PWD GSI Design Report Definitions
December 2022

Some fields are not required or are made inactive based on the system function or the SMP type. Users can reference the *GreenIT Data Entry Application User Guide* for a complete list of business rules.

Field Name	Units	Definition	Additional Information
INFILTRATION TEST DATA METRICS			
Boring Depth	feet	Depth of deepest test at system location. If a deep boring test is conducted, this should be the depth of the deep boring.	
Depth to Bedrock	feet	The depth to the bedrock measured from the surface. If no bedrock was detected during the deep borings or infiltration testing, this should be given as not encountered.	
Depth to Groundwater	feet	The depth to the groundwater table measured from the surface.	
Infiltration Rate	inches per hour	Rate or velocity at which water enters the soil. Calculated from infiltration testing. Typically includes a reduction factor.	Infiltration test rates are averaged together using the geometric mean if there is more than one test per SMP. For systems with infiltration column SMPs, this rate is multiplied by the designed open well screen area of the infiltration columns and then divided by the total system footprint to get the effective infiltration rate in inches per hour.
Test Date	date	Date of infiltration testing.	
Test Type	category value	Type of infiltration test conducted.	Category values include: Double Ring Infiltrometer, Modified Borehole Percolation, Borehole Infiltration (Bentonite Casing), Borehole Infiltration (Direct Push Casing), Infiltration Column Permeability
SYSTEM LEVEL METRICS			
A System is a combination of SMPs that are hydraulically connected and function as a unit to manage a given drainage area. There may be multiple systems within a given project location.			
Contributing Impervious Area	square feet	Existing impervious surface, which has a direct connection to the stormwater management system.	
Contributing Pervious Area	square feet	The drainage area to the stormwater management system from additional existing pervious surfaces. This is mostly applicable for off-street work. Management of pervious areas is not counted towards greened acres.	
Disconnected Impervious Area	square feet	Impervious surfaces that drain to pervious surfaces, such as depaved areas, and that do not connect to the sewer drainage system or that are disconnected or re-routed from the combined sewer system to the separate or non-contributing sewer system.	

Field Name	Units	Definition	Additional Information
SYSTEM LEVEL METRICS (continued)			
Infiltration Depth/Head	feet	The depth of water from the bottom of the infiltration storage capacity to the top of the storage, inclusive of all storage media, (stone, soil, sand, ponding, modular storage, etc.) This does not include depth above overflow weirs, or other storage capacity limiting discharge points. (*UPDATED*)	
Infiltration Footprint	square feet	The area where infiltration will occur with a system. Excludes any part of the storage that is lined with an impermeable liner.	For drainage wells, this includes the area of the vertical sides of the gravel storage around the manhole.
Model Input Category	category value	Categorization of each system to be used in Green City Clean Waters H&H model.	Category values are: Bioinfiltration, Bioretention (lined), Bioretention (unlined), Cistern, Depaving, Drainage Wells, Green Roof, Inlet Disconnection, Permeable Pavement, Subsurface infiltration, Subsurface slow release (lined), Subsurface slow release (unlined)
Modeled Storm Size Managed	inches	The depth of runoff over the Contributing Impervious Drainage Area managed by the system via storage, infiltration, and/or slow release over the duration of a design storm. User input value developed through modeling. (*UPDATED*)	Field for reporting dynamic accounting values. Credited greened acres will then be calculated from this value, rather than static storage. (*UPDATED*)
Orifice Diameter	inches	The diameter of the orifice used to regulate the flow back to the sewer system. This is not applicable if the system is designed for infiltration.	
Overflow Type	category value	Categorization of the overflow for the GSI system. Direct discharge systems collect runoff from existing combined sewer areas and do not overflow back to the combined sewer.	Category values are: Sewer System, Direct Discharge
Primary Program	unitless	Categorization of each system based on the land type the system is located on. Category values are: • Alleys/Driveways • Campuses • Facilities • Industry & Business • Open Space • Parking • Schools • Streets • Vacant Land	PWD Planner can provide direction on classification if needed.
Ponded Storage Volume	cubic feet	The volume of runoff stored on the ponded surface below the lower of either the riser or overflow elevation, volume of water that will be stored and filtered through the soil profile	
Ponding Surface Area	square feet	The total surface area at the ponding elevation set by the riser or other drainage structure for vegetated SMPs that capture runoff at the surface.	

Field Name	Units	Definition	Additional Information
SYSTEM LEVEL METRICS (continued)			
Secondary Program	unitless	Categorization of each system based on the land type the system is located <u>adjacent</u> to. Category values are: • Alleys/Driveways • Campuses • Facilities • Industry & Business • Open Space • Parking • Schools • Streets • Vacant Land	May have multiple secondary programs for a given system. Streets should be selected as a secondary program when right-of-way runoff is managed. PWD Planner can provide direction on classification if needed.
Sewer System Type	category value	The **pre-existing** sewer system infrastructure from which runoff is diverted to be managed in the green stormwater infrastructure system.	Category values include: Combined, Non-Contributing, Separate, Storm Water Only
Slow Release Hydraulic Head	feet	The depth of water from the bottom of the orifice to the overflow weir or discharge point, inclusive of all potential storage media, (stone, soil, sand, ponding, modular storage, etc.) This does not include depths of water below the orifice for either infiltration or pipe bedding. (*UPDATED*)	
Soil Storage Volume	cubic feet	The volume of runoff stored in the voids of stormwater soil in surface systems for runoff that has filtered through the soil profile. Equal to the total soil volume multiplied by the void ratio of soil.	
Subsurface DCIA	square feet	Existing impervious surface, which has a direct connection to the sub-surface of the stormwater management system. Runoff will <u>not</u> be filtered through the soil profile.	
Surface DCIA	square feet	Existing impervious surface, which has a direct connection to the surface of the stormwater management system. Runoff will be filtered through the soil profile.	
Storage Footprint	square feet	The area occupied by the physical storage volume of the system.	
System Name, System Number	text	Unique identifier for system. Composed of the project ID and system ID. System Number and System Name should be the same.	
Storage Volume	cubic feet	The volume of runoff storage created by the system. Includes the volume of void space in all potential storage media (stone, soil, sand, ponding, modular storage, etc). Includes the volume below the orifice for infiltration and for unlined detention/slow-release systems. (*UPDATED*)	
Storage Volume below the Orifice or Center of Underdrain	cubic feet	The storage volume below the elevation of the orifice for slow release systems open to infiltration. For fully lined slow release systems, this should equal zero. For partially lined systems, this should be calculated as the total storage volume along the full system footprint, regardless of liner extents.	
System Function	category value	The system function refers to the way stormwater is managed by the system.	Category values include: Infiltration, Detention/Slow Release, Disconnection

Field Name	Units	Definition	Additional Information
SYSTEM LEVEL METRICS (continued)			
Total System Volume	cubic feet	The total volume of the system at the overflow elevation, typically footprint times depth for cube-shaped systems. In fully lined systems, this is just the volume above the elevation of the orifice. Does not take into account the void ratio of the storage media.	
Underdrain	Yes/No	Perforated pipe placed within a system for the purpose of slow-releasing or draining stormwater back to the sewer.	Defaults to Yes
CALCULATED SYSTEM LEVEL METRICS			
Credited Green Acres	acre-inches	Expression of the volume of stormwater managed by the GSI practice up to, but not exceeding 2 inches of runoff managed. Primary metric to track GSI projects. Accounts for runoff volume managed through storage, infiltration, and/or slow release during a design storm. (*UPDATED*)	Uses the formula: *If Sewer Type is not Combined, Credited Greened Acres = 0* *If Overflow Type = Direct Discharge and System Function = Disconnection, Credited Greened Acres = Greened Acres = Disconnected Impervious Area * 2 inches * (1 acre/ 43560 sf)* *If Overflow Type = Direct Discharge, Credited Greened Acres = Greened Acres = Contributing Impervious Area * 2 inches * (1 acre/ 43560 sf)* *If System Function = Disconnection and SMP = Green Roof and Area Weighted Green Roof SMP Primary Storage Type Depth >= 0.833 ft, Credited Green Acres = Sum of Green Roof SMP Footprint (sf) * 0.833 ft *12 (in/ft) * (1 acre/ 43560 sf) * 0.2* *If System Function = Disconnection and SMP = Green Roof and Area Weighted Green Roof SMP Primary Storage Type Depth < 0.833 ft, Credited Green Acres = Sum of Green Roof SMP Footprint (sf) * Area Weighted Green Roof SMP Primary Storage Type Depth (ft) * 12 (in/ft) * (1 acre/43560) * 0.2* *If System Function = Disconnection, Credited Greened Acres = Greened Acres = (Disconnected Impervious Area (sf) + Total Pervious Area (sf) (from summed SMP data)) * 1 in * (1 acre/ 43560 sf)* (Continued on next page)

Field Name	Units	Definition	Additional Information
CALCULATED SYSTEM LEVEL METRICS (continued)			
Credited Green Acres	acre-inches	Expression of the volume of stormwater managed by the GSI practice up to, but not exceeding 2 inches of runoff managed. Primary metric to track GSI projects. Accounts for runoff volume managed through storage, infiltration, and/or slow release during a design. (*UPDATED*)	(Formulas continued from previous page) If Modeled Storm Size Managed is not null, Credited Greened Acres = Contributing Impervious Area * Modeled Storm Size Managed * (1 acre / 43560 sf) (up to 2 inches maximum credit) If storm size managed < 2 in, Credited Greened Acres = Greened Acre = Storage Volume * (12 in / 1 ft) * (1 acre / 43560 sf) If storm size managed > 2 in, Credited Greened Acres = Contributing Impervious Drainage Area (sf) * 2 in * (1 acre / 43560 sf) If Total Contributing Impervious Drainage Area is Null and SMP Type = Stormwater Tree, Credited Greened Acres = Greened Acres (acre-in) If Contributing Impervious Drainage Area = 0, Credited Greened Acres = 0
Credited Storm Size Managed	inches	The depth of runoff over the Contributing Impervious Drainage Area managed by the system up to, but not exceeding 2 inches. (*UPDATED*)	Uses the formula: If Sewer Type is not Combined, Credited Storm Size Managed = 0 If Overflow Type = Direct Discharge, Credited Storm Size Managed and Storm Size Managed = 2 inches If System Function = Disconnection and SMP Type = Green Roof and if storm size managed >= 2 in, Credited Storm Size Managed = 2 in If System Function = Disconnection or Total Contributing Impervious Drainage Area is Null (for SW Trees), Credited Storm Size Managed = 1 in If Modeled Storm Size Managed is not null, Credited Storm Size Managed = Modeled Storm Size Managed (up to 2 inches maximum credit) (Continued on next page)

Field Name	Units	Definition	Additional Information
CALCULATED SYSTEM LEVEL METRICS (continued)			
Credited Storm Size Managed	inches	The depth of runoff managed by the system up to, but not exceeding 2 inches.	(Formulas continued from previous page) *If storm size managed < 2 in, Credited Storm Size Managed = Storm Size Managed (in)* *If storm size managed >= 2 in, Credited Storm Size Managed = 2 in* *If Total Contributing Impervious Drainage Area = 0, Credited Storm Size Managed = 0*
Greened Acres (GA)	acre-inches	Expression of the volume of stormwater able to be stored by the GSI practice. Typically, a conversion of the system storage volume into acre-inches. (*UPDATED*)	Uses the formula: *If Overflow Type = Direct Discharge and System Function = Disconnection, Greened Acres = Disconnected Impervious Area * 2 inches * (1 acre/ 43560 sf)* *If Overflow Type = Direct Discharge, Greened Acres = Contributing Impervious Area * 2 inches * (1 acre/ 43560 sf)* *If System Function = Disconnection and SMP Type = Green Roof, Greened Acres = SMP Footprint (sf) * Area Weighted Green Roof SMP Primary Storage Type Depth (ft) * 12 (in/ft) * (1 acre/ 43560 sf) * 0.2* *If System Function = Disconnection, Greened Acres = (Disconnected Impervious Area (sf) + Total Pervious Area (sf) (from summed SMP data)) * 1 in * (1 acre/ 43560 sf)* *Greened Acre = Storage Volume * (12 in / 1 ft) * (1 acre / 43560 sf)*
Loading Ratio for Contributing Impervious Area	ratio	Ratio of the contributing impervious area to the infiltration footprint.	Uses the formula: *Loading Ratio for Contributing Impervious Drainage Area = Contributing Impervious Drainage Area (sf) / Infiltration Footprint (sf)*
Loading Ratio for Total Contributing Drainage Area	ratio	Ratio of the total contributing drainage area to the infiltration footprint.	Uses the formula: *Loading Ratio for Total Contributing Drainage Area = Total Contributing Drainage Area (sf) / Infiltration Footprint (sf)*

Field Name	Units	Definition	Additional Information
CALCULATED SYSTEM LEVEL METRICS (continued)			
Peak Release Rate	cubic feet per second	The maximum flow rate through the orifice when the system is full.	Uses the formula: *Q = CA √(2gh) where Q = Peak Release Rate; C = 0.62; A=Area of orifice (in) = π*(diameter/12)^2/4; G = gravity (ft/s^2) = 32; H = Slow Release Hydraulic Head (ft)*
Storm Size Managed	inches	The depth of runoff over the Contributing Impervious Drainage Area able to be stored by the system. (*UPDATED*)	Uses the formula: *If Overflow Type = Direct Discharge, Storm Size Managed = 2 inches* *If System Function = Disconnection and SMP Type = Green Roof, Storm Size Managed = Sum of SMP Footprints (sf) * Area Weighted Green Roof SMP Primary Storage Type Depth (ft) * 0.2 / Disconnected Impervious Area (sf) * 12 in / 1 ft* *If System Function = Disconnection or Total Contributing Impervious Drainage Area is Null, Credited Storm Size Managed = 1 in* *If Total Contributing Impervious Drainage Area = 0, Storm Size Managed = 0* *Storm Size Managed = Storage Volume (cf) * (12 in / 1 ft)/ Contributing Impervious Area (sf)*
Subsurface Loading Ratio for Contributing Imp. Area	ratio	Ratio of the subsurface DCIA to the infiltration footprint.	Uses the formula: *Subsurface Loading Ratio for Contributing Imp. Area = Subsurface DCIA / Infiltration Footprint*
Surface Loading Ratio for Contributing Imp.	ratio	Ratio of the surface DCIA to the infiltration footprint.	Uses the formula: *Surface Loading Ratio for Contributing Imp. Area = Surface DCIA / Ponding Surface Area (sf)*
Total Contributing Drainage Area	square feet	The impervious and pervious drainage areas flowing into the system.	Uses the formula: *Total Contributing Drainage Area = Contributing Pervious Area (sf) + Contributing Impervious area (sf)*

Field Name	Units	Definition	Additional Information
SMP LEVEL METRICS			
SMPs, or Stormwater Management Practice, are the individual assets that compose a GSI System.			
Number of SMP Trees	count	The number of new trees planted within or immediately adjacent to the SMP.	Includes trees within vegetated areas. (*UPDATED*)
Ponding Depth	inches	The maximum depth of free surface water in surface systems, taken as the finished soil grade to the overflow or discharge point.	
Pretreatment	category value	The type of method used to screen particles and trash before entering GSI.	Category values include: Sump, Forebay, Inlet Insert, Upstream SMP, Trapped Inlet, Filter Strip, Screen, and/or Water Quality Device
Primary Storage Type	category value	The primary media in which water is stored. Multiple categories can be selected.	Category values include: Soil, Stone, Modular, Ponding, and/or Pipe
Primary Storage Type Depth	feet	The depth of the primary media in which water is stored.	
SMP Footprint	square feet	The flat, horizontal area of the SMP area that corresponds to the credited storage for that SMP	
SMP Name, SMP Number	text	Unique identifier for SMP. Composed of the project ID, system ID, and SMP ID. SMP Number and SMP Name should be the same.	
SMP Type	Category value	The type of stormwater management practice. The categories are defined based on the unique maintenance requirements. See following page for definitions of each SMP type.	Category values include: Basin, Blue Roof, Bump-out, Cistern/Rain Barrel, Depaving, Drainage Well, Green Gutter, Green Roof, Infiltration Column, Infiltration/Storage Trench, Inlet Disconnection , Pervious Paving, Planter, Rain Garden, Stormwater Tree, Swale, Tree Trench, Wetland
Total Pervious Area	square feet	The total area of the pervious surface of the SMP installed, inclusive of tree pits inside of systems, porous pavement, and depaving.	Excludes area of any hard structures such as splash pads, weirs, cleanouts, etc.
Total Vegetated Area	square feet	The total area planted with vegetation, inclusive of tree pits.	Excludes area of any hard structures such as splash pads, weirs, cleanouts, etc.
PROJECT LEVEL METRICS			
Number of Non-System Trees	count	Number of additional tree plantings not planted within or immediately adjacent to any SMPs.	

SMP Type Definitions	
SMP Type Name	**Definition/Purpose**
Basin	A basin or depression that is vegetated with mowed grass. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Blue Roof	A storage system designed into a roof surface such that the roof retains stormwater. Blue roofs are designed to reduce the rate of stormwater runoff.
Bump-out	A vegetated curb extension that intercepts gutter flow. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Depaving	When existing impervious pavement is removed and the surface is restored with grass or other types of vegetation such that the area can thereafter be considered pervious area. Depaving SMPs are classified as disconnection systems.
Drainage Well	A manhole structure designed to manage stormwater runoff by receiving stormwater from upstream collection and pretreatment systems and then discharging the stormwater into the surrounding soils through perforations in the manhole. It is designed to infiltrate stormwater.
Green Gutter	A narrow and shallow landscaped strip along a street's curb line. It is designed to manage stormwater runoff by placing the top of the planting media in the green gutter lower that the street's gutter elevation allowing stormwater runoff from both the street and sidewalk to flow directly into the green gutter. It is designed to slow and infiltrate stormwater.
Green Roof	A vegetated surface installed over a roof surface. Green roofs are effective in reducing the volume and rates of stormwater runoff.
Infiltration/Storage Trench	A subsurface structure designed to detain and release stormwater runoff and/or infiltrate where feasible.
Inlet Disconnection	Re-routing of existing inlets, or addition of new inlets, to convey runoff that would have gone to the combined sewer system to the separate, non-contributing sewer system, or receiving waterbody.
Pervious Paving	A hard permeable surface commonly composed of concrete, asphalt or pavers. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Planter	A structure filled with soil media and planted with vegetation or trees. It is designed to detain and release stormwater runoff and/or infiltrate where feasible. Planters often contain curb edging or fencing as barrier protection around the planter.
Rain Garden	A shallow vegetated area designed to detain and release stormwater runoff and/or infiltrate where feasible. Rain gardens may also be referred to as bio-infiltration basins and bio-retention basins. They are typically integrated into landscape features (e.g. median strips) and are non-mowed areas.

SMP Type Definitions	
SMP Type Name	**Definition/Purpose**
Stormwater Tree	A specialized tree pit that has stormwater runoff directed to its pit. It is designed to manage stormwater by placing the top of the planting media in the tree pit lower than the street's gutter elevation and connecting the tree pit to an inlet which directs runoff from the street into the tree pit. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Swale	A moist or marshy depression designed to convey stormwater. It can be designed to attenuate and/or infiltrate runoff where feasible.
Tree Trench	A subsurface infiltration/storage trench that is planted with trees. They are typically linear features that are constructed between the curb and the sidewalk. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Wetland	A vegetated basin designed principally for pollutant removal. It typically holds runoff for periods longer than 72 hours and may include a permanent pool. Wetlands can also detain and release stormwater runoff.

Model Input Categories Definitions	
Model Input Category	**Definition**
Bioinfiltration	Systems with vegetated surface SMPs where some or all runoff will filter through a soil profile, designed for infiltration. Typical surface SMPs include bumpouts, planters, and rain gardens.
Bioretention (lined)	Systems with vegetated surface SMPs where some or all runoff will filter through a soil profile, designed for storage and slow release but not open for infiltration due to impermeable materials lining the storage. Typical surface SMPs include bumpouts, planters, and rain gardens.
Bioretention (unlined)	Systems with vegetated surface SMPs where some or all runoff will filter through a soil profile, designed for storage and slow release and open for infiltration. Typical surface SMPs include bumpouts, planters, and rain gardens.
Blue Roof	A storage system designed into a roof surface such that the roof retains stormwater.
Cistern	A cistern temporarily detains stormwater so that it can be used for various purposes, such as irrigation, greywater reuse, cooling towers, etc. Credit is given to the volume stored in the cistern that will be used within 72 hours of a rainfall event.

Model Input Categories Definitions	
Model Input Category	**Definition**
Depaving	When existing impervious pavement is removed and the surface is restored with grass or other types of vegetation such that the area can thereafter be considered pervious area.
Drainage Well	A storage system designed into a roof surface such that the roof retains stormwater. A manhole structure designed to manage stormwater runoff by receiving stormwater from upstream collection and pretreatment systems and then infiltrating the stormwater into the surrounding soils through perforations in the manhole.
Green Roof	A vegetated surface installed over a roof surface.
Inlet Disconnection	Re-routing of existing inlets, or addition of new inlets, to convey runoff that would have gone to the combined sewer system to the separate, non-contributing sewer system, or receiving waterbody.
Permeable Pavement	Infiltration systems where all runoff enters the storage media by filtering through a permeable pavement surface. (If there is slow release, then system should be tracked as subsurface slow release. Similarly, if there are inlets that direct runoff directly to the subsurface, then system should be tracked as subsurface infiltration or slow release, respectively.)
Subsurface infiltration	Subsurface systems designed for infiltration. Typical subsurface infiltration systems include tree trenches and infiltration/storage trenches.
Subsurface slow release (lined)	Subsurface storage and slow release systems that are not open for infiltration due to impermeable materials lining the storage. Typical subsurface systems include tree trenches and infiltration/storage trenches.
Subsurface slow release (unlined)	Subsurface storage and slow release systems that are open for infiltration. Typical subsurface systems include tree trenches and infiltration/storage trenches.