A Guide to Drainage Charge Credits

A drainage charge credit is a reduction in the drainage charge to a property based on the implementation and continuing proper operation of a stormwater management practice, also referred to as Green Stormwater Infrastructure (GSI). Customers are encouraged to adopt sustainable methods of stormwater management practices that reduce stormwater flows to the drainage system, enhance the natural environment, and protect against flooding and sewer overflows. The installation of stormwater management practices that result in a measurable reduction in volume and/or peak flow rates will qualify the property owner for a credit to their bill.

This guide provides an overview of the types of credits available for common stormwater management practices.

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What is a Stormwater Management Practice?

Stormwater management practices, also referred to as Green Stormwater Infrastructure (GSI), are designed or constructed to reduce or control the volume and rate at which stormwater leaves a site. Stormwater management practices can be structural or non-structural. Stormwater management practices may use vegetation, soils, and other elements to restore some of the natural processes that reduce runoff. Examples of stormwater management practices include disconnected downspouts, rain gardens, bioretention practices, permeable pavement, green roofs, and detention ponds.

1. *Disconnected Downspout*
2. *Bioretention in an Open Space*
3. *Bioretention in Parking Lots*
4. *Subsurface Detention Storage*
5. *Traditional Detention Basin*

Removing Impervious Area

Reducing a drainage charge does not necessarily require implementation of a structural stormwater management practice. By simply reducing the impervious area on a property, customers reduce the amount of stormwater leaving their property and thus reduce their drainage charge. Examples of impervious area reduction include removal of asphalt or concrete parking spaces and replacing the impervious area.

Note: Because the drainage charge is calculated using the amount of impervious area on a site, the removal of impervious area is not considered a drainage charge credit but rather an adjustment to the impervious area.

IMPORTANT:
Removal of excess parking requires zoning review by the City's Building Safety Engineering & Environmental Department (BSEED).

Drainage Charge Credits

The amount of the drainage charge credit is determined based on how well a customer can control the volume and peak flow characteristics of their runoff. Credits of up to 80 percent of the total drainage charge bill may be earned for reductions of:

- Annual Volume of Flow (40%)
- Peak Flow Rate (40%)

The maximum total drainage charge credit is 80 percent.

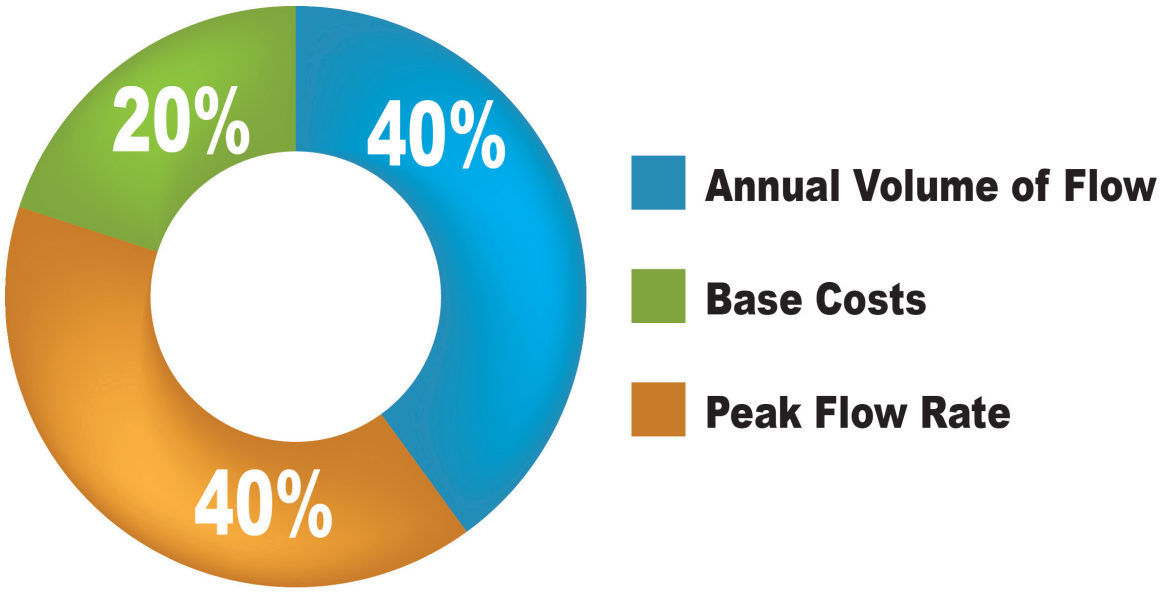


Figure 1: Drainage Charge Credits

Volume-Related Costs

The vast majority of stormwater that enters Detroit's combined sewer system reaches the wastewater treatment plant (WWTP). Detroit's share of the cost associated with running the regional WWTP is based on the total volume of flow from the City. In addition, some components of the cost associated with combined sewer overflow control (CSO), facilities such as chemical use and power use, are also related to flow volume. Efforts that customers make to reduce the total volume of flow that is handled by the sewer system over the course of the year helps to reduce these costs to DWSD.

Detroit's Wastewater Treatment Plant

Peak Flow Rate Related Costs

Detroit has invested approximately $1 billion in CSO facilities since the 1990's. These facilities treat overflows caused by large storm events. Detroit faces the prospect of being mandated to invest up to $2 billion in additional costs (based on 2010 reports) to control additional CSO points along the Detroit and Rouge Rivers if stormwater management practice measures prove insufficient to prevent overflows.

When customers implement measures to limit the peak rate of flow from their properties to the sewer system it helps to reduce the need for these facilities. The majority of peak flow related costs are for the construction and ongoing operation expense of the CSO facilities.

Conner Creek CSO

Base Costs

In addition to the costs associated with the WWTP and the CSO facilities, DWSD operates an extensive system of sewers and pump stations. These system elements are necessary to make centralized sewer and stormwater management practice services available. The systems must be maintained in order to be ready to serve each property in the City. In addition, there are various costs associated with administering the drainage charge system such as data management, billing, customer service, and credit administration.

Volume Credit

Volume-based drainage charge credits are determined based on the average annual volume reductions that result from managing stormwater on-site. The annual runoff volume is computed prior to and after construction of the stormwater management practice. The volume credit is calculated as the fraction of average annual runoff volume that is reduced as a result of implementing stormwater management practices on-site.

$$\%\, Volume\ Credit = \frac{Average\ Annual\ Runoff\ Volume\ Retained}{Total\ \ Average\ Annual\ Runoff\ Volume}$$

As the maximum credit that can be earned for volumetric control is 40 percent, the result of the above equation is multiplied by 40 percent. The site credit is prorated based on how much of the site is managed.

Peak Flow Credit

Peak flow-related drainage charge credits are based on the ability of the site to control peak flows of stormwater. Generally this credit is earned by the construction of an above or below ground detention system. In order to qualify for a peak credit, the detention system MUST have a controlled outlet. Once the system has a controlled outlet, the peak flow credit is calculated as the fraction of the volume associated with a 100-year, 24-hour rain event that is detained.

In order to earn a peak flow credit, the outlet capacity for the managed portion of the site must be limited to 0.15 cfs/acre.

$$\%\ Peak\ Flow\ Credit = \frac{Storage\ Volume\ Provided}{100-yr, 24-hr\ Storage\ Volume\ Required}$$

As the maximum credit that can be earned for peak flow control is 40 percent, the result of the above equation is multiplied by 40 percent. The site credit is prorated based on how much of the site is managed.

How Much Credit Will Various Practices Accomplish?

Various types of stormwater management practices are able to control either annual volume, peak flow or both. Table 1 identifies anticipated ranges of credit that various common stormwater management practices can earn. The credit applies to the area draining to the stormwater management practice. Common stormwater management practices are described in the following sections.

DID YOU KNOW?

Retention is the process of permanently keeping stormwater from leaving a property. It can be accomplished through infiltration, evaporation, transpiration (water uptake through plants) or water reuse. This process helps to remove volumes of stormwater from the sewer system. ***It is through retention that a site achieves a volumetric credit.***

Detention is the process of temporarily storing stormwater runoff to mitigate sewer overflows. This process helps reduce the flow rate (volume per unit time) of stormwater through the sewer system. This stormwater is later released into the system after the rainfall or storm melt subsides. ***It is through detention that a property qualifies for a peak flow credit.***

TABLE 1 - Credits for Commonly Used Stormwater Management Practices			
Practice Type	Volume Credit	Peak Flow Credit	Potential Credit for Area Managed (%)
Downspout disconnection	✓		**0-40**
Disconnected impervious area	✓		**0-40**
Bioretention	✓	✓	**0-80**
Detention basins		✓	**0-40**
Subsurface detention storage		✓	**0-40**
Permeable pavement	✓	✓	**0-80**
Green roof	✓		**0-40**
Water harvesting*	✓	✓	**0-80**
**For water harvesting, peak flow volume evaluated on a case-by-case basis.*			

Downspout Disconnection

Downspout disconnection is the process of disconnecting roof downspouts from the sewer system and redirecting the roof runoff onto pervious surfaces, most commonly a lawn. This reduces the amount of directly connected impervious area in a drainage area.

Typically an existing downspout is cut above ground level. An elbow and an extension are then added to the downspout in order to divert rainwater and snowmelt away from the building or structure and onto the ground. The abandoned drain pipe is then capped. A splash pad may also be attached at the end of the downspout extension to prevent erosion in garden areas and help direct the flow of water.

Required: Disconnected downspouts must be directed to pervious or lawn areas that will not result in flooding, icing hazards or discharge to public right of ways and/or neighboring properties. They must be properly extended away from the building foundation.

Increasing a credit: The credit for downspout disconnection is directly related to the size of the lawn area or the type of outlet location (lawn or bioretention area). Larger lawn areas and more highly designed stormwater management practices will result in a larger credit.

Extended Downspout

Disconnected Impervious Area

When impervious surface areas such as roofs, driveways, sidewalks, and parking lots are directed to pervious areas that allow for infiltration, customers may qualify for a disconnected impervious area credit. The pervious area to which stormwater is directed may be a grass lawn or vegetated landscaped area.

Required: Disconnected impervious areas must be directed to pervious or lawn areas that will not result in flooding, icing hazards or discharge to public right of ways and/or neighboring properties.

Increasing a credit: The credit for disconnected impervious areas is directly related to the size of the pervious vegetated area where the stormwater is directed. Larger ratios of pervious area to impervious area will result in higher credit percentages.

Bioretention

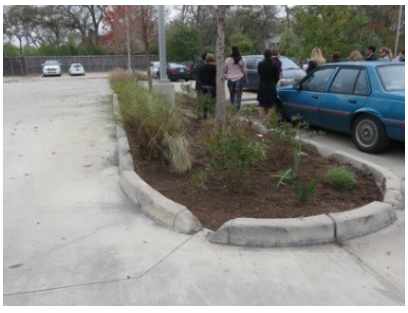
Bioretention is typically sited in an area of natural or constructed depression and consists of vegetation, a ponding area, mulch layer, and planting or engineered soil media and released through an underdrain. The vegetation may include perennials, grasses, shrubs, and trees. It typically incorporates a vegetated groundcover or mulch that can withstand urban environments and tolerate periodic inundation and dry periods. Runoff intercepted by the practice is temporarily captured in the depression and then infiltrated into the underlying soil. Flow that doesn't infiltrate is filtered through the soil (often engineered soil) media. Pretreatment of stormwater flowing into the bioretention area is recommended to remove large debris, trash, and larger particulates. Pretreatment may include a grass filter strip, sediment forebay, or grass swale. Ponding areas can be designed to provide detention.

Bioretention in an Open Space

Required: Bioretention systems must promote infiltration and evapotranspiration. However the system must also be able to drain below the ground surface within 24 hours.

Increasing a credit: The credit for bioretention systems is most directly related to the size (area and volume) of the bioretention relative to the tributary area. Examples of bioretention can include bioretention planter boxes, bioretention islands in parking lots or parking lot aisles.

Bioretention in Planter Boxes



Bioretention Islands in Parking Lots

Bioretention between Parking Lot Aisles

Detention Basins

Detention is a stormwater management practice that temporarily stores runoff volume and slowly releases it to the sewer system with a controlled outlet. Detention systems include dry detention and wet detention where the control structure is offset from the bottom of the basin which creates a landscape feature such as a permanent wet pool.

Traditional Dry Detention Basin

Required: Detention basins must have a controlled outlet to be eligible for a credit.

Increasing a credit: The credit for detention basins is based on the volume of the detention basin relative to the volume of a 100-year, 24-hour event storm. The larger the basin, the larger the credit. Water stored in a detention basin can also be reused for irrigation, which would result in a volume credit.

Subsurface Detention Storage

Underground detention performs the same function as a detention basin. Stormwater (and snowmelt) is routed to underground vaults or a system of large-diameter or low-profile storage pipes. Pipe or manufactured systems can be used. As with detention basins, a controlled outlet is required. In some cases where soils have available infiltration capacity, these systems can also function as an infiltration practice for a retention credit. Alternatively, they can function as cisterns for water reuse.

Subsurface Detention Storage

Required: Subsurface detention basins must have a controlled outlet to be eligible for a credit. Pretreatment is required to prevent a buildup of solids and other debris in the subsurface detention.

Increasing a credit: The credit for subsurface detention is based on the volume of the detention relative to the volume of a 100-year, 24-hour event storm. The larger the detention, the larger the credit.

Permeable Pavement

Permeable pavement is sometimes used in highly impervious areas to help infiltrate stormwater runoff that would otherwise enter the sewer system. This practice includes an aggregate stone layer to provide both structural support and volume storage, and a porous pavement layer that allows runoff to infiltrate. Because it can replace traditional impervious pavement, permeable pavement is an effective option for parking lots in urban areas.

Permeable Pavement

Required: A stone/aggregate layer to control stormwater. To be eligible for credits, installations must follow important design considerations.

Increasing a credit: The depth of stone under a parking area significantly affects the volume available to manage stormwater. The more storage volume, the larger the credit will be. The stone storage area, if properly sized, can also be used for roof drains and other impervious surfaces.

Green Roof

Green Roofs

Green roofs are used to introduce vegetation onto sections of roof tops to absorb and filter rainfall. Between rain events, some of the rain water is held in the plants and evaporates. At a minimum, a green roof consists of a waterproof membrane and root barrier system to protect the roof structure, a drainage layer, filter fabric, a lightweight soil media, and vegetation that filters, absorbs, and retains/ detains the rainfall. The overall thickness of a green roof commonly ranges from two to six inches. A green roof may be connected to other stormwater management practices such as a bioretention, bioswale, or cistern.

Green roofs are most often applied to buildings with flat roofs, but can be installed on roofs with slopes with the use of mesh, stabilization panels, fully contained trays, or battens.

Increasing a credit: The credit associated with a green roof is dependent on size of the green roof area and depth of the media. The larger these two are, the more significant the credit.

Water Harvesting (Reuse)

Water harvesting practices are generally used to collect stormwater runoff from impervious areas and store it in large cisterns or ponds. Runoff can then be used in non-potable applications such as watering vegetation or greywater systems. Cisterns as well as smaller rainwater harvesting systems can be constructed above or below ground depending on the space constraints of the site.

Required: Any water reuse system must include a means of using the water on a routine basis and a meter to measure the water used OR measure the residual flow to the sewer system.

Increasing a credit: Reuse systems are only as effective as the ability to use the water. The credit will be increased if more uses for the stored water are identified. For example, some industrial customers are reusing stormwater for the facility's industrial processes. This likely requires sufficient treatment of the water for the desired purpose.

Cistern

Irrigation Pond

Full or Partial Site Credits

DWSD does not require stormwater from the entire site to be managed in order to take advantage of the credit system. However, drainage charge credits will be calculated for only that fraction of a property that is "managed", meaning the area from where stormwater runoff is directed to a stormwater management practice. Runoff from an "unmanaged" area of a property will not be eligible for a drainage credit. Figure 2 represents these concepts.

For the example in Figure 2, the portion of the site that is tributary to the stormwater management practice would be eligible for a credit. The unmanaged portion (shaded area) would not be eligible for a credit.

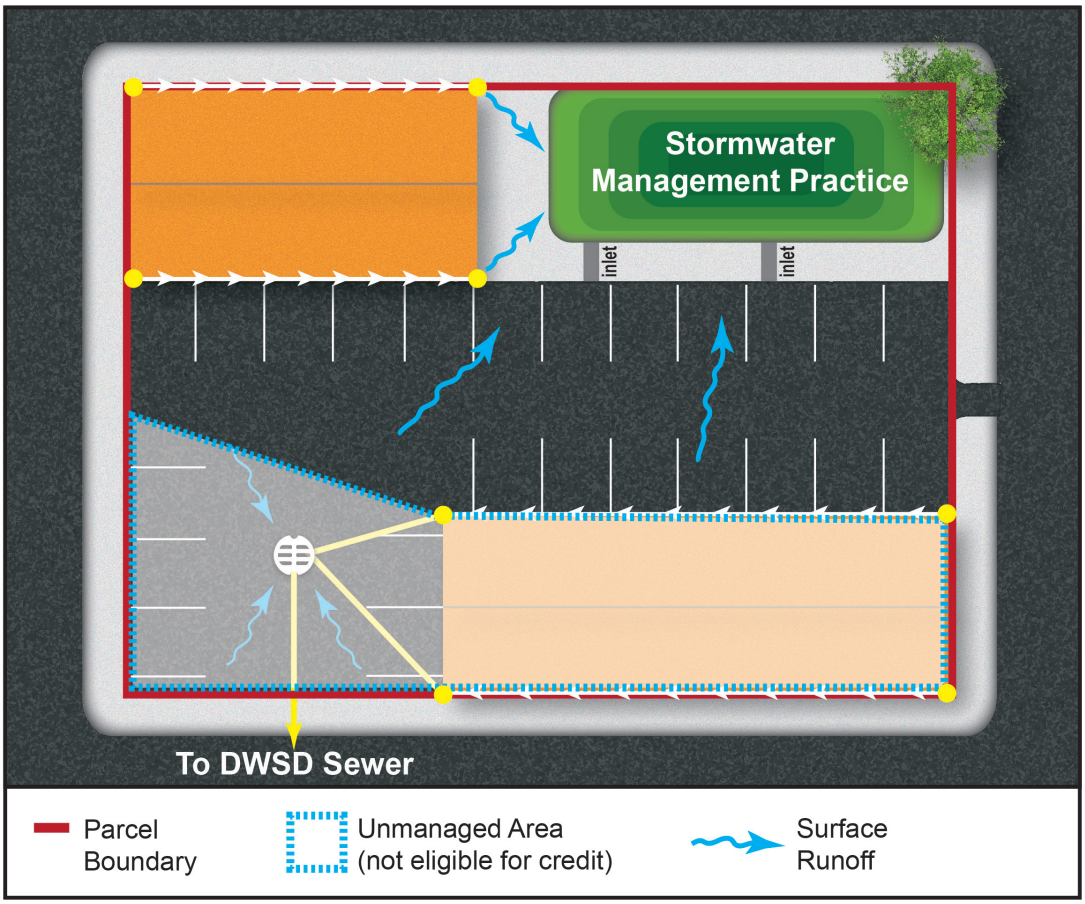


Figure 2: Managed versus Unmanaged Area

Example for partial Site Credits: Due to the layout of the site, 6 of the 10 impervious acres drain to a detention basin. The basin is sized to detain 70 percent of the 100-year, 24-hour storm event's runoff volume for the impervious acres draining to it. This makes it eligible for a peak flow credit, however the practice has no infiltration capabilities, so it cannot earn a volume credit.

The credit is calculated as shown in Table 2:

TABLE 2 - Partial Site Credits					
Area	Credit Type	Practice Performance (%)	Managed Impervious Area (acres)	Credit Calculation	Credit Amount (%)
Managed Area	Volume	70	6	(6/10) * 0.7 * 0.4	17
Non-managed	None	0	0	N/A	0
				Total	17

Multiple Credits

In cases where more than one stormwater management practice is present, the credit will be determined based on the total site's potential to manage stormwater. The customer can earn multiple drainage charge credits.

Note: While multiple credits can be given to eligible properties, the total drainage charge credit to any property cannot exceed 80 percent for that property. If customer is receiving a transition credit, they get either the transition credit or the stormwater management practice credit, whichever is greater.

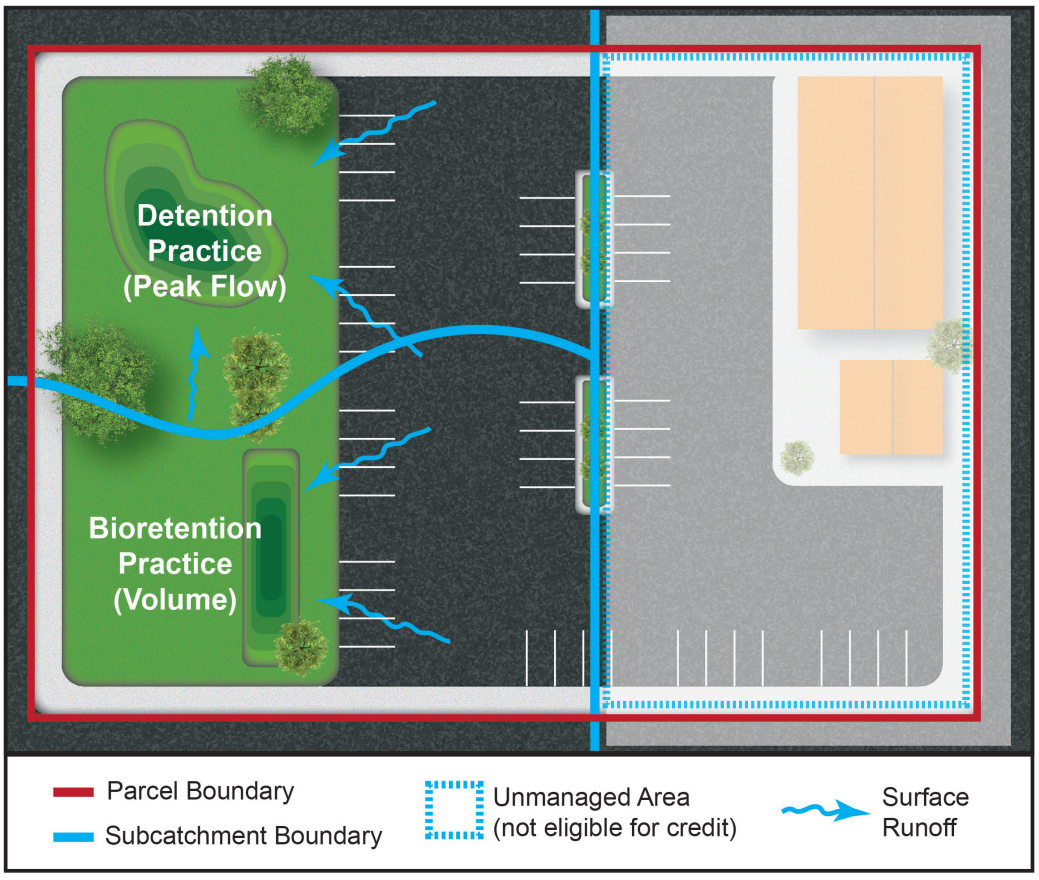


Figure 3: Multiple Credits

Example for Multiple Credits: A site with 8.7 impervious acres drains to 3 different locations. Of the 8.7 impervious acres, 2.3 drain to a detention basin that can detain 80% of the 100 year, 24 hour storm even volume making it eligible for a peak flow credit. Then 2.4 acres of impervious area drain to a separate bioretention practice that retains 90% of the annual rainfall volume; making the second practice eligible for a volume credit. The remaining 4 impervious acres drain to a DWSD sewer and are not managed.

The credit that this site can earn is shown in Table 3:

TABLE 3 - Multiple Credits

Subcatchment	Credit Type	Practice Performance (%)	Managed Impervious Area (acres)	Credit Calculation	Credit Amount (%)
Detention Basin	Peak Flow	80	2.3	(2.3/8.7) * 0.8 * 0.4	8
Bioretention	Volume	90	2.4	(2.4/8.7) * 0.9 * 0.4	10
Not Managed	None	0	4.0	N/A	0
Total			8.7		18

Shared Stormwater Management Practices

DWSD allows the location of the stormwater management practice to be on a separate parcel from where the stormwater is generated. There are two circumstances where this may happen:

- A single property owner owns multiple parcels
- Multiple property owners construct a shared stormwater practice

Situation #1: Single Property Owner

Required: A single property owner with multiple adjacent parcels must:

- Have consistent owner names and addresses on each parcel

Situation #2: Multiple Property Owners

Required: A legal agreement between the property owners documenting that this is a shared stormwater management practice.

DWSD will assess the practice performance and, if credit requirements are achieved by a joint practice, each property owner will be granted a credit for their contributing impervious area.

Note: DWSD encourages cost-sharing to support the design, construction, and maintenance of shared stormwater management practices. DWSD will not intervene in private transactions associated with financing and maintenance. DWSD will apply credits to the properties whose flow is managed.

EXAMPLE: Four individual properties have entered into an agreement whereby a single detention basin will control peak flow from each of their properties. The detention basin is sized to detain 60 percent of the 100-year, 24-hour event storm runoff volume from all impervious area on each property. Therefore, the properties are eligible for the peak flow rate credit. Because the detention basin has no infiltration capabilities, no property will receive volume credits. With the information below, the total credits allocated to each property are calculated.

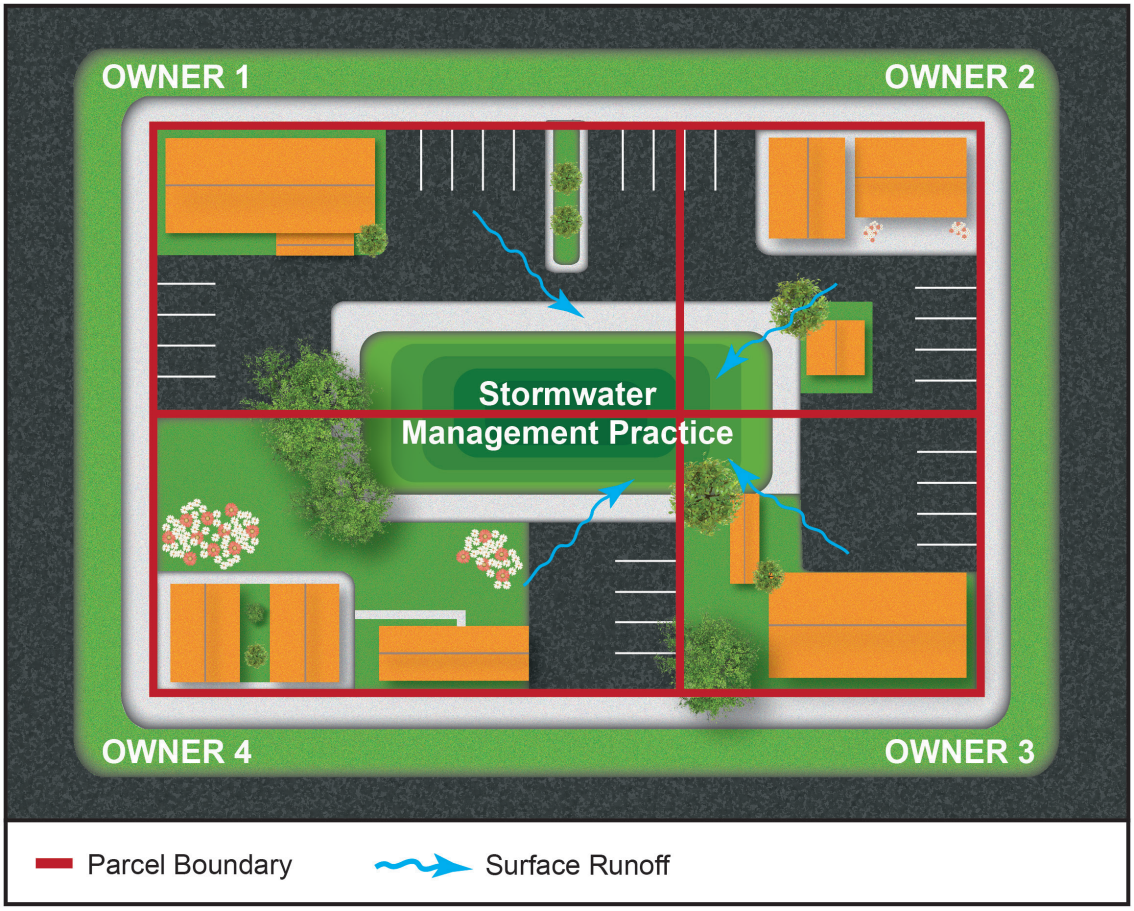


Figure 4: Shared Ownership of Stormwater Management Practice

TABLE 4 - Shared Ownership of a Stormwater Management Practice

Owner # Calculation	Credit Type	Practice Performance (%)	Managed Impervious Area (acres)	Credit Calculation	Credit Amount (%)
1	Peak	60	3	(3/3) * 0.6 * 0.4	24
2	Peak	60	2	(2/2) * 0.6 * 0.4	24
3	Peak	60	2	(2/2) * 0.6 * 0.4	24
4	Peak	60	2.1	(2.1/2.1) * 0.6 * 0.4	24

Note: All impervious area on each site is controlled.

How to Get a Drainage Charge Credit

In order to be eligible for a drainage charge credit, the stormwater management practice must be approved by DWSD. To obtain a drainage charge credit, the property owner will need to meet eligibility requirements, apply for and receive an approval from DWSD, and fulfill on-going operations and maintenance (O&M) requirements. The customer's name must be on the account.

To be eligible for a credit, the stormwater management practices must:

- Reduce annual runoff volume and/or control peak flow rate;
- Be documented in terms of design and performance in a manner acceptable to DWSD;
- Comply with all applicable city, county, state, and federal construction, building, and stormwater codes and permits;
- Be fully installed and functioning properly;
- Not create a safety hazard or nuisance; and
- Be located on a property that is geographically located within DWSD's Drainage Service Area.