage.

Stormwater Fee Discount - The program that will allow District water and sewer ratepayers to apply for a discount of up to fifty-five percent (55 %) of the DDOE Stormwater Fee that appears on their DC Water bill. To be eligible for a discount, ratepayers must have installed Best Management Practices (BMPs) that retain or prevent stormwater runoff. The program rules are defined in Title 21, Water and Sanitary, Chapter 5, Water Quality and Pollution, of the DCMR sections 557 through 563. Details are provided under a separate and unique DDOE guidance manual.

Stormwater management - A system to control stormwater runoff with structural and non-structural bBest mManagement pPractices, including: (a) quantitative control of volume and rate of surface runoff and (b) qualitative control to reduce or eliminate pollutants in runoff.

Stormwater Management Guidebook (SWMG) - The current manual published by DDOE containing design criteria, specifications, and equations to be used for planning, design, and construction, operations, and maintenance of a site and each bBest mManagement pPractice on the site.

Stormwater Management Plan (SWMP) - A set of drawings, calculations, specifications, details, and supporting documents related to the management of stormwater for a site. A SWMP includes information on construction, installation, operation, and maintenance.

Stormwater Pollution Prevention Plan (SWPPP) - A document that identifies potential sources of stormwater pollution at a construction site, describes practices to reduce pollutants in stormwater discharge from the site, and may identify procedures to achieve compliance.

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Stormwater Retention Credit (SRC) - One gallon (1 gal.) of retention capacity for one (1) year, as certified by DDOE. An SRC may also be referred to as a RainReC.

Stormwater Retention Credit c~~C~~eiling - Maximum retention for which DDOE will certify an SRC, calculated using the SWRv equation with P equal to 1.7 inches.

Stormwater Retention Volume (SWRv) - Volume of stormwater from a site for which the site is required to achieve retention.

Stripping - An activity which removes or significantly disturbs the vegetative surface cover including clearing, grubbing of stumps and rock mat, and top soil removal.

Substantial improvement - A repair, alteration, addition, or improvement of a building or structure, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure before the improvement or repair is started.

Structural best management practice - A practice engineered to minimize the impact of stormwater runoff, including a bioretention, green roof, permeable paving system, system to capture stormwater for non-potable uses, etc.

Supplemental review - A review that DDOE conducts after the review it conducts for a first re-submission of a plan.

Swale - A narrow low-lying stretch of land which gathers or carries surface water runoff.

Total suspended solids (TSS) - The entire amount of organic and inorganic particles dispersed in water. TSS is measured by several methods, which entail measuring the dry weight of sediment from a known volume of a subsample of the original.

Waste material - Construction debris, dredged spoils, solid waste, sewage, garbage, sludge, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial or municipal waste.