

Determining Urban Stormwater Best Management Practice (BMP) Removal Efficiencies

Task 1.1 – National Stormwater BMP Database Data Elements

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Introduction

This document contains a summary of the data elements included in Version 1.0 of the National Stormwater Best Management Practices Database. The data elements are provided on a table-by-table basis and include the data element name, a brief description of the data element and the priority level of the data.

General Test Site Information

The purpose of the BMP General Test Site Information data is to identify the test location. The location information is important for a variety of reasons. For example, it enables recognition of the types of conditions under which the BMP test is conducted (e.g., Seattle = lots of low intensity rain much of the year, Phoenix = few high intensity storms). This information also enables interface with other EPA databases.

Data Element	Description	Priority Level
BMP Test Site Name	Name that the site is known by locally (e.g., Shop Creek, First Bank).The site may contain more than one BMP, but ONLY if the watersheds tributary to these BMPs are virtually identical.	Required
City	City closest to the test site. The site does not have to be within the city limits.	Required
County	County in which test site is located.	Nice to Have
State	State where test was performed (2 characters).	Required
Zip Code	Zip code of the test site.	Required
Country	Country where the test site is located (2 characters).	Required
Time Zone	Time zone in which the BMP test site is located off-set in hours from Greenwich Mean Time. For example in the United States, Eastern Time is -5, Central Time is -6, Mountain Time is -7 and Pacific Time is -8.	Nice to Have
USGS Quadrangle Map Name	U.S. Geological Survey (USGS) map on which the site can be located. This information should be identified for U.S. sites only.	Nice to Have
Principal Meridian	Local or international meridian from which the degrees of longitude locating the BMP test site are measured.	Nice to Have
Range	Range identifies the site distance and direction (east or west) from the selected principal meridian. For example, Range 60 West (R60W). This information can be found on a U.S. Geological Survey quadrangle map. U.S. sites only.	Nice to Have
Township	Township is a public land surveying unit consisting of 36 sections or 36 square miles in the United States. Townships are located by their distance and direction (north or south) from a selected baseline. For example, Township 2 North (T2N). U.S. sites only.	Nice to Have
Section	Section is a land area containing one square mile or 640 acres that can be identified on a U.S. Geological Survey quadrangle map. There are 36 sections in a township numbered from 1 to 36. U.S. sites only.	Nice to Have
Quarter-Quarter-Quarter section	Quarter-Quarter-Quarter section should be provided to locate the BMP test site on a U.S. Geological Survey quadrangle map. U.S. sites only.	Nice to Have

Latitude	Latitude is the North-South coordinate that locates the project to the nearest second on the globe relative to the equator. The degree, minute and second measures of the latitude can be obtained from a U.S. Geological Survey Quadrangle Map.	Essential, But Not Required
Longitude	The East-West coordinate that locates the project to the nearest second on the globe relative to the selected principal meridian. The degree, minute and second measures of the latitude can be obtained from a U.S. Geological Survey (USGS) Quadrangle.	Essential, But Not Required
Altitude	Elevation above mean sea level provided to the nearest 100 feet from a U.S. Geological Survey quadrangle map or to the nearest 30 meters for studies outside of the United States.	Required
Hydrologic Unit Code	is the U.S. Geological Survey (USGS) 8-digit hydrologic unit code (HUC) which represents a geographic area containing part or all of a surface drainage basin or distinct hydrologic feature. The first two digits of the code represent the water resources region; the first four digits represent the subregion; the first six digits represent the accounting unit; and all eight digits represent the cataloguing unit. The HUC can be looked up on the EPA "Surf Your Watershed" web site at http://www.epa.gov/surf/ . If the user's search response is "no results", then higher level tributary names should be tried, or other descriptors such as county name or zip code, until an HUC is provided. If these approaches are unsuccessful, the user should provide the requested latitude and longitude information so that this information can be completed by EPA or the database clearinghouse staff.	Essential, But Not Required
EPA Reach Code	EPA-designated RF1 or RF3 river reach with which the station is associated. Sites will either have an RF1 code or an RF3 code, but not both. There are about 67,000 RF1 codes and over 2 million RF3 codes within the United States. The first eight digits of the Reach Codes are the hydrologic unit code (HUC) described above; therefore, the user only needs to provide the last three or four digits in the Reach Code which follow the 8-digit HUC. The RF1 and RF3 codes can be obtained from the BASINS watershed analysis software, which EPA has distributed to state water quality agencies, as well as many regional or local agencies. The BASINS software modules may be obtained from EPA at no charge; however, the user must have ArcView, a commercial GIS software product. More information on obtaining BASINS is available on the EPA web site at http://www.epa.gov/OST/BASINS/ .	Essential, But Not Required

Sponsoring and Testing Agencies for Test Site

The purpose of this table is to provide contact information for the entity sponsoring the BMP test and the entity actually conducting the test. For example, EPA may be sponsoring the test by providing funding, while a private firm may be actually conducting the monitoring.

Data Element	Description	Priority Level
Agency Type	Agency types may include city, county, state, industry, federal, special district, council of governments, authority, consultant, or other.	Nice to Have

Address	Address information includes agency name, department (if any), street or post office address, city, state, zip code, country, phone, fax and e-mail.	Required
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Watershed Information

Watershed characteristics play a significant role in the types and quantities of pollutants contributed to stormwater runoff. The information requested below is useful for comparing effectiveness of BMPs under various watershed conditions.

Data Element	Description	Priority Level (see notes below table)
Subject Watershed Name	Name that the watershed is referred to locally.	Required
Total Watershed Area	Topographically defined area drained by an urban system, channel, gulch, stream, etc., such that all outflow is directed to a single point.	Required
Total Length of Watershed	Length of the watershed along the main drainage path to the furthest point on the watershed divide.	Nice to Have
Total Length of Grass-Lined Channel	Total length of grass-lined and natural channels in the watershed. This is the portion of the storm drainage network in the watershed that is not conveyed in concrete channels, storm sewers or pipes.	Variable (see notes below)
Total Watershed Area Disturbed	Total watershed area that is disturbed or under construction. This parameter may be useful in indicating the types and levels of pollutant loads in stormwater.	Variable
Percent (%) Irrigated Lawn and/or Agriculture in Watershed	Particularly important in arid areas where vegetation may be difficult to establish without irrigation.	Variable
Percent (%) Total Impervious Area in Watershed	Impervious or impermeable surfaces either prevent or retard the entry of water into the soil mantle as would occur under natural conditions prior to development. Impermeable surfaces cause water to run off the surface in greater quantities or at an increased rate relative to natural conditions. Common impervious surfaces include, but are not limited to, rooftops, walkways, patios, driveways, parking lots, storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and macadam or other surfaces that similarly impede the natural infiltration of urban runoff. Rainfall on impervious areas can cause rapid overland flow to drainage inlets. The percent of the total watershed that is impervious can be determined as the total impervious area divided by the total area of the watershed.	Required
Percent (%) of Total Impervious Area (above) that is Hydraulically Connected	Calculated by dividing the hydraulically connected impervious area by the total impervious area. An example of hydraulically connected impervious area includes building rooftops that drain onto paved areas.	Essential, But Not Required

Percent (%) of Watershed Served by Storm Sewers	Storm sewers are conduits designed for the principal purpose of conveying storm or combined (sanitary and storm) flows to either treatment facilities or receiving water bodies. The percentage of watershed area served by storm sewers is typically higher in urbanized areas than in rural areas.	Variable
Storm Sewer Design Return Period (yrs)	Most common design storm return period for the storm sewers in the watershed provided in years. The design storm is the storm for which a storm drainage system, flood protection project, spillway or other engineering structure is designed. For example, the storm sewers may be designed to handle flows generated by the 25-year storm.	Variable (2)
Average Watershed Slope	Average unitless slope of the watershed (i.e., ft fall/ft run or m fall/m run--unitless). Calculate slope by dividing the vertical distance (or fall) by the linear length of the flow path (or run). Slope for each linear reach can be determined as the elevation difference for the reach divided by the length of the reach. An average slope for the watershed can then be calculated as a weighted sum of the slopes of individual reaches using the length of the individual reaches relative to the total length of the channel as the weighting factor.	Variable (2)
Average Runoff Coefficient	Based on runoff and rainfall data collected in the watershed using the area-weighted average runoff coefficient. If data permit, calculate the average of individual storm runoff coefficients using each storm's runoff volume divided by its rainfall volume.	Variable
NRCS Hydrologic Soil Group	Dominant Natural Resource Conservation Service (NRCS--formerly Soil Conservation Service) hydrologic soil group--A, B, C, or D. Hydrologic soil groups are used to estimate runoff from precipitation. Soils are placed in one of four groups on the basis of the infiltration of water after the soils have been wetted and have received precipitation from long-duration storms.	Variable (2)
Soil Type	NRCS soil type--(c)lay (s)ilt, s(a)nd. Clay particles are smaller than 0.002 millimeters (mm) in diameter. Silt particles are between 0.002 and 0.05 mm in diameter. Sand particles range from 0.05 mm to 2.0 mm.	Variable
Type of Vegetation	Type of vegetation predominant in pervious areas (grass turf, dryland grasses, etc.) influences the rate and efficiency of stormwater infiltration and filtration.	Variable

Regional Climate Station in the United States	Regional Climate Station in the United States that is most relevant to the test site can be selected from a drop-down box. Storm event statistics have been calculated including the average and coefficient of variation for these parameters: number of storms, precipitation (in/yr), storm duration (hours), storm intensity (in/hr), and storm volume (in/hr). These data were taken from <i>Analysis of Storm Event Characteristics for Selected Rainfall Gauges Throughout the United States</i> by Eugene D. Driscoll, Gary E. Palhegyi, Eric W. Strecker and Philip E. Shelley, prepared for the U.S. Environmental Protection Agency, November 1989. For sites outside of the United States, this information can be developed based on the definition of an individual storm being separated by six hours or more of inter-event time. Storms that have less than 0.1 inches of total rainfall should be filtered out before calculating these statistics. For non-United States test sites, this information can be entered into the Comments field on the General Test Site Information form or table.	Required
Land Use Information	Should be provided for each land use present in the watershed. The percent of each land use in the watershed can be categorized according to % Light Industrial, % Heavy Industrial, % Multi-family Residential, % Office Commercial, % Retail, % Restaurants, % Automotive Services, % Rangeland, % Orchard, % Vegetable Farming, etc. This parameter may be useful in indicating the type and level of pollutant loads in stormwater.	Required for Non-structural BMPs; Essential, But Not Required for Structural BMPs
Settling Velocity Distributions	Rates at which suspended sediment settles over time. This can be determined through settling column tests. Based on the results of the test, enter the settling velocities at which various percentiles of the sediment settle. For example, 10 percent of the sediment may settle at a rate of 1 foot/minute or faster, 20 percent may settle at a rate of 1.5 feet/minute or faster, 30 percent may settle at a rate of 2 feet/minute or faster, etc.	Nice to Have
Comments	This field is provided to enable the user to provide additional information about the test.	Nice to Have

Notes:

“Variable” priority level is defined as:

- Required: For non-structural BMPs and structural BMPs that are based on minimizing directly connected impervious area.
- Essential, But Not Required: For infiltration/percolation type structural BMPs.
- Nice to Have: For non-infiltrating structural BMPs.

“Variable(2)” priority level is defined as:

- Required: For structural BMPs that are based on minimizing directly connected impervious area.
- Essential, But Not Required: For infiltration/percolation type structural BMPs and non-structural BMPs.
- Nice to Have: For non-infiltrating structural BMPs.

Watershed Information: Roads and Parking Lots

Separate data sets are requested for 1) roads, streets and alleys in the watershed and 2) parking lots in the watershed. The requested information is described below

Data Element	Description	Priority Level (see notes below table)
Roads, Streets and Alleys in Watershed	The following fields request information on streets, roads and alleys present in the watershed. Do not include parking lots in this information because it is requested separately.	
Total Paved Roadway Area	Total area of paved roads, streets and alleys in the watershed as a component of the total impervious area of the watershed. Associated paved shoulders should be included in this area.	Variable
Total Length Curb/Gutter on Paved Roads	Total length of curb & gutter along paved roads, streets, and alleys. Curbs and gutters are man-made stormwater conveyance systems that remove stormwater from paved roads, streets and alleys; however, they also concentrate stormwater runoff with minimal opportunity for infiltration, filtering or settling of pollutants.	Variable
Total Unpaved Roadway Area	Total area of unpaved roads, streets, and alleys in the watershed. Unpaved shoulders should be included in this area.	Variable
Total Length Curb/Gutter on Unpaved Roads	Total length of curb & gutter along unpaved roads, streets, and alleys. Curbs and gutters are man-made stormwater conveyance systems that remove stormwater from roads, streets and alleys; however, they also concentrate stormwater runoff with minimal opportunity for infiltration, filtering or settling of pollutants.	Variable
% Paved Roads Draining to Grass Swales/Ditches	Can be calculated by dividing the length of paved roads, etc., draining to grass swales and ditches by the total length of paved roads, streets and alleyways in the watershed. Well-vegetated and maintained grass swales and ditches typically provide more infiltration and filtering of pollutants from stormwater than curb and gutter systems.	Variable
% Unpaved Roads Draining to Grass Swales/Ditches	Percentage of unpaved roads, street and alley areas draining to grass swales/ditches that can be calculated by dividing the length of unpaved roads, etc., draining to grass swales and ditches by the length of unpaved roads, streets and alleyways in the watershed. Well-vegetated and maintained grass swales and ditches typically provide more infiltration and filtering of pollutants from stormwater than curb and gutter systems.	Variable
Type of Pavement on Roads, Streets and Alleys	Can be (C)oncrete,(A)sphalt, or a Mix of (B)oth.	Variable
Parking Lots in Watershed	The following fields request information on parking lots in the watershed. Do not include the previously entered road, street and alley information.	
Total Paved Parking Lot Area	Total area of all paved parking lots within the watershed. Paved parking lots can be a significant component of total impervious area within a watershed.	Variable

Total Length Curb/Gutter on Paved Lots	Total length of curb & gutter along paved parking lots. Curbs and gutters are man-made stormwater conveyance systems that remove stormwater from paved roads, streets, alleys and parking areas; however, they also concentrate stormwater runoff without opportunity for infiltration, filtering or settling of pollutants.	Variable
Total Unpaved Parking Lot Area	Total area of all unpaved parking lots within the watershed.	Variable
Total Length Curb/Gutter on Unpaved Lots	Total length of curb & gutter along unpaved parking lots.	Variable
% Paved Lot Area Draining to Grass Swales	Percentage of parking lot areas draining to grass swales or ditches. This can be calculated by dividing the total parking lot area draining to swales by the total parking lot area.	Variable
% Unpaved Lot Area Draining to Grass Swales	Percentage of unpaved parking lot areas draining to grass swales or ditches. This can be calculated by dividing the total unpaved parking lot area draining to swales by the total unpaved parking lot area.	Variable
Type of Pavement in Parking Lots	Can be (C)oncrete, (A)sphalt, or a Mix of (B)oth. Select the type of pavement present in parking lots in the watershed from the drop-down list. Additionally, provide the percentages of porous concrete, porous asphalt and porous modular pavement present relative to the total paved parking lot area.	Variable

Notes:

“Variable” priority level is defined as:

- Required: For non-structural BMPs and structural BMPs that are based on minimizing directly connected impervious area
- Essential, But Not Required: For infiltration/percolation type structural BMPs,
- Nice to Have: For non-infiltrating structural BMPs

Non-structural BMP Data Entry

A non-structural BMP can generally be described as a preventative action to protect receiving water quality that does not require construction. Nonstructural BMPs rely predominantly on behavioral changes in order to be effective. Major categories of non-structural BMPs include education, recycling, maintenance practices and source controls, as described below.

- **Educational BMPs:** Include efforts to inform city employees, the public, and businesses about the importance of using practices that protect stormwater from improper use, storage, and disposal of pollutants, toxics, household products, etc. The ultimate goal of educational BMPs is to cause behavioral changes.
- **Recycling BMPs:** Include measures such as collecting and recycling automotive products, household toxics, leaves, landscaping wastes, etc.
- **Maintenance practices:** Include measures such as catch basin cleaning, parking lot sweeping, road and street pavement repair, road salting and sanding, roadside ditch cleaning and restoration, street sweeping, etc.
- **Source controls:** Include preventing rainfall from contacting pollutant-laden surfaces and preventing pollutant-laden runoff from leaving locations such as automobile maintenance, salvage and service stations; commercial, restaurant and retail sites; construction sites; farming and agricultural sites; industrial sites, etc.

Data Element	Description	Priority Level
Non-structural BMP Type	Major categories of non-structural BMPs include education, recycling, maintenance practices and source controls,	Required
BMP Name for the subject non-structural BMP	BMP Name for the subject non-structural BMP (e.g., Erosion and Sediment Control Pamphlets).	Required
Date Test Began	Date (month, day and 4-digit year) that the BMP test was begun (e.g., 01/01/1998).	Required
Describe the quantity or measure of the BMP being practiced	See examples below.	Required
Educational BMP "measurements"	Could include, as examples: the number of brochures distributed per resident and employee in watershed per year on the quantities of pesticide/herbicide application, automotive product disposal or recycling, household toxics use and disposal, yard waste management, etc. Other examples include: the number of elementary school children living in the watershed reached through classes at local schools; number of public notices on TV, radio and/or major newspapers per year; number of billboards per acre of watershed used per year; percent of all stormwater inlets in the watershed stenciled.	
Recycling BMP "measurements"	Could include gallons of used oil collected per resident in the watershed; pounds of household toxics collected per resident in the watershed; tons of landscaping waste per resident collected, etc.	

Maintenance BMP "measurements"	Could include percent of stormwater catch basins cleaned once each year, twice each year, etc.; tons of materials removed per average inlet each year; lane miles of street swept each year and tons of material removed per lane mile each year; acres of parking lots swept each year and tons of material removed each year per acre of parking lot swept; type and pounds of deicing materials used per lane mile of road per year; percent of salt in deicing materials used during the year; number of de-icing applications during the year; percent of roadside ditch miles cleaned in watershed during the year; tons of solids removed during the year from roadside ditches; percent of roadside ditch miles stabilized for erosion control during year, etc.	
Source Control "measurements"	Could include percent of industrial storage area in watershed that is covered; percent of materials handling sites in watershed that are covered; percent of gasoline stations with pumps that have overhead cover and how far these covers extend beyond the pumps, etc. The total area, number or mass of sources should be provided as well as the percentages in order to facilitate comparison to other source control BMP tests.	
Initial Costs	Include the time and measures necessary to design and implement a program. For example, if brochures were developed on proper disposal of household waste, the cost of development and initial printing would be the initial cost. Subsequent distribution and reprints of the brochures would be considered annual costs. Another example could include inventorying the types of maintenance practices that should be conducted, creating a routine schedule and assigning personnel to complete the work.	Nice to Have
Annual Costs	Year-to-year costs once the initial program has been developed.	Nice to Have

Structural BMP Information (complete for all structural BMPs)

A structural BMP includes constructed facilities or measures to help protect receiving water quality and control stormwater quantity. Representative practices include storage, vegetation, infiltration and filtration.

Data Element	Description	Priority Level
What date was the BMP facility put into service?	Enter month, day and 4-digit year (e.g., 04/05/1998). If the exact day is unknown, use the first day of the month.	Required
How many separate inflow points does the facility have?	For example, a wet pond may receive flow from two (2) storm sewers and one (1) natural drainage, for a total of three (3) separate inflow points.	Required
Is the BMP designed to bypass or overflow when full?	Select "Bypass" or "Overflow" from the drop-down menu.	Required
Describe the type and frequency of maintenance, if any	For example, provide the number of times per year that the following or other site-specific practices were conducted: Tree/Shrub/Invasive Vegetation Control, Mowing, Algae Reduction, Sediment Removal/Dredging, Litter/Debris Control, Erosion Control/Bank Stability, Inlet Cleaning, Outlet Cleaning, Media Replacement/Regeneration, Pump Cleaning/Repair, Valve Cleaning/Repair, Pipe Cleaning/Repair, General Maintenance, Odor Control, Mosquito Control, Vector Control.	Essential, But Not Required
What was the last date that the facility was rehabilitated, if any?	Enter month, day and 4-digit year (e.g., 04/05/1998) of rehabilitation. If the exact day is unknown, use the first day of the month. Rehabilitation activities are more extensive than routine maintenance practices. While the goal of maintenance practices are to ensure proper functioning and efficiency of a BMP, rehabilitation is required when a BMP no longer functions properly, in some cases due to lack of routine maintenance. Examples include: replacing an outlet structure that has been washed out in a large storm; making repairs needed to put a BMP back on-line that has been out of use for an extended time period due to neglect, lack of funding, etc.; or modifying an existing water quantity control BMP to provide water quality functions.	Essential, But Not Required
Describe the type of rehabilitation, if any	See the description of rehabilitation activities in the previous field.	Essential, But Not Required
Describe the type and design of each BMP outlet	For example, perforated riser, pipe or plate with a horizontal orifice overflow, three vertical orifices that control quarter quality volume, 2-year and 10-year volumes, etc.	Essential, But Not Required
BMP Drawing	In order for others to develop a clear understanding of the BMP, drawings of the BMP in plan, profile and layout view are requested. These drawings must be "saved down" to a single file in bitmap (*.BMP) format.	Required

Monitoring Stations

The monitoring station form must be completed for both structural and non-structural BMPs. This form is the basis for all subsequent data entry and is crucial to allow proper data retrieval. In the matrix provided on the form, the user should identify each monitoring station in the watershed with a unique code and provide its location relative to BMPs at the test site. Monitoring stations providing overall site data such as precipitation should be identified with a Station I.D., selecting "Not Applicable" for the "Relationship to BMP" fields and leaving the BMP fields blank.

Data Element	Description	Priority Level
Station	Station is the user-assigned name for the subject monitoring station. There is no limit on the number of monitoring stations at a test site. Stations shared by two BMPs should only be entered once. For example, if a station monitors outflow from one BMP and inflow to another BMP, then the monitoring station should be identified only once.	Required
Identify Upstream BMP	Identify Upstream BMP by selecting a previously identified BMP from the drop-down list. If the station measures inflow to the most upstream BMP, then this field should be left blank.	Required
Identify Relationship to Upstream BMP	Identify Relationship to Upstream BMP by selecting inflow, outflow, bypass, intermediate or not applicable from the drop-down box. An intermediate location would be a sample taken from the middle of a pond.	Required
Identify Downstream BMP	Identify Downstream BMP by selecting a previously identified BMP from the drop-down list. This is the BMP downstream of the monitoring station. This field should be left blank if no downstream BMP exists.	Required
Identify Relationship to Downstream BMP	Identify Relationship to Downstream BMP by selecting inflow, outflow, bypass, intermediate or not applicable from the drop-down box. An example of an intermediate location would be a sample taken from the middle of a pond.	Required

Site Monitoring Instrumentation

The database requests information on the instruments present at the monitoring stations in the watershed. More than one instrument may be present in a monitoring station. For example, a monitoring station may contain a flow gauge and a water quality sampler.

Data Element	Description	Priority Level
Select monitoring station where instrument is located	A monitoring station that contains the instrument must be selected or defined before entering data on specific instruments.	Required
What date was the instrument installed?	Provide the date (month, day and 4-digit year) the instrument was installed (e.g., 6/1/1998).	Essential, But Not Required
What type of instrument is in place?	Select the instrument type from the list in the drop-down box, including Bubble Gauge, Digital Recorder, Graphic Recorder, Land Line Telemetered, Radio Telemetered, Satellite Relayed, ADHAS, Crest Stage Indicator, Tide Gauge, Deflection Meter, Stilling Well, CR Type Recorder, Weighing Rain Gauge, Tipping Bucket Rain Gauge, Acoustic Velocity Meter, or Electromagnetic Flow Meter, Pressure Transducer, Unknown or Other.	Essential, But Not Required
What type of monitoring is conducted?	Select the type of data collected by the instrument based on U.S. Geological Survey (USGS) code. Data types may include: Tide, Water Flow/Stage Continuous, Water Flow/Stage Intermittent, Water Quality Continuous, Water Quality Grab, Precipitation Continuous, Precipitation Intermittent, Evaporation Continuous, Evaporation Intermittent, Wind Velocity Continuous, Wind Velocity Intermittent, Tide Stage Continuous, Tide Stage Intermittent, Water Quality Probe Continuous, Water Quality Probe Intermittent, Unknown, or Other.	Essential, But Not Required
What type of control structure is in place, if any?	A control structure is a feature associated with the measurement device that controls or regulates the flow at the measurement location. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross-section over a long reach of the channel. Examples of artificial structures include weirs and flumes.	Essential, But Not Required
Additional Comments	May be necessary to explain special features associated with the instrument or other information deemed important to the user.	Nice to Have

Site Monitoring Costs

Data Element	Description	Priority Level
Monitoring Year	Year during which monitoring was conducted. If monitoring has been conducted over a five-year period, then enter costs for each of the five years. This may be done by simply dividing the total monitoring costs by the number of years.	Nice to Have
Comments	May be needed to clarify unusual monitoring costs or other details as deemed appropriate by the user.	Nice to Have
Fixed Monitoring Station Costs	Those costs associated with fixed monitoring instrumentation installed for long term use. For example, a shed may be constructed to house the instrumentation. Year of cost basis, equipment, maintenance, sampling and laboratory costs are requested for fixed monitoring stations.	
Temporary Monitoring Station Costs	Costs associated with temporary monitoring instruments not intended for long-term use. Year of cost basis, equipment, sampling and laboratory costs are requested for temporary monitoring stations.	
Year of Cost Basis	Year that the monitoring activities were conducted or equipment purchased. For example, if the instrument was purchased in 1995 for \$500, then 1995 is the year of cost basis.	Nice to Have
Equipment Costs	Costs of sampling and flow gauging equipment (rental or purchase) and installation in U.S. currency.	Nice to Have
Maintenance Costs	Annual maintenance costs for equipment in U.S. currency.	Nice to Have
Sampling Costs	Annual costs of sampling in U.S. currency.	Nice to Have
Laboratory Costs	Annual costs of sample analysis by a laboratory.	Nice to Have

Precipitation Data

Enter data for each precipitation event monitored in the watershed. Individual precipitation events are separated by a period of at least six hours of no precipitation. Example: If rainfall ceases at 6:00 p.m. and begins again at 12:00 p.m., then two separate storm events have occurred. If rainfall had begun again at 10:00 p.m., then only one storm event would have occurred. In the latter case, the total rainfall would be summed.

Data Element	Description	Priority Level
Select Monitoring Station for Event	A station must be identified for each sampling event and is required information.	Required
Start Date	Calendar date (month, day and 4-digit year) that storm started (e.g., 01/01/1998).	Essential, But Not Required
Start Time	Time that the storm started, e.g., 21:00. If only storm duration is provided, enter 00:00 for start time and enter the storm duration for end time.	Essential, But Not Required
End Date	Calendar date (month, day and 4-digit year) that storm ended (e.g., 01/01/1998). Use six hours as the separation criteria to define a new storm.	Essential, But Not Required
End Time	Time that the storm ended, e.g., 13:21. Use six hours between the end of one storm and the beginning of the next storm as the separation criteria to define a new storm. If only storm duration is provided, enter 00:00 for start time and enter the storm duration for end time.	Essential, But Not Required
Total Storm Precipitation	Amount of precipitation that occurred during the storm. For example, a total of 4 inches of rain fell during a 12-hour storm.	Essential, But Not Required
Peak One Hour Precipitation Rate	The most intense one-hour of rainfall for the storm. For storms with less than one-hour duration, divide the storm rainfall depth by one hour. This parameter is intended to form a basis for linking rainfall intensity with the performance of similar BMPs nationwide.	Essential, But Not Required

Storm Runoff and Base Flow Data

Enter the following data collected for each flow monitoring event.

Data Element	Description	Priority Level
Monitoring Station	Select monitoring station where flow event was monitored from the drop-down list.	Required
Select the type of flow	Select the type of flow: base flow or storm runoff. Base flow occurs during dry weather conditions, while storm runoff includes flows generated by storm events.	Required
If storm runoff, select the related precipitation event, if available.	Select a previously entered precipitation event from the list in the drop-down box in order to link runoff and/or water quality to the storm event.	Essential, But Not Required
Flow Start Date	Date (month, day and 4-digit year) that the measurement began being taken (e.g., 01/01/1998).	Required
Flow Start Time	Time at beginning of measurement event, e.g., 23:30. If only flow duration is provided, enter 00:00 for start time and enter the flow duration for end time.	Essential, But Not Required
Flow End Date	Date (month, day and 4-digit year) that the measurement event ended (e.g., 01/01/1998). The end of runoff event can be defined as that point in time when the recession limb of the hydrograph is <2% of the peak or is within 10% of the pre-storm base flow, whichever is greater.	Essential, But Not Required
Flow End Time	Time at the end of the measurement event, e.g., 01:30. The end of runoff event can be defined as that point in time when the recession limb of the hydrograph is <2% of the peak or is within 10% of the pre-storm base flow, whichever is greater.	Essential, But Not Required
Total Storm Flow Volume into or from BMP	Total Runoff Volume minus the Bypass Volume. Do not include any bypass volume in this field.	Required
Peak Storm Flow Rate into or from BMP	Greatest rate of storm flow into or from the BMP, for example 5 cubic feet/second (cfs).	Essential, But Not Required
Total Bypass Volume, if any	Total Runoff Volume minus the Runoff Volume Influent to the BMP.	Required
Peak Bypass Flow Rate, if any	Peak rate of flow measured for flows bypassing the BMP.	Essential, But Not Required
Dry Weather Base Flow Rate	Flow rate during dry-weather conditions. Base flow is collected during non-wet weather conditions.	Required

Water Quality Sampling Event

The water quality sampling event form provides the general information for a water quality sampling event such as date, time, location, and QA/QC measures. This information is common to all parameters collected during a sampling event.

Data Element	Description	Priority Level
Select Monitoring Station Where Data Collected	Select from drop-down list.	Required
Select Related Flow Event	Select from drop-down list.	Required
Date Water Quality Sample Collected	Date that the water quality sample began being collected.	Required
Time Water Quality Sample Collected	Time that the water quality sample began being collected.	Essential, But Not Required
What medium does the instrument monitor?	Groundwater, Surface Runoff/Flow, Soil, Dry Atmospheric Fallout, Wet Atmospheric Fallout, Pond/Lake Water, Accumulated Bottom Sediment, Biological, or Other.	Required
What type of samples are collected?	Select the type of samples that the instrument collects from the list in the drop-down box, including: Flow Weighted Composite EMCs (Event Mean Concentrations), Time Weighted Composite EMCs, Unweighted (mixed) Composite EMCs, or Grab Sample.	Essential, But Not Required
Provide the Number of Samples, If Composite	A composite sample consists of multiple samples of water during a runoff-event that can be collected using a variety of methods such as flow-weighted, time-weighted, grab samples or other approaches. The purpose of a composite sample is to provide an overall picture of the characteristics of the water throughout the runoff event. The Comments field below can be used to describe the type of composite, if any.	Essential, But Not Required
Describe Quality Assurance/Quality Control Measures in Place for the Sampling Event	Describe the types of Quality Assurance/Quality Control (QA/QC) measures in place for both laboratories and field activities. Alternatively, the user may define the quality assurance objectives and state whether these were met.	Essential, But Not Required
Provide Additional Comments, If Needed	Allows the user to clarify special circumstances associated with the sampling event.	Nice to Have
Water Quality Parameter (STORET)	STORET description for the relevant constituent should be selected from the drop-down list. STORET is the U.S. Environmental Protection Agency's water quality database for streams and other waterbodies throughout the United States. Each constituent in the STORET database has a numeric code assigned to it along with a description of the constituent. The STORET code, constituent description and constituent group are provided in the drop-down list. Because STORET contains over 1,000 constituents, the most common 50-60 constituents monitored for in stormwater have been sorted to the top of the list in order of constituent group then by constituent name. A hard copy of the most commonly monitored STORET constituents is also provided in the User's Manual that accompanies this database. STORET codes must be used to enter water quality data in this database to ensure consistency with other EPA databases and for consistent data retrieval.	Required

Value	Value of the measured constituent should be provided. If the value is below detection limits, provide the reported detection limit with a "U" qualifier in the qualifier field and place a minus sign in front of the value.	Required
Unit	Unit of the measured constituent should be provided. If water quality data are being entered into the database, then this is required information. Even though STORET has units automatically built in to the STORET parameter code, the user should still enter units separately.	Required
Qualifier	Qualifier, if any, for the data should be selected from the drop-down list. If water quality data are being entered into the database and a qualifier is warranted to accurately describe the data, then this is required information. Observations in STORET are stored as numerical values usually representing the result of a laboratory or field analysis to quantify the concentration of a chemical in a water sample. In some cases, the numerical value stored represents something other than a normal outcome, and a "Remark Code," or Qualifier, is associated with the value as it is entered. Qualifier codes which are permitted and provided in a drop-down list.	Required
Analysis Method	Analysis Method should be provided for the constituent. For example EPA 8270 or Standard Method 513.	Essential, But Not Required

Detention Basin Design Data

Extended detention (ED) dry basins are designed to completely empty at some time after stormwater runoff ends. These are adaptations of the detention basins used for flood control. The primary difference is in outlet design; the extended detention basin uses a much smaller outlet that extends the retention time for more frequent events so that pollutant removal is facilitated. The term “dry” implies that there is no significant permanent water pool between storm runoff events.

Data Element	Description	Priority Level
Water Quality Detention Volume	The volume of storm runoff that is captured and slowly drained over a period of time (e.g., 12 to 48 hours) to promote settling and other pollutant removal mechanisms.	Required
Water Quality Detention Surface Area When Full	The area of the water surface in the detention basin at full water quality detention volume.	Required
Water Quality Detention Basin Length	Length of the water quality detention basin, measured as the distance between inflow and outflow. If there is more than one inflow point, use the average distance between the inflow points and the outflow weighted by the tributary impervious area.	Required
Detention Basin Bottom Area	Area of the bottom of the entire detention basin, not including the side slopes but including the bottom stage area.	Required
Brim-full Volume Emptying Time	Emptying time (in hours) of the water quality detention volume.	Required
Half Brim-full Volume Emptying Time	Emptying time (in hours) of the lower half of the water quality detention volume.	Required
Bottom Stage Volume, If Any	The volume of the lower “bottom stage” portion (if applicable) of the detention basin, which is designed to fill with runoff from smaller, more frequent storm events.	Required
Bottom Stage Surface Area, If Any	The surface area of the lower “bottom stage” portion (if applicable) of the detention basin, which is designed to fill with runoff from smaller, more frequent storm events.	Required
Is There a Micro Pool?	Enter Y=Yes or N=No. Identify whether there is a small (i.e., micro) permanent pool within the bottom stage of the basin near the outlet.	Required
Forebay Volume	Volume of the forebay portion of the detention basin when filled to the point of overflow into the rest of the basin. The forebay (if it exists) captures the initial inflow entering the detention basin to remove the bulk of sediments, routing its overflow to the bottom stage.	Required
Forebay Surface Area	Surface area of water in the forebay at the level of overflow to the bottom stage.	Required
Describe Vegetation Cover Within Basin	Describe the types of vegetation on the basin sides and floor.	Required
Flood Control Volume, If Any	It is often feasible and desirable to establish the water quality detention basin within a larger flood control facility. If this is the case for this basin, record the volume of the flood control detention volume in excess of the water quality detention basin volume (if any).	Required

List Design Flood Return Periods	If the water quality detention basin is embedded within a larger flood control facility, list the flood return period (in years) for which the above flood control volume is designed (e.g., 25-year).	Required
Depth to Seasonal High Water Table, If Known	Report the minimum depth to the water table during the monitoring season.	Nice to Have
Detention Basin Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	Nice to Have
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Structural Control Devices	The estimated cost of establishing all structural control devices, such as inlet and outlet structures, trash racks and energy dissipators, including cost of materials and construction.	Nice to Have
Vegetation and Landscaping Costs	The estimated cost of establishing vegetation for the BMP, including acquiring landscape materials, establishing vegetation, and establishing the irrigation infrastructure, if any.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove sediment accumulated in the detention basin at a frequency that ensures the continued function of the basin.	Nice to Have
Average Annual Revegetation Costs	Estimated average annual cost to revegetate the sides and floor of the detention basin at a frequency that ensures the continued function of the basin.	Nice to Have

Grass Filter Strip Design Data

Grass filter strips, sometimes called biofilters or buffer strips, are vegetated areas designed to accept sheet flow provided by flow spreaders which accept flow from an upstream development. Vegetation may take the form of grasses, meadows, forests, etc. The primary mechanisms for pollutant removal are filtration, infiltration, and settling.

Data Element	Description	Priority Level
Grass Strip Length	Length of the grass strip in the direction of the flow path.	Required
Grass Strip Slope	The slope of the strip along the flow path expressed as unit length per unit length (e.g., feet/feet).	Required
Flow Depth during 2-Year Storm	The design depth of flow over the strip during the 2-year storm peak flow.	Required
2-Year Peak Flow Velocity	The design flow velocity over the strip during the 2-year peak flow.	Required
Describe Grass Species and Densities	Describe Grass Species and Densities. List the grass species and their densities.	Required
Is Strip Irrigated?	Enter Y=Yes if the strip is artificially watered during any part of the year, N=No if it is not.	Required
Estimated Manning's n During 2-Year Flow	The Manning's roughness factor n expresses the degree of resistance to flow over the surface due to filter strip vegetation; here n should be estimated for the 2-year peak runoff event. The Manning's factor is larger for rougher surfaces (e.g., high, dense vegetation) that increase flow friction.	Nice to Have
Depth to Groundwater or Impermeable Layer	Depth to the seasonal high groundwater table and/or the impermeable layer, whichever is shallower.	Nice to Have
Measured Saturated Infiltration Rate, if Known	Rate of infiltration into the filter strip under saturated soil conditions, based on soil surveys or infiltrometer measurements.	Nice to Have
NRCS Hydrologic Soil Group	The Natural Resource Conservation Service Hydrologic Soil Group (e.g., A, B, C, or D) comprising the infiltrating surface. This classification reflects the infiltration rate of the soil, with Group A soils having the highest rates of infiltration and Group D soils having the lowest.	Essential, But Not Required
Grass Filter Strip Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	Nice to Have
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all BMP control devices, such as slotted curbing or other flow spreading devices, and outflow collection and conveyance systems. Include costs of materials and construction.	Nice to Have
Vegetation and Landscaping Costs	The estimated cost of establishing vegetation for the BMP, including acquiring landscape materials, establishing vegetation, and establishing the irrigation infrastructure, if any.	Nice to Have

Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove sediment accumulated on the grass filter strip at a frequency that ensures the continued function of the filter.	Nice to Have
Average Annual Revegetation Costs	Estimated average annual cost to revegetate and/or reseed the grass filter strip at a frequency that ensures the continued function of the basin.	Nice to Have

Infiltration Basin Design Data

An infiltration basin is a basin that can capture a given stormwater runoff volume and infiltrate it into the ground, transferring this volume from surface flow to groundwater flow. A schematic of an infiltration basin is provided below.

Data Element	Description	Priority Level
Capture Volume of Basin	The design runoff capture volume of the basin.	Required
Surface Area of Capture Volume, When Full	The area of the water surface in the infiltration basin, when full.	Required
Infiltrating Surface Area	The plan area of the surface used to infiltrate the water quality volume.	Required
Basin Length	Length of the infiltration basin, measured as the distance between inflow and outflow.	Nice to Have
Depth to Seasonal High Groundwater Below Infiltrating Surface	Depth to the seasonal high groundwater table.	Required
Depth to Impermeable Layer Below Infiltrating Surface	Depth to the impermeable layer, if any.	Required
NRCS Hydrologic Soil Group	The Natural Resource Conservation Service Hydrologic Soil Group (e.g., A, B, C, or D) comprising the infiltrating surface. This classification reflects the infiltration rate of the soil, with Group A soils having the highest rates of infiltration and Group D soils having the lowest.	Essential, But Not Required
Depth and Type of Each Layer of Soil	Give the order of stratification (from the surface downward) and the depth of each layer of soils at the infiltration basin site, to a depth of at least ten feet (3.05 meters).	Essential, But Not Required
Field Measured Infiltration Rate	The saturated soil infiltration rate, based on soil surveys, infiltrometer measurements or observed draw down of a new basin.	Essential, But Not Required
List Plant Species on Infiltrating Surface	List the plant species (by Latin names, if known) and densities of cover on the bottom of the infiltration basin.	Required
Describe Granular Material on Infiltrating Surface, If Any	Describe the granular material, if any, and its depth and porosity, if such material is used to cover basin's bottom instead of grass.	Required
Hydraulic Conductivity of Underlying Soils	The hydraulic conductivity of the soils underlying the infiltration surface. Hydraulic conductivity is an expression of the permeability of a porous material.	Essential, But Not Required
Groundwater Flow Gradient	The flow gradient (in unit length per unit length, e.g. feet/feet) of groundwater below the infiltration basin. The flow gradient may be thought of as the slope of the local ground water table.	Essential, But Not Required
Flood Control Volume Above Water Quality Detention Volume	It is often feasible and desirable to establish the infiltration basin within a larger flood control facility. If this is the case for this basin, record the volume of the flood control detention volume above the infiltration basin volume.	Essential, But Not Required
List All Design Flood Control Return Periods	List the flood return periods being controlled by the flood control volume, if the infiltration basin is incorporated within a larger flood control facility.	Essential, But Not Required

Describe Purpose of Basin	Describe the purpose of the infiltration basin (e.g., surface water quality only, groundwater recharge, etc.).	Nice to Have
Infiltration Basin Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	Nice to Have
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	
Structural Materials Costs	The estimated cost of materials used in constructing the infiltration basin, excluding vegetative cover.	Nice to Have
Basin Construction Costs	The estimated cost for construction of the infiltration basin, including site survey and construction activities.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all BMP control devices, such as inlet devices, trash racks, energy dissipators, and outlet structures. Include costs of materials and construction.	Nice to Have
Vegetation and Landscaping Costs	The estimated cost of establishing vegetation for the infiltration basin, including acquiring landscape materials, establishing vegetation, and establishing the irrigation infrastructure, if any.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative/Maintenance Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove sediment accumulated in the infiltration basin at a frequency that ensures the continued function of the BMP.	Nice to Have
Average Annual Revegetation Costs	Estimated average annual cost to revegetate the infiltration basin at a frequency that ensures the continued function of the BMP.	Nice to Have

Media Filter Design Data

A Media Filter is a facility that uses some form of a granular or membrane filter, with or without a pre-settling basin, to remove a fraction of the constituents found in stormwater. The most typical filter is sand, but other materials, including peat mixed with sand, compost with sand, geotextiles, and absorption pads and beds are commonly used.

Data Element	Description	Priority Level
Permanent Pool Volume Upstream of Filter Media, If Any	Volume of the permanent pool (if any) if the pool is part of the filter basin installation and not a separate pretreatment retention pond or a detention basin.	Required
Permanent Pool Surface Area of Sedimentation Basin Preceding Filter, If Any	Area of the water surface in the permanent pool (if any).	Required
Permanent Pool Length of Sedimentation Basin Preceding Filter, If Any	Length of the permanent pool (if any) measured as the distance from pool inflow to outflow. If more than one inflow point, use the average length.	Required
Surcharge Detention Volume, Including Volume Above Filter Bed	The design water quality capture volume, including the volume above the filter.	Required
Surcharge Detention Volume Surface Area	The surface area of the design water quality captured runoff including the area above the filter.	Required
Surcharge Detention Volume Length	The length of the design captured runoff volume, including the portion above the filter, measured as the distance along the flow path. If more than one inflow point, use the average length.	Nice to Have
Surcharge Detention Volume's Design Drain Time, If Controlled and Known	The design time for complete drawdown (in hours) of the water quality capture volume if the drain time is controlled by a flow regulating device such as an orifice. Leave blank if the drain rate is only a fraction of the filter's flow-through rate.	Required
Surcharge Detention Volume Design Depth	The design depth of water quality capture volume that can be stored above the filter before overflow or runoff bypass occurs.	Required
Media Filter Surface Area	Surface area of the media filter (e.g., the sand bed or geotextile filter) as a whole orthogonal to the flow.	Required
Angle of Sloping or Vertical Filter	Provide this information in degrees above the horizontal plane (i.e., 0 to 90 degrees). For example, a horizontal filter media would be entered as 0 degrees and a vertical filter would be entered as 90 degrees.	Required
Number of Media Layers in Filter	The number of layers of different filter materials in this BMP.	Required
Describe Depth and Type of Each Filter Media Layer	Describe the type of media used in the filter. (Examples: ASTM C-33 Sand with $d_{50}=0.7$ mm, 50% ASTM C-33 Sand with $d_{50}=0.6$ mm and 50% Peat, Non-Woven Geotextile Fabric with 100 micron effective pore openings, Non-Woven Geotextile with 100 micron effective pore openings above the ASTM C-33 sand with $d_{50}=0.7$ mm, etc.)	Required
Media Filter Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were	Nice to Have

	made.	
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Basin Construction Costs	The estimated cost for construction of the media filter, including site survey and construction activities.	Nice to Have
Filter Construction Costs	The estimated cost of establishing the filter system itself, including filter material and the underdrain system. Include costs of materials and construction.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all BMP control devices, such as inlet devices, trash racks, energy dissipators, and outlet structures. Include costs of materials and construction.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative/ Maintenance Costs:		
Average Annual Sediment Removal and Media Replacement Costs	Estimated average annual cost to remove sediment accumulated in the media filter and replace the filter material at a frequency that ensures the continued function of the BMP.	Nice to Have

Porous Pavement Design Data

There are two forms of porous pavement: modular block, which is made porous through its structure, and poured-in-place concrete or asphalt which is porous due to the mix of the materials. Modular block porous pavement consists of perforated concrete slab units underlain with gravel. The surface perforations are filled with coarse sand or sandy turf. It is used in low traffic areas to accommodate vehicles while facilitating stormwater runoff at the source. It should be placed in a concrete grid that restricts horizontal movement of infiltrated water through the underlying gravels. Poured-in-place porous concrete or asphalt is generally placed over a substantial layer of granular base. The pavement is similar to conventional materials, except for the elimination of sand and fines from the mix. If infiltration to ground water is not desired, a liner may be used below the porous media along with a perforated pipe and a flow regulator to slowly drain the water stored in the media over a 6 to 12 hour period.

Data Element	Description	Priority Level
Porous Pavement Surface Area	Surface area of the porous pavement.	Required
Depth to Seasonal High Groundwater	The minimum depth to the seasonal water table below the porous pavement.	Required
Depth to Impermeable Layer	The depth to the first impermeable layer below the BMP, if known.	Required
NRCS Hydrologic Soil Group	The Natural Resource Conservation Service Hydrologic Soil Group (e.g., A, B, C, or D) comprising the infiltrating surface. This classification reflects the infiltration rate of the soil, with Group A soils having the highest rates of infiltration and Group D soils having the lowest.	Essential, But Not Required
Infiltration Rate	Rate of infiltration for site soils under saturated conditions, based on soil surveys or infiltrometer measurements.	Required
Type of Granular or Other Materials Used in or Below Pavement	Describe the type and depth of each granular material layer under the porous pavement, if any. Include each layer of geotextile fabric used as though it was a granular layer.	Required
Porosity of Granular Materials, as a Percent	Porosity measures the volumetric portion of the filter material that is not occupied by solid material (for example, clean sands and gravels typically have porosities of 25-50%; this space is occupied by air or water). If the layer is geotextile fabric, give the effective pore size.	Required
Is Grass Growing in Modular Pores?	Enter Y=Yes or N=No.	Essential, But Not Required
If Yes, is Grass Healthy?	Enter Y=Yes or N=No.	Essential, But Not Required
Describe Depth of Each Soil Layer Below Pavement, If Known	Give the order of stratification (from the surface downward) and the depth of each layer of soils below the porous pavement, to a depth of at least ten feet (3.05 meters).	Essential, But Not Required
Total Storage Volume Under Pavement, If Any	Give the net available volume of the pore spaces in the granular materials under the porous pavement, if any. This would normally equal the volume of the granular materials times their porosity adjusted for loss of volume due to sloping surfaces.	Required
Estimated Drain Time of Storage Volume Under Pavement, If Any	When granular materials under the pavement are used to detain surface runoff which is then released to the surface drainage system, similar to an underdrain, give the total	Required

	emptying time (in hours) for this detention volume.	
Groundwater Hydraulic Conductivity	The hydraulic conductivity of the groundwater underlying the BMP. Hydraulic conductivity is an expression of the permeability of a porous material.	Essential, But Not Required
Groundwater Flow Gradient	The flow gradient (in unit length per unit length, e.g. feet/feet). of groundwater below the infiltration basin. The flow gradient may be thought of as the slope of the local groundwater table.	Essential, But Not Required
Does Porous Pavement Have Underdrains?	The granular base under porous pavement is frequently drained with the aid of perforated pipes installed, for example, at set intervals. Enter Y=Yes if this BMP has underdrains, N=No if it does not.	Required
Describe Purpose of Porous Pavement	Describe the purpose(s) of the porous pavement (examples: water quality treatment, reduction in peak surface runoff rate and volume, groundwater recharge, etc.)	Nice to Have
Porous Pavement Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	Nice to Have
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Structural and Piping Costs	The estimated cost of establishing the structural and piping features of the BMP, including modular blocks, retaining concrete, subbase material, and inlay material. Include costs of materials and construction.	Nice to Have
Granular Fill Costs	The estimated cost of establishing the granular fill for the BMP, including sand or gravel inlay materials, filter fabric, and perforated underdrain (if any). Include costs of materials and construction.	Nice to Have
Paving Costs	If poured-in-place porous concrete or asphalt paving was used, this is the estimated cost of establishing the paving. Include costs of materials and construction.	Nice to Have
Curb and Gutter Costs	The estimated cost of establishing curbs and gutters for the BMP. Include costs of materials and construction.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative/Maintenance Costs:		
Average Annual Vegetation Replacement and Granular Media Replacement and Maintenance Costs	Estimated average annual cost to revegetate void spaces in modular block pavement. If poured-in-place porous pavement, report estimated average annual cost to wash, vacuum, pressure wash, patch, gutter clean, etc. at a frequency that ensures the continued function of the BMP.	Nice to Have

Retention Pond Design Data

Retention ponds are also commonly known as “wet ponds” because they have a permanent pool of water, unlike detention basins, which dry out between storms. The permanent pool of water is replaced in part or in total by stormwater during a storm event. The design is such that any available surcharge capture volume is released over time. The hydraulic residence time (HRT) for the permanent pool over time can provide biochemical treatment. A dry weather base flow, pond liner and/or high groundwater table are required to maintain the permanent pool.

Data Element	Description	Priority Level
Volume of permanent pool	Volume of the permanent pool of water.	Required
Permanent Pool Surface Area	Area of the water surface in the permanent pool.	Required
Permanent Pool Length	Length of the permanent pool of water, measured as the distance between inflow and outflow. If more than one inflow point, use the average distance between the inflow points and the outflow weighted by the tributary impervious area.	Required
Littoral Zone Surface Area	Surface area of the littoral zone. The littoral zone refers to the area above the level of the permanent pool that is periodically and temporarily covered by captured storm runoff.	Essential, But Not Required
Littoral Zone Plant Species List	List plant species (by Latin name, if known), percent of cover and densities in the littoral zone.	Required
Water Quality Surcharge Detention Volume When Full	Retention ponds may be designed to handle a specified volume of runoff above the permanent pool, releasing this surcharge volume to the pool over a specified period of time through an outlet structure.	Required
Water Quality Surcharge Surface Area When Full	The surface area of any supplementary water quality detention volume above the permanent pool, if applicable.	Required
Water Quality Surcharge Basin Length	Length of the water quality detention volume, measured as the distance between inflow and outflow. If more than one inflow point, use the average distance between the inflow points and the outflow weighted by the tributary impervious area.	Required
Brim-full Emptying Time For Surcharge	The period of time (in hours) required for the retention pond water quality surcharge detention volume to be released to the permanent pool.	Required
Half Brim-full Emptying Time For Surcharge	Period of time (in hours) required for the lower half of the retention pond water quality surcharge detention volume to be released to the permanent pool.	Required
Forebay Volume	Volume of the forebay portion of the retention basin when it is filled to the point of overflow into the lower part of the basin. The forebay captures the initial inflow entering the basin to remove the bulk of sediments, with overflow routed to the lower pond.	Required
Forebay Surface Area	Surface area of water in the forebay when it is filled to the point of overflow into the lower part of the basin.	Required
Describe Vegetation Cover Within Basin	Describe the types of vegetation (provide Latin names, if known) on the basin sides and floor.	Required
Flood Control Volume, If Any	It is often feasible and desirable to incorporate the water quality retention basin within a larger flood control facility. If this is the case for this basin, record the volume of the flood control detention volume in excess of the retention basin	Required

	volume.	
List Design Flood Return Periods (in years)	If the water quality retention basin is embedded within a larger flood control facility, list the flood return periods (in years) for which the above flood control volume is designed (e.g., 25 for a 25-year flood).	Required
Retention Pond Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Structural Materials Costs	The estimated cost of materials used in constructing the retention pond, excluding vegetation costs.	Nice to Have
Basin Construction Costs	The estimated cost for construction of the retention pond, including site survey and construction activities.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all retention pond control devices, such as inlet and outlet structures, spillways, and culverts. Include the cost of materials and construction.	Nice to Have
Vegetation and Landscaping Costs	The estimated cost of establishing vegetation for the BMP, including acquiring landscape materials, establishing vegetation, and establishing of the irrigation infrastructure, if any.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove sediment accumulated in the retention pond at a frequency that ensures the continued function of the pond.	Nice to Have
Average Annual Revegetation Costs	Estimated average annual cost to revegetate and/or reseed the retention pond at a frequency that ensures the continued function of the pond.	Nice to Have

Percolation Trench and Dry Well Design Data

Percolation or infiltration trenches can be generally described as a ditch filled with porous media designed to encourage rapid percolation of runoff to the groundwater. A dry well is a drilled well, often drilled through impervious layers to reach lower pervious layers, filled with porous media designed to percolate surface water to groundwater.

Data Element	Description	Priority Level
Percolation Trench/Well Surface Area	The top surface area of the percolation trench or well.	Required
Percolation Trench/Well Length	The length of the percolation trench, or the diameter of the well.	Required
Percolation Trench/Well Depth	The depth of the trench or the well that is exposed to permeable soils.	Required
Depth to Seasonal High Groundwater Below Bottom of Trench/Well	The minimum depth to the seasonal high groundwater table below the trench or well.	Required
Depth to Impermeable Layer Below Bottom of Trench/Well	The depth to the first impermeable layer below the trench or well.	Required
Depth and Type of Each Soil Layer Adjacent To and Below Trench/Well	Give the order of stratification (from the surface downward) and the depth of each layer of soils at the BMP site.	Required
Type and Gradation of Granular Materials Used in Trench/Well	Describe the type and depth of granular material used in the trench or well.	Required
Was Geotextile Used Above Granular Trench Fill?	Enter Y=Yes or N=No.	Required
Was Geotextile Used On the Sides of Granular Fill?	Enter Y=Yes or N=No.	Required
Was Geotextile Used On the Bottom of Granular Fill?	Enter Y=Yes or N=No.	Required
Give porosity (in percent) of the granular fill material	Give porosity (in percent) of the granular fill material. Porosity measures the portion of the fill material volume that is not occupied by solids (for example, clean sands and gravels typically have porosities of 25-50%; this volume is occupied by air or water). If the layer is geotextile fabric, give the effective pore size.	Required
Total Storage Pore Volume in Trench	Give the volume of the available pore space in the granular materials. This will normally equal the product of the volume of granular material and its porosity.	Required
Describe Type of Geotextile Used	Describe the types and locations of the geotextile fabrics used in the trench or well, if any. Include the effective pore opening of the fabrics.	Required
Hydraulic Conductivity of Adjacent Soils	The hydraulic conductivity of the soils adjacent to the trench or well infiltration surfaces. Hydraulic conductivity is an expression of the permeability of porous material.	Required

Groundwater Flow Gradient	The flow gradient of groundwater below the infiltration basin (expressed as unit length per unit length, e.g., feet/feet). The flow gradient may be thought of as the slope of the local groundwater table.	Required
Purpose of Trench or Well	Describe the purpose of the percolation trench or well (e.g., water quality treatment, reduction of surface runoff, groundwater recharge, etc.).	Nice to Have
Percolation Trench and Dry Well Construction Costs Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	Nice to Have
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Well Drilling	The estimated cost of establishing the well, if this is a dry well.	Nice to Have
Trench Construction Costs	The estimated cost of establishing the trenches, if this is a percolation trench.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all percolation trench or dry well control devices, such as inlet and outlet structures and culverts. Include the cost of materials and construction.	Nice to Have
Structural Materials Costs	The estimated cost of materials used in the percolation trench, such as granular fill and geotextiles.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove sediment accumulated in the retention pond at a frequency that ensures the continued function of the pond.	Nice to Have

Wetland Channel and Swale Design Data

A wetland channel is a channel designed to flow very slowly, probably less than two feet per second at the two-year flood peak flow rate. It has, or is designed to develop, dense wetland vegetation on its bottom. A swale, sometimes called a biofilter, is a shallow grass-lined channel with zero, or little, bottom width designed for shallow flow near the source of storm runoff.

Data Element	Description	Priority Level
Average Longitudinal Inflow Spacing	The average longitudinal spacing between all separate stormwater inflow points.	Essential, But Not Required
Length of Channel/Swale	The length of the wetland channel or swale, from the stormwater inflow to outflow point.	Required
Longitudinal Slope of Channel/Swale	The average longitudinal slope (in unit length per unit drop, e.g., feet per foot or meter per meter) of the wetland channel or swale, as measured between grade control structures.	Required
Bottom Width of Channel/Swale	The average width of the nearly flat bottom of the channel or swale between its side slopes.	Required
Side Slope of Channel/Swale	The average (in vertical unit length per horizontal unit length) of the channel or swale's side slopes.	Required
2-Yr Flow Design Depth in Channel/Swale	The average depth of water in the channel or swale during the two-year flood peak flow.	Required
2-Yr Peak Design Flow Velocity	The flow velocity in the channel or swale during the two-year flood peak flow.	Required
2-Yr Manning's n	The Manning's roughness factor n expresses the resistance to surface flow due to roughness such as vegetation; here n should be measured or estimated for the 2-year peak flow. The Manning's factor is larger for rougher surfaces (e.g., high, dense vegetation) that increase flow friction.	Essential, But Not Required
Type of Plant Species in Wetland Zone or Swale	List the plant species, percent of cover and densities.	Required
Maximum Design Flow Capacity Return Period of Swale	The flood return period that the channel has been designed to convey within its banks in addition to the water quality design event. (Example: 2-year and 10-year flood).	Nice to Have
Depth to High Groundwater or Impermeable Layer	The minimum depth to the water table during the high water table season, or to the first impermeable layer.	Nice to Have
Groundwater Hydraulic Conductivity	The hydraulic conductivity of the groundwater below the channel or swale. Hydraulic conductivity is an expression of the permeability of porous material.	Nice to Have
Wetland Channel and Swale Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	Nice to Have
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all wetland channel or swale control devices, such as inlet and outlet devices, trash racks, etc. Include the cost of materials and construction.	Nice to Have

Vegetation and Landscaping Costs	The estimated cost of establishing vegetation for the BMP, including acquiring landscape materials, establishing vegetation, and establishing the irrigation infrastructure, if any.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove sediment accumulated in the wetland basin at a frequency that ensures the continued function of the basin.	Nice to Have
Average Annual Revegetation Costs	Estimated average annual cost to revegetate the sides and floor of the wetland basin at a frequency that ensures the continued function of the basin.	Nice to Have

Wetland Basin Design Data

A wetland basin is a BMP similar to a retention pond (with a permanent pool of water) with more than 50% of its surface covered by emergent wetland vegetation, or similar to a detention basin (no significant permanent pool of water) with most of its bottom covered with wetland vegetation.

Data Element	Description	Priority Level
Volume of permanent pool	Volume of the permanent pool of water, if any.	Required
Permanent Pool Surface Area	Area of the water surface in the permanent pool, if any.	Required
Permanent Pool Length	Length of the permanent pool of water, if any, measured as the distance between inflow and outflow. If more than one inflow point, use the average distance between the inflow points and the outflow weighted by the tributary impervious area.	Required
Water Quality Surcharge Detention Volume When Full	Wetland basins may be designed to handle a specified volume of runoff above the permanent pool, releasing this surcharge volume to the pool over a specified period of time through an outlet structure. Specify the surcharge detention volume.	Required
Water Quality Surcharge Surface Area When Full	The surface area of any supplementary water quality detention volume above the permanent pool, if applicable.	Required
Water Quality Surcharge Basin Length	Length of the water quality detention volume, measured as the distance between inflow and outflow. If more than one inflow point, use the average distance between the inflow points and the outflow weighted by the tributary impervious area.	Required
Brim-full Emptying Time For Surcharge	The period of time (in hours) required for the wetland basins water quality surcharge detention volume to be released to the permanent pool.	Required
Half Brim-full Emptying Time For Surcharge	Period of time (in hours) required for the lower half of the water quality surcharge detention volume to be released to the permanent pool.	Required
Forebay Volume	Volume of the forebay portion of the wetland basin when it is filled to the point of overflow into the rest of the basin. The forebay captures the initial inflow entering the basin to remove the bulk of sediments.	Required
Forebay Surface Area	Surface area of water in the forebay when it is filled to the point of overflow into the rest of the basin.	Required
Describe Vegetation Cover Within Basin	Describe the types of vegetation on the basin sides and floor.	Required
Flood Control Volume, If Any	It is often feasible and desirable to incorporate the wetland basin within a larger flood control facility. If this is the case for this basin, record the volume of the flood control detention volume above the wetland basin volume.	Required
Design Flood Return Periods	If the wetland basin is embedded within a larger flood control facility, list the flood return periods (in years) for which the above flood control volume is designed (e.g., 25 for a 25-year flood).	Required
Wetland Surface Area	Surface area of the wetland basin, including all pond areas and meadow wetland areas. Use permanent pool surface area if no other wetland area exists adjacent to the pool.	Required
Percent of Wetland Pond with 12 inches (0.3 m)	Percent of the wetland basin's surface area typically having 12 inches (0.3 m) or less water depth.	Required

Depth		
Percent of Wetland Pond with 12 - 24" (0.3 – 0.6 m) Depth	Percent of the wetland basin's surface area typically having 12 to 24 inches (0.3 - 0.6 m) water depth.	Required
Percent of Wetland Pond with 24 - 48" (0.6 – 1.3 m) Depth	Percent of the wetland basin's surface area typically having 24 to 48 inches (0.6 - 1.3 m) water depth.	Required
Percent of Wetland Pond with > 48" (> 1.3 m) Depth	Percent of the wetland basin's surface area typically having greater than 48 inches (> 1.3 m) water depth.	Required
Percent of wetland basin's area that is meadow wetland	Percent of the wetland basin that is meadow area, that is, area without standing water.	Required
List All Known Plant Species in the Wetland	Provide type and percent cover of the wetland basin by each wetland species, and densities.	Required
Wetland Basin Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring.	Nice to Have
Structural Materials Costs	The estimated cost of materials used in the wetland basin, such as imported topsoil or fill.	Nice to Have
Basin Construction Costs	The estimated cost of establishing the wetland basin itself, not including vegetation costs.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all wetland basin control devices, such as inlet and outlet devices, trash racks, etc. Include the cost of materials and construction.	Nice to Have
Vegetation and Landscaping Costs	The estimated cost of establishing vegetation for the BMP, including acquiring landscape materials, establishing vegetation, and establishing the irrigation infrastructure, if any.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove sediment accumulated in the wetland channel/swale at a frequency that ensures the continued function of the basin.	Nice to Have
Average Annual Revegetation Costs	Estimated average annual cost to revegetate the sides and floor of the wetland channel/swale at a frequency that ensures the continued function of the basin.	Nice to Have

Hydrodynamic Devices

The hydrodynamic device BMP category includes BMPs such as oil-water separators, sand interceptors, swirl-type concentrators, sedimentation vaults, and other prefabricated and package-type treatment devices.

Data Element	Description	Priority Level
Volume of Permanent Pool	Volume of the permanent pool (dead pool) of water.	Required
Permanent Pool Surface Area	Area of the water surface in the permanent pool (dead pool).	Required
Permanent Pool Length	Length of the permanent pool of water, measured as the distance between inlet and outlet. If more than one inlet location, use the average distance between the inlet location and the outlet location.	Required
Water Quality Surchage Detention Volume When Full	Hydrodynamic devices may be designed to handle a specified volume of runoff above the permanent pool, releasing this surcharge volume from the outlet over a specified period of time through an outlet control structure. Specify the surcharge detention volume (device active storage volume).	Required
Inlet Chamber Volume, If Any	Volume of the inlet chamber portion of the hydrodynamic device when it is filled to the point of overflow into the lower (next) part of the device. The inlet chamber captures the initial inflow entering the device to remove trash, rocks and heavy sediments, with overflow routed to the lower or next permanent pool.	Required
Brim-full Emptying Time For Surchage	The period of time (in hours) required for the hydrodynamic device water quality surcharge detention volume to be released from the outlet discharge.	Required
Half Brim-full Emptying Time For Surchage	Period of time (in hours) required for the lower half of the hydrodynamic device water quality surcharge detention volume to be discharged from the outlet.	Required
Comments.	This field can be used for comments and other miscellaneous information such as model type and related manufacturer's specifications for design.	Nice to Have
Hydrodynamic Device Construction Cost Estimates		
Year of Cost Estimate	Four-digit year (e.g., 1998) for which the above estimates were made.	Nice to Have
Construction Costs:		
Excavation Costs	The estimated cost of all excavation-related activities, including stripping, drilling and blasting, trenching and shoring, and backfilling.	Nice to Have
Structural Materials Costs	The estimated cost of materials such as gravel, pavement and vegetation necessary for the installation of the hydrodynamic device. These costs should include installation costs but exclude the cost of the device itself.	Nice to Have

Device Construction Costs	The estimated cost for supply, construction, and installation of the hydrodynamic device, including site survey and construction activities.	Nice to Have
Structural Control Devices Costs	The estimated cost of establishing all hydrodynamic device control devices, such as inlet and outlet structures (manholes), spillways, pipelines and culverts. Include the cost of materials and construction.	Nice to Have
Engineering and Overhead Costs	The estimated engineering and associated overhead costs, including site, structural, and landscape design and engineering expenses.	Nice to Have
Land Costs or Values	The estimated value of the land dedicated to this BMP or the cost of acquiring this land.	Nice to Have
Rehabilitative Costs:		
Average Annual Sediment Removal Costs	Estimated average annual cost to remove oils, sediments, and trash accumulated in the hydrodynamic device at a frequency that ensures the continued function of the device.	Nice to Have