48TH WARD STORMWATER BMP MENU

A GUIDE TO STORMWATER BEST MANAGEMENT PRACTICES

Chicago Department of Environment

Richard M. Daley
Mayor

Overview

This menu is meant to inspire 48th Ward landowners to begin thinking about ways they can use stormwater BMPs in this flood-prone ward. It is not the intent of this menu to provide in-depth or comprehensive guidance on how to implement these practices. Landowners should consult a design professional or some of the many detailed manuals that provide technical guidance for designing and installing stormwater BMPs. See the Resources section in the back of this guide for some examples.

Goals of implementing stormwater BMPs in the 48th Ward include:

- Reduce stormwater volume/quantity by capturing stormwater before it enters the sewer system.
- Reduce rate/velocity at which stormwater enters sewer by temporarily storing water above ground during rain events.
- Remove stormwater pollutants before stormwater enters Chicago waterways.

Look at the dots in the upper-left corner of each BMP page to see what types of property the BMP is most appropriate for.

SF Applies to Single-Family Homes

COM Applies to Commercial Properties

CON Applies to Condominiums

IND Applies to Industrial and Institutional Properties

[Insert Menu excel spreadsheet here]

Summary of 48th Ward-Specific Suggestions for Stormwater BMPs

Disconnected Downspouts
Disconnecting your downspout is the most effective and cheapest thing you can do to decrease basement flooding in the 48th ward. Before you consider any of the other practices described in this tool kit, disconnect your downspouts. You might consider installing rain barrels or a native plant rain garden, to further decrease the amount of water going into the stormwater sewers.

Natural Landscaping
Native plants absorb more water than turf lawns while providing habitat for biodiversity. Turning a lawn into a native plant garden is one of the easiest things a 48th ward land owner can do to assist the ward with our flooding problems.

Rain Barrels and Cisterns
The 48th Ward was targeted for the City's Rain Barrel Pilot Program in Summer '04. Rain barrels have multiple functions: conserving water, reducing stormwater volume and reducing stormwater rate. A cistern has a larger capacity than a rain barrel and should be used at downspouts that drain large roof surface areas.

Rain Gardens
Rain gardens in low spots that collect water and/or receive water from a disconnected downspout work especially well in the 48th Ward because sandy soils can infiltrate more stormwater than the clay soil typical of other Chicago areas.

Green Roofs
Green roofs are especially useful in the 48th Ward where houses are densely packed, leaving less room for traditional on-the-ground gardens.

Permeable Paving
Low-traffic areas such as quiet residential alleys, walkways, less-frequently used parking lots, driveways and patios are excellent locations for permeable paving and are especially effective in the 48th ward, given the area's prevalent sandy soils. Permeable paving should be considered for any new construction or renovation of these low traffic areas in the ward.

Bioinfiltration
Bioinfiltration systems are great for the 48th Ward, because the relatively sandy soils soak up the stormwater relatively quickly. Because it involves soil amendments and drainage pipes, Bioinfiltration takes more effort than rain gardens but can accommodate larger volumes of water. It is most effective in combination with other stormwater practices, such as the disconnection of a downspout that handles a large quantity of water, or the installation of an enhanced run-off inlet structure on a parkway.

Drainage Swales
Drainage swales down the center or on the side of some of the 48th Ward's wider streets would be an excellent sink for stormwater coming off of our streets. A depressed channel, swales will reduce the stormwater volume and the rate at which stormwater flows into the sewers, while improving its quality.

Parking Lot Detention
When constructing a new parking lot, consider designing the parking lot to detain water during a significant storm event. Especially given the 48th Ward's density, other green parking lot techniques, such as spaces for compact cars and shared parking will help reduce impervious surfaces.

French Drains
Especially when an alley is under construction, the 48th ward should consider installing a French drain in the alley's lowest point.

Naturalized Detention Basin
Where space is available, land owners can have a significant impact on the rate at which stormwater enters the sewer system and its quality by constructing detention basins on their property.

Enhanced Run-off Inlet Structures
Especially when 48th ward construction on streets or sidewalks requires curb construction, and enhanced run-off inlet structure should be considered. Curb cuts that allow runoff from the street to enter a bioinfiltration parkway are in design in the 48th ward.

Filter Strips
Filter strips slow and treat stormwater runoff before it flows into the sewers. In most cases, they need to be very long to be effective. Additionally, they are not designed to reduce the amount of water going into the sewer system. Because of greenspace constraints in the 48th ward, swales, bioinfiltraion and other practices are typically a better stormwater best management practice.

SF CON COM IND

Disconnecting your downspout is the most effective and cheapest thing you can do to decrease basement flooding in the 48th ward. Before you consider any of the other practices described in this tool kit, disconnect your downspouts. You might consider installing rain barrels or a native plant rain garden, to further decrease the amount of water going into the stormwater sewers.

Disconnected Downspouts

The City of Chicago was the first major metropolitan area in the country to successfully implement an inlet control system to relieve basement flooding. The system works by installing restrictors to slow the flow of stormwater into the sewer system. Stormwater is detained on city streets for brief periods before flowing back into the sewer system. This measure helps relieve the burden on the sewer system and reduce the frequency of basement flooding and combined sewer overflows into our waterways.

The effectiveness of the inlet control system depends on the number of roof downspouts that are disconnect-ed from the sewer system. While impractical in some places (where there are only hard surfaces or where drainage could impact neighboring property), the potential to reduce basement flooding and increase natural infiltration is great.

The City actively encourages homeowners to disconnect their downspouts from the sewer system and direct the water instead to their yards or gardens. Public service announcements, community meetings, instructional video tapes, brochures and discounts on materials for downspout disconnection have all been provided to homeowners. The City will continue and expand its efforts to educate citizens on the benefits of disconnecting existing downspouts and on alternative uses of stormwater.

Guide to Downspout Disconnection

Downspout disconnection can help prevent basement sewage backup. Before you disconnect your downspout, consider where you are directing the water, and that cold weather will cause icing conditions. When you are completed, your project should be a permanent solution which is beneficial to your grass, flowers, shrubbery and trees.

The illustrations on the other side will demonstrate that the physical disconnection is relatively simple, inexpensive, does not require a permit, and can be accomplished with a minimum of inconvenience.

Important Things to Remember

1) Direct downspout extensions toward the street or alley to prevent seepage into building foundations or adjacent properties.

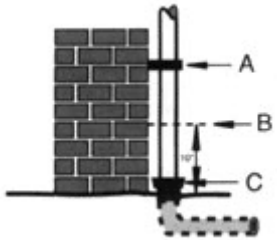
(2) Firmly anchored splashblocks should be installed if downspout drainage is to travel over landscaping or dirt.

(3) Do not allow water to splash or pond on adjacent private property

(4) Make sure downspout extensions end at least three feet away from basement foundations, and water is being directed on ground that slopes away (downward) from your building.

If you have any questions about how to disconnect your downspouts, or whether special problems prevent downspout disconnection, call The Department of Water Management at (312) 747-7047.

STEP 1

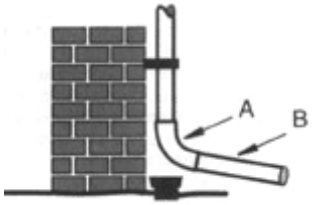


A) Drill a 1/4"hole in mortar joint and hammer stand-off bracket into wall; attach the downspout.

B) Cut downspout appx. 10" above the ground using a hack or sabre saw. Distance will vary depending upon installation.

C) Loosen mortar cement from drain tile, and remove lower portion of down spout.

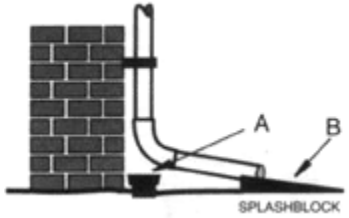
STEP 2



A) Place the larger end of elbow over edge of downspout, hold elbow in place and drill a hole in each side. Secure with sheet metal screws or pop rivets.

B) Place the end of extension over elbow (length will depend upon installation). Hold extension in place and drill a hole on each side. Secure extension with sheet metal screw or pop rivets.

STEP 3



A) Plug top of drain hole with crumpled newspaper and fill to top with at least 1" of mortar cement.

B) Optional: Install a splash block to protect grass and shrubbery. This is not necessary when downspout splashes on driveway or property sidewalks.

48th Ward Contacts/Examples:
- Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:
Approximately $20 for materials needed for disconnecting downspouts

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Native plants absorb more water than turf lawns while providing habitat for biodiversity. Turning a lawn into a native plant garden is one of the easiest things a 48th ward land owner can do to assist the ward with our flooding problems.

Natural Landscaping

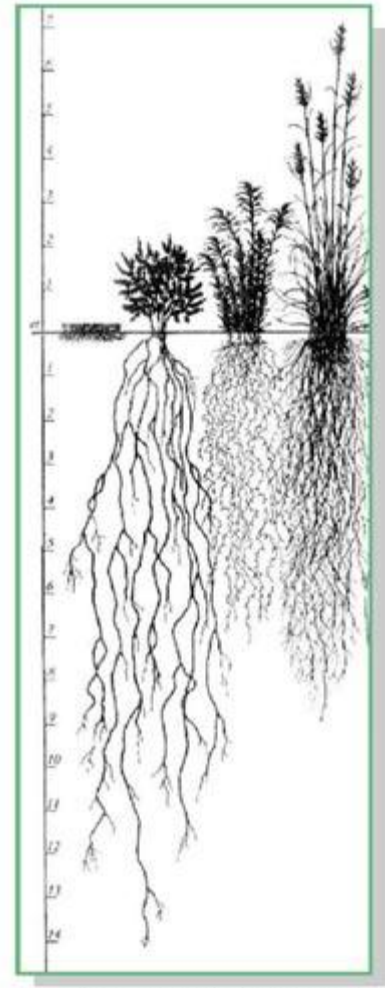
Natural landscaping refers to the use of native vegetation – particularly prairie, wetland and woodland species – on a development or redevelopment site. Native vegetation is a low-cost alternative to traditional landscaping that utilizes turf grass and ornamental plantings.

A site that is naturally landscaped will produce substantially less stormwater runoff than a conventional landscape. Native vegetation enhances both absorption of rainfall and evaporation of soil moisture due to extensive root systems that extend down 3 to 10 feet or more. In contrast, the root zone of turf grass typically extends only about 3 to 4 inches. The benefits of natural landscaping are enhanced if runoff from impervious surfaces is routed across native vegetation buffer strips. A local residential site assessment indicated that annual storm runoff volumes from a residential development could be reduced by as much as 65 percent by utilizing swales and filter strips with native wet prairie and prairie vegetation. Similarly, natural landscaping reduces pollutants associated with urban runoff. In the residential site assessment, it was estimated that removal rates for suspended solids and heavy metals (such as cadmium and lead)could be as high as 80 percent and removal rates for nutrients (such as phosphorus and nitrogen)could be as high as 70 percent for a residential development utilizing natural drainage and native landscaped filter strips.

In addition to reducing stormwater runoff, natural landscaping provides a host of other benefits. Deep-rooted native plants effectively stabilize soils and prevent erosion along streambanks and detention basin edges. The reduced maintenance needs of natural landscaping not only save money, but also reduce air, water and noise pollution. Natural landscaping also provides habitat for native and migrating birds, butterflies, and insects. Natural landscapes, especially trees, also moderate temperature extremes (such as the “urban heat island” effect), resulting in reduced heating and air conditioning costs. Finally, natural landscaping provides four seasons of color and textures not commonly found in conventional landscapes and requires less maintenance over time.

Applicability

Natural landscaping is feasible on nearly all sites as an alternative to conventional landscaping. It should be tailored to individual site characteristics, factoring in topography, soils, drainage patterns and sun exposure. On some sites natural landscaping can be installed or preserved in an informal setting; on others, native plants can be used in more formal settings in place of imported species. Suggested site applications include: river or wetland edges, detention basin and drainage features, parks, green roofs, residential areas and gardens, commercial, industrial and institutional developments.



Root length of conventional turf grass (left)as compared to native plant roots (right).

Maintenance Considerations
Natural landscaping requires much less maintenance – less irrigation, mowing, fertilizer and pesticides – than conventional landscaping. Natural landscape maintenance typically involves annual mowing or controlled burning. Burning may not be possible on small lots but it is one of the best methods of maintaining natural landscaping. Some initial watering and spot spraying to control invasive weeds also may be needed, but this need diminishes rapidly once the natural landscape is well established (generally within 3-4 years).

Cost Considerations
Costs will vary from site to site depending on site size, plant selection and other factors. In general, it is expected that installation costs will be similar for both conventional turf and natural landscapes (roughly $2,000 -$4,000 per acre). Conventional landscaping costs will be higher if sod and irrigation systems are installed. In the long run, maintenance costs for natural landscapes will be much lower than conventional landscapes – typically half or as little as one--fifth the cost of conventional landscapes.

Local Examples
The Peggy Notebaert Nature Museum of the Chicago Academy of Sciences has installed a natural landscape on its campus that links to the naturalized shoreline of the North Pond in Lincoln Park.

The Peggy Notebaert Nature Museum of the Chicago Academy of Sciences has installed a natural landscape on its campus.

48th Ward Contacts:
- Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:
Similar to conventional costs: from $2,000-$4,000 per acre.

Natural Landscaping attracts all sorts of wildlife.

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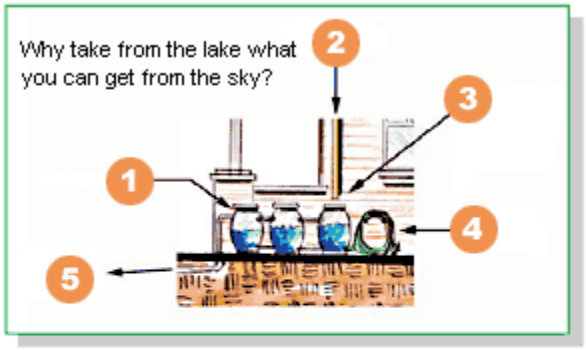
Rain Barrels and Cisterns

The 48th Ward was targeted for the City's Rain Barrel Pilot Program in Summer '04. Rain barrels have multiple functions: conserving water, reducing stormwater volume and reducing stormwater rate. A cistern has a larger capacity than a rain barrel and should be used at downspouts that drain large roof surface areas.



1 Rain Barrels
2 Rain Water From the Roof
3 Disconnected Downspout Rerouted into the Rain Barrel
4 Rain Water Reuse Hose
5 Overflow to Rain Garden

Traditionally, roof runoff in Chicago has been routed via downspouts directly into the sewer system. However, the City of Chicago encourages the careful disconnection of downspouts so that roof runoff can be absorbed by nearby foliage and pervious surfaces. Temporarily storing the water in a rain barrel or cistern is a great option for doing this.

Rain barrels can effectively capture and store the runoff from small to moderate storms. The stored water then can be used to irrigate lawns and landscaped areas in between storm events.

The effectiveness of rain barrels (or cisterns) is a function of their storage volume in comparison to the size of the roof. In a simple residential example, a 1,200 square foot roof could utilize 55-gallon barrels to store runoff from downspouts at the four corners of the house. The resultant storage is equivalent to about 0.3 inches of runoff. While this volume will not substantially reduce flooding from large storms, it can considerably reduce direct runoff from smaller storms and divert water from the combined sewer system. The actual effectiveness of this approach will depend on the regular draining of rain barrels (such as for irrigation) between storm events. In that respect, rain barrels are most effective when used during the growing season.

Applicability

Effective downspout disconnection requires that there be adequate landscaping or vegetation available to accept the water. Rain barrels are appropriate where vegetation is limited, provided that the collected water can overflow to open green space areas. Diversion and/or storage of roof runoff with rain barrels or cisterns is applicable to most residential, commercial and institutional properties in the City.

Maintenance Considerations
Occasional cleaning may be necessary to remove debris, such as leaves, coming off the rooftop. A mesh filter can be inserted at the top of a rain barrel. The barrel must be sealed during the warm months of the year to avoid mosquito breeding. To avoid freezing, the rain barrel should be drained prior to winter.

Cost Considerations
Typical costs for a ready-made rain barrel range from $20 to $150. Homeowners can reduce costs by making their own.

Local Examples
Much of the rain that falls on Chicago Center for Green Technology's roof flows into four 3,000-gallon cisterns and is later used to water the landscape.

Some of Chicago's Green Bungalows utilize rain barrels in yard and garden areas.

48th Ward Contacts:
- Alderman's Office: Ernie Constantino, (773) 784-5277
- Rain Barrel Owner:
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Costs:
$20 - $200 each

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Rain gardens in low spots that collect water and/or receive water from a disconnected downspout work especially well in the 48th Ward because sandy soils can infiltrate more stormwater than the clay soil typical of other Chicago areas.

Rain Gardens

A rain garden is a simple form of bioinfiltration that typically relies on the underlying soils for drainage. Therefore it may not function properly if underlying soil is compacted by heavy equipment and/or its absorption rate is slow. Where appropriate, however, rain gardens can be fitted with French drains, or other types of underdrains, to move more water through the soil.

Rain gardens can be aesthetically pleasing. The plants provide food and shelter for many birds, butterflies, and beneficial insects, such as dragonflies, which eat mosquitoes. Plants can include a combination of shrubs, grasses and flowering perennials where the soil medium is between 6 and 8 inches deep. Ideally, plants should consist of native wetland and prairie grasses, and wildflowers. Suggested designs incorporate perennial flowers in the spring and summer, and vividly colored or patterned shrubs and grasses in the fall and winter. Some suggested plants for rain gardens include: Black-eyed Susan, Butterflyweed, Golden Alexander, Obedient Plant, Purple Coneflower, Spiderwort, Wild Columbine and Wild Geranium. (See the resource section at the end of this guide for additional information on creating rain gardens).

Applicability
Rain gardens can be incorporated into front and back yards of residential areas, parkway planting strips, parking lot planter islands and under roof down spouts.

Maintenance Considerations Rain garden maintenance is similar to that for a typical garden - including weeding and reestablishing plants as necessary. Periodically removing sediment may be required to ensure the proper functioning of these systems. It is best for runoff to be pretreated via swales and/or filter strips before entering the rain garden to avoid sediment accumulation. Plants should be selected to reduce maintenance needs and to tolerate snow storage and winter salt and sand, where appropriate.

Cost Considerations The costs of rain gardens will vary depending on how much work is completed by the owner and the types of plants desired. Rain garden installations average $3 to $4 per square foot depending on soil condition and density and types of plants used. If planned and designed properly, a rain garden is likely to retain its effectiveness for over 20 years.

NOTE: A rain garden is not a pond. It should not provide a breeding ground for mosquitoes. Mosquitoes need at least four days of standing water to develop as larva. Rain gardens generally should be designed to drain within six hours (water may pond for longer times during winter and early spring).

Request a copy of the City's rain garden brochure by calling 312-743-WATER.

Bioinfiltration systems are great for th
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Bioinfiltration takes more effort than
water. It is most effective in comb
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Rain gardens are used at the Green bungalows and in parkways around the City of Chicago. The photo depicts a rain garden using native plants.

48th Ward Contacts:
Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:
$3-4 per square foot

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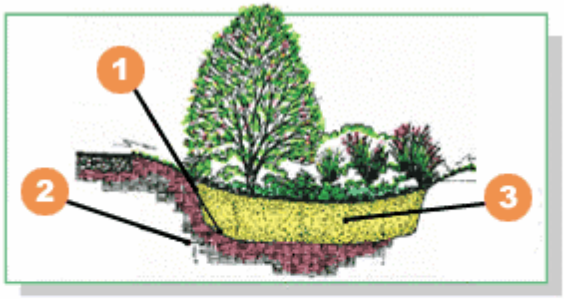
Bioinfiltration

Bioinfiltration systems are shallow, landscaped depressions used to promote absorption and infiltration of stormwater runoff. This management practice is very effective at removing pollutants and reducing the volume of runoff, especially when used for parking lot islands. Stormwater flows into the bioinfiltration area, ponds on the surface, and gradually infiltrates into the soil bed. Filtered runoff is infiltrated into the surrounding soils via an absorption basin or trench. Excess water can be collected by an under-drain system and discharged to the storm sewer system or directly into receiving waters. Bioinfiltration systems typically are designed to store and treat runoff from relatively small storms, such as those that occur every year or every other year. Bioinfiltration systems should be located at least 10 feet away from buildings to ensure water does not drain into the foundations. Ideally, pretreatment should be provided to remove suspended solids from the runoff before it enters the system.



1. No liner or geotextile fabric allows the in-situ soils to infiltrate to their maximum capacity.
2. In-situ soils must have a high porosity to allow runoff to infiltrate at a rate of greater than 1"/hr
3. Soil Medium consisting of 50-60% sand, 20-30% top soil, and 20-30% leaf compost allows a high infiltration capacity

Applicability

Bioinfiltration is suitable for developments that have sufficient room for the water to be absorbed. Suggested applications include: *parking lot islands, residential developments utilizing swale drainage for pre-treatment, commercial developments utilizing filter strips adjacent to parking lots for pre-treatment, and campus developments utilizing swale drainage and filter strips for pre-treatment.*

If the surrounding soils are permeable, the system can be designed so runoff absorbs into the soils. The soils should allow the structure to drain in a reasonable amount of time, generally 72 hours or less. This design would be most effective in Chicago areas with relatively sandy lake bed soils. In tighter soils, underdrains may be necessary. Bioinfiltration may not be appropriate for industrial land uses where there is a high potential for groundwater contamination from infiltrated runoff

Maintenance Considerations

Bioinfiltration maintenance includes periodic inspection to ensure the system is operating properly, along with management of the vegetation. If a practice fails due to clogging, rehabilitative maintenance will restore it to proper operation. Incorporating pretreatment helps to reduce the maintenance burden of bioinfiltration and reduces the likelihood that the soil bed will clog over time.

Cost Considerations

Bioinfiltration costs can range between $10 to $40 per square foot, based on the need for plants, control structures, curbing, storm drains and underdrains. Bioinfiltration should reduce the size and cost of necessary downstream conveyance and storage devices. Bioinfiltration may need to be replaced periodically due to sediment accumulation.

48th Ward Contacts:
- Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:
$10-40 per square foot

SF CON COM IND

Permeable Paving

Low-traffic areas such as quiet residential alleys, walkways, less-frequently used parking lots, driveways, and patios are excellent locations for permeable paving and are especially effective in the 48th ward, given the area's prevalent sandy soils. Permeable paving should be considered for any new construction or renovation of these low traffic areas in the ward.

The alley, constructed of a rigid grid system and gravel, allows rainwater to soak into the ground. Close up of finished system upper left corner.

Permeable Alley

The City is creating a green infrastructure by utilizing unique open spaces to hold water that would normally drain directly into the sewer system. For instance, the City built a new kind of alley in a North Side community as part of a pilot project. The alley, constructed of a rigid grid system and gravel, allows rainwater to soak into the ground-reducing water flow into the sewer system and backyard flooding.

Permeable Paving

Permeable paving refers to paving materials - typically concrete, stone or plastic - that promote absorption of rain and snowmelt. The discussion that follows focuses primarily on one form of permeable pavement - paving blocks and grids, as they are the most common and available type of permeable paving. These modular systems contain openings that are filled with sand and/or soil. Some can support grass or other suitable vegetation, providing a green appearance. A portion of rainfall is trapped in the block's depressions and infiltrates into the underlying soil.

Permeable paving is effective in reducing the quantity of surface runoff, particularly for small to moderate-sized storms. It also reduces the runoff pollutants associated with these events. Permeable paving in Chicago will be most effective in areas closer to Lake Michigan that are underlain with sandy, permeable soils. Effectiveness can be improved by designs that:

- maximize the openings in the paving material and
- provide an effective permeable sub-layer (e.g., at least 12 inches).

Permeable paving may have aesthetic and marketing advantages over conventional paving, depending on the materials selected. Vegetated pavers, in particular, could substantially improve the aesthetic appeal of paved areas. Vegetated pavers also can be effective in reducing the "urban heat island" effect.

An alternative form of permeable paving is porous pavement that relies on larger particles in the aggregate to rapidly infiltrate precipitation into an underlying stone "reservoir." While not discussed at length in this guide, porous pavement may be a suitable option for certain low-impact applications. Porous pavement may be prone to clogging, be adversely affected by the freeze/thaw cycle and can have higher maintenance requirements than permeable paving. However, some recent reports - mostly from warmer climates - conclude that porous pavement may be a

reliable, cost-effective alternative. One key consideration when using porous pavement is to ensure that the aggregate is sufficiently durable.

Applicability

Permeable paving is particularly appropriate for the following applications: overflow and special event parking, driveways, utility and access roads, emergency access lanes, fire lanes and alleys.

Maintenance Considerations

Vegetated paving blocks may require occasional mowing. Snow plowing may require special care due to the slightly uneven surface of the pavement.

Cost Considerations

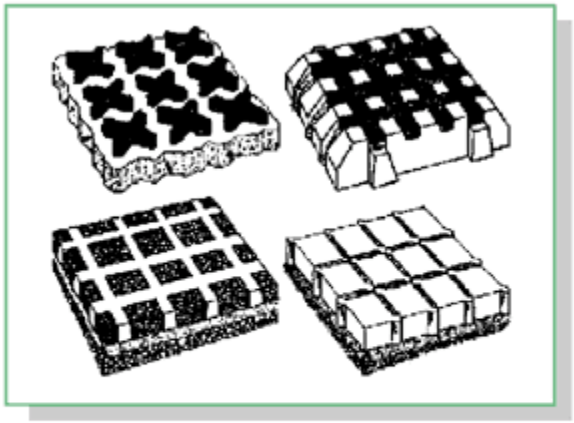
Installation costs for permeable paving can be as much as two to three times greater than conventional concrete or asphalt. However, there are indications that permeable paving requires less frequent replacement. Also, because it substantially reduces runoff quantities, permeable paving can substantially reduce related stormwater engineering and infrastructure (e.g., curbs, gutters and storm sewer) costs. These savings can at least partially offset the higher installation costs.

48th Ward Contacts/Examples:

- Alderman's Office: Ernie Constantino, (773) 784-5277
- Alley just north of 1400 block of W. Catalpa

Costs:

2-3 times conventional costs



Paving Blocks and Grids (above). Permeable paving in Chicago will be most effective in areas closer to Lake Michigan that are underlain with sandy, permeable soils.

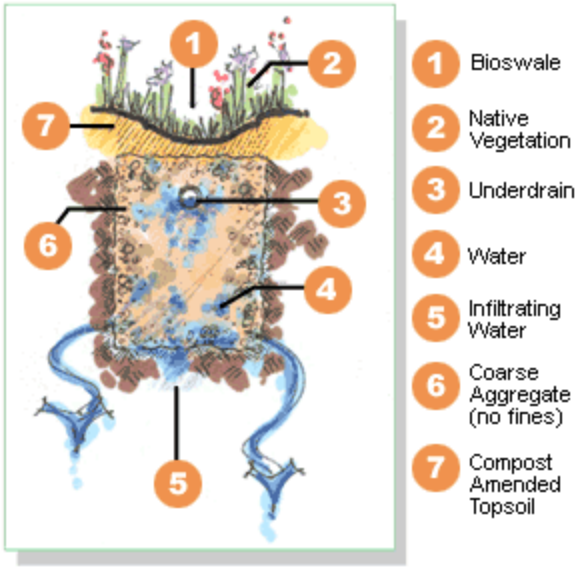
CON COM IND

Drainage swales down the center or on the side of some of the 48th Ward's wider streets would be an excellent sink for stormwater coming off of our streets. A depressed channel, swales will reduce the stormwater volume and the rate at which stormwater flows into the sewers, while improving its quality.

Drainage Swales

A swale is a broad, vegetated channel used for the movement and temporary storage of runoff. Swales also can move a portion of the runoff into the ground and filter out runoff pollutants. Drainage swales that are planted with native vegetation are commonly called bioswales. Swales can be effective alternatives to enclosed storm sewers and lined channels, where their only function is to rapidly move runoff from a developed site. On some sites, natural drainage courses may still be present and it is recommended that they be retained as part of the site drainage plan. Drainage swales are different from filter strips in that swales are primarily used for conveying water.

In contrast to conventional curb-and-gutter/storm sewer systems, swales can reduce both the rate and volume of stormwater runoff on a site. Since this is achieved via absorption of runoff into the soil, swales in sandy soils will be much more effective than swales in clay soils. Swales are most effective in reducing runoff volumes for small storm events and on an annual basis can reduce storm runoff volumes by up to 15 percent in clay soils.



Pollutant removal rates in swales are highly variable depending on the condition of the swale, particularly its slope, soils and vegetation. Estimated removal rates range from 30 percent to 70 percent of suspended solids and metals (such as cadmium and lead) and 10 percent to 30 percent of nutrients (such as phosphorus and nitrogen), biochemical oxygen demand and other organic compounds. As discussed earlier, soluble inorganic compounds (most notably road salt) generally cannot be removed in the soil and will eventually migrate downstream or into deep groundwater.

Swales can provide limited wildlife habitat when planted with native vegetation. Preserving existing drainageways on a development site also protects aquatic habitat.

Applicability

Drainage swales are applicable on virtually all development sites. In dense urban settings swales generally will be used in conjunction with storm sewers, rather that in lieu of storm sewers. Suggested applications include: office campus, commercial, industrial, multi-family residential, parking lots, residential parkways and highway drainage (where right-of-way widths are adequate). One type of swale is a depressed median – a recessed, landscaped area within paved surfaces. Depressed medians can be used as an alternative to raised parking lot islands, allowing water to flow into them from the surrounding pavement. Using vegetation is important in order to filter contaminants that may enter the median from the surrounding pavement.

Maintenance Considerations
Drainage swales may require periodic cleaning but this cost should be minimized if upstream sources of sediment, particularly from construction activities, are well controlled. In comparison, storm sewer catch basins need to be cleaned periodically and manholes, storm sewer pipes, and curbs will need occasional repair.

Another maintenance issue sometimes raised for swales is ponding water and the potential to breed mosquitoes. This can be avoided by providing adequate slopes and/or underdraining to avoid ponding. Alternatively, the swale can be vegetated with wetland plants that can aid in the evaporation of water and provide habitat for mosquito predators such as dragonflies.


An example of a drainage swale near a parking area at the Chicago Center for Green Technology.

Cost Considerations
Roadside swales in residential settings achieve substantial documented cost savings over conventional curb and gutter and storm sewers. In a suburban example, a savings of about $800 per residence was estimated. Swale drainage in commercial, industrial and parking lot settings has great potential in Chicago and also has documented cost savings over conventional storm sewer approaches. In several case studies done in Portland, Oregon, savings ranged from $4,000 to $5,500 per acre of developed area. A related consideration is replacement costs. Although periodic cleaning may be required, swales should never need to be replaced, in contrast to storm sewers.

Local Examples
Commercial and institutional applications of swales are fairly common. The Chicago Department of Transportation is creating a drainage swale at 126th Place in the Calumet area. Other Chicago developments incorporating swales in their site designs include the Ford/Centerpoint Supplier Park and Solo Cup developments in the Calumet area.

48th Ward Contacts:
Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:
Less than conventional costs

CON COM IND

When constructing a new parking lot, consider designing the parking lot to detain water during a significant storm event. Especially given the 48th Ward's density, other green parking lot techniques, such as spaces for compact cars and shared parking will help reduce impervious surfaces

Parking Lot Detention

Parking lots can provide water quantity control through detention of stormwater runoff. They should be used in conjunction with stormwater quality treatment practices, which can be located either upstream or downstream from the parking lot detention. Since they must be useable for their primary function (parking) most of the time, parking lots should only be used for temporary detention – not for extended amounts of time.

Other green parking lot techniques include setting maximums for the number of parking lots created, minimizing the dimensions of parking lot spaces, utilizing alternative pavers in overflow parking areas, using bioretention areas to treat stormwater, encouraging shared parking and providing economic incentives for structured parking.

Applicability

Parking lot detention can be applied in areas that have large, paved lots that can be temporarily used for runoff storage without significantly interfering with regular vehicle and pedestrian traffic. There are two ways to create parking lot detention: by using ponding areas along sections of raised curbing, or through depressed areas of pavement at drop inlet locations.

The City allows a maximum of 10" of ponding over a catch basin rim on new developments. On existing catch basins, a survey or grading plan of the parking lot would be needed to ensure that there is an overflow to the street so as not to exceed the existing ponding limit. A restrictor in the catch basin(s) can be sized for a 100-year storm. To do it properly without causing any problems, it is recommended that an engineering firm be hired to review the plans and do the calculations.

The storage area must have at least a 0.5% slop toward the outlet to ensure total drainage after a storm, but it would ideally have a slope of 1% or more.

Fire lanes must be free of ponding water at all times.

Many parking lots designs result in far more spaces than actually required. This problem is exacerbated by a common practice of setting parking ratios to accommodate the highest hourly parking during the peak season. By determining actual average parking demand instead, a maximum number of parking spaces can be set as well. Parking stall dimensions can be further reduced if compact spaces are provided.

Shared parking in mixed use areas and structured parking are also green parking techniques that can further reduce the conversion of land to impervious cover. A shared parking arrangement could include usage of the same parking lot by an office space that experiences peak parking demand during the weekday with a church that experience parking demands during the weekends and evenings. Costs may dictate the usage of structure parking, but building upwards or downwards can help minimize surface parking.

Maintenance Considerations
Every year, and following significant storm events, debris must be removed from ponding area to reduce outlet clogging and improve aesthetics. There may be additional maintenance such as removal of sediment buildup, repairing and re-vegetating eroded areas, and performing structural repairs to inlet and outlets.

Cost Considerations
Setting maximums for parking spaces, minimizing stall dimensions, and encouraging shared parking can result in considerable construction cost savings. At the same time all of the green parking techniques can also reduce stormwater management costs. Bioretention areas costs about $6.40 per cubic foot of quality treatment.

Local Examples

48th Ward Contacts:
Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:

Especially when an alley is under construction, the 48th ward should consider installing a French drain in the alley's lowest point.

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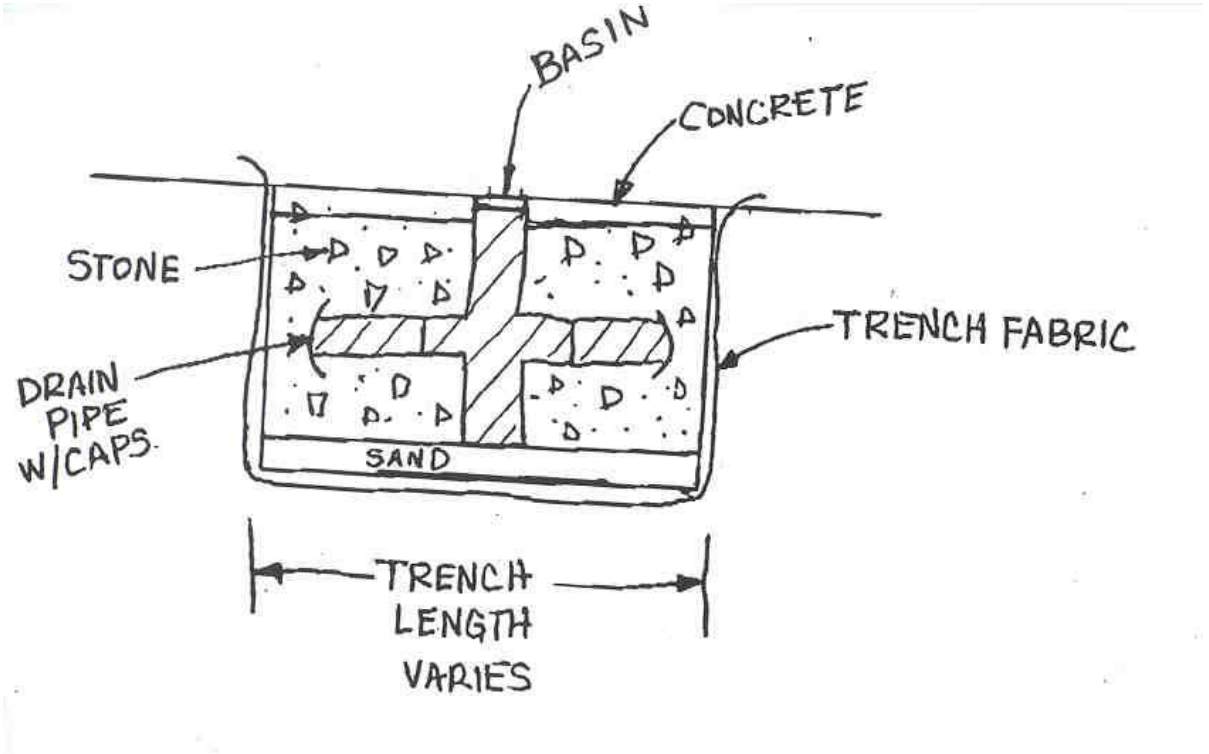
French Drains

The basic French drain is a drainage system which consists of a long trench that's dug into the ground through an area that's troubled by poor drainage. The trench is filled with a porous material, usually gravel, crushed stone or slag, along with a perforated pvc plastic pipe to collect unwanted ground water.

French drains can be an excellent way to collect and distribute excessive ponding of rain water if soil conditions meet the requirements.



Applicability
French drains are only applicable in soil of a sand mixture. Clay soil is not acceptable for a French drain installation. Clay will not allow the water to properly dissipate.

Maintenance Considerations

Cost Considerations

Local Examples

48th Ward Contacts:
Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:

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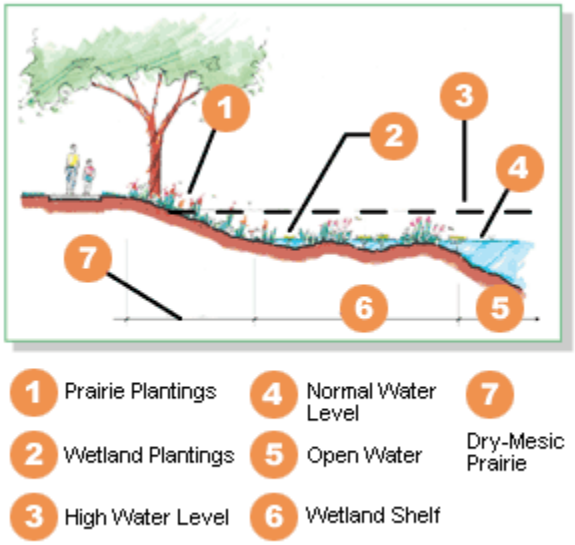
Naturalized Detention Basins

Where space is available, land owners can have a significant impact on the rate at which stormwater enters the sewer system and its quality by constructing detention basins on their property.



Conventional detention is designed to prevent flooding by temporarily storing stormwater runoff and releasing it gradually to the downstream drainage system. Naturalized detention is intended to serve multiple functions, in addition to flood prevention, including pollutant removal and creation of wildlife habitat (where appropriate). Natural detention basin designs emulate natural lake or wetland systems by utilizing native plants along the water's edge and on side slopes. The design generally incorporates flat slopes at the edge of the water or wetland, shallow zones of emergent vegetation at the edge of wet basins, and a combination of vegetated and open water areas in wetland basins.

Effective detention designs will dramatically reduce runoff rates and prevent most increases in flooding associated with new development. However, unless underlying soils are highly permeable, detention will not significantly reduce flood volumes.

The greatest benefit of naturalized designs is the reduction of runoff pollutants. Suspended sediments and attached pollutants, which are removed primarily by settling, can be reduced by 60 percent to 90 percent. Some dissolved pollutants, including nutrients and organic matter, can be reduced by 40 percent to 80 percent.

Because wet basins are more effective at removing pollutants, in some instances they are a beneficial alternative to dry bottom basins. Naturalized basins also will not experience shoreline erosion, further improving water clarity.

Naturalized detention also can provide desirable habitat for birds and aquatic organisms and at the same time discourage nuisance populations of Canada geese that are commonly found around conventional basins. In addition, many property owners prefer the appearance of a well-designed natural basin over the more manicured look of a conventional basin (such as coarse gravel shorelines and/or concrete channels), thereby enhancing property values.

Applicability Natural detention basin designs are suitable for all development types. Detention may not be feasible on very small sites – such as individual lots – due to the need for very small outlet structures. On very small site, rain garden or bioinfiltration designs may be more appropriate.

Maintenance Considerations
Conventional basins require regular mowing of side slopes and/or basin bottoms. In contrast, naturalized detention basins typically require only annual (or less frequent) mowing once the vegetation is established. Also, because native vegetation provides effective shoreline stabilization, there should be little need to repair shoreline erosion problems commonly found in conventional wet basins. Other maintenance concerns – occasional sediment removal and trash control – are similar for naturalized and conventional basins.

Cost Considerations
The construction costs of naturalized detention basins are generally comparable or less than the costs of conventional detention basins. Some cost savings may result from the use of native vegetation for shoreline stabilization versus coarse gravel, stone or concrete. In the long term, costs for naturalized basins will be lower due to reduced needs for conventional turf maintenance.

The Chicago Center for Green Technology on Sacramento has an effective naturalized detention basin.

Local Examples
A notable example of a naturalized detention basin in the City is at the CET1 power plant located at 117th & Torrence Avenue.

48th Ward Contacts:
Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:
Similar to conventional costs

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Especially when 48th ward construction on streets or sidewalks requires curb construction, and enhanced run-off inlet structure should be considered. Curb cuts that allow runoff from the street to enter a bioinfiltration parkway are in design in the 48th ward.

Enhanced Run-off Inlet Structures (EROIS)

Design 1: An EROIS is a box structure that diverts street stormwater into a bio-retention (e.g. a rain garden) basin for treatment. Runoff is diverted into the EROIS chamber though a curb cut. A perforated pipe then drains the chamber into a level spreader (gravel trench) that distributes water evenly over the bio-retention basin.

Design 2: An EROIS is a simple flow diversion structure consisting of a curb cut and concrete ramp. Street runoff enters the curb cut opening, down a serrated ramp, and into a level spreader (gravel trench) that distributes water evenly over the bio-retention basin. (I think we will likely go with this design)

Soil in the bio-retention basin is amended with compost to improve infiltration and enhance pollution reduction. The texture, structure, and high organic content of compost increases the overall porosity of the amended soil. The sorption and ion-exchange properties of composts reduce the concentrations of many cations (e.g. metals) and toxicants in the infiltrating water. The bio-retention basin can be design for detention or retention depending on the permeability of the underlying soils.

Applicability

EROIS can be implemented in both new developments and already built areas. EROIS can be placed in parkways, landscape medians, and other greenspace areas. If installed primarily for pollution reduction, receiving bio-infiltration basin should be sized to capture the first flush volume (first 1" of precipitation). If installed for flow management, it should be sized to accomplish the desired flow rate and volume reduction objectives. At a minimum, the bio-infiltration basin should be at least 5 feet wide, 20 feet long and between 6 inches and 1 foot deep.

If trees will be planted within the bio-retention basin, side slopes should be at least 4:1 or flatter. Floodplain trees or trees that can tolerate both dry conditions and extended inundation should be used. Also consider overall growth and placement of trees in relation to the basin as many native plants do not do well in shaded areas. In cold climates, salt tolerant plants should be used. In retro-fit installations, excavations should be avoided over existing utilities or under existing tree canopies. The retention basin should be designed to completely drain within 24 to 48 hours to avoid mosquitoes.

Maintenance Considerations
Annually inspect concrete for visual signs of damage. Annually inspect and clean-out level spreader as needed. Periodically inspect inlets for obstructions. Pick up accumulated trash and litter. See O&M considerations for bio-retention basins.

Cost considerations
Depends largely on size and type (new development or retro-fit) of project. Typical single installation around $50 per square foot of bio-infiltration area. (Also refer to cost for bio-retention basins).

48th Ward Contacts:
Alderman's Office: Ernie Constantino, (773) 784-5277

Costs:
Appx. $50 per sq. ft. of bioinfiltration area.

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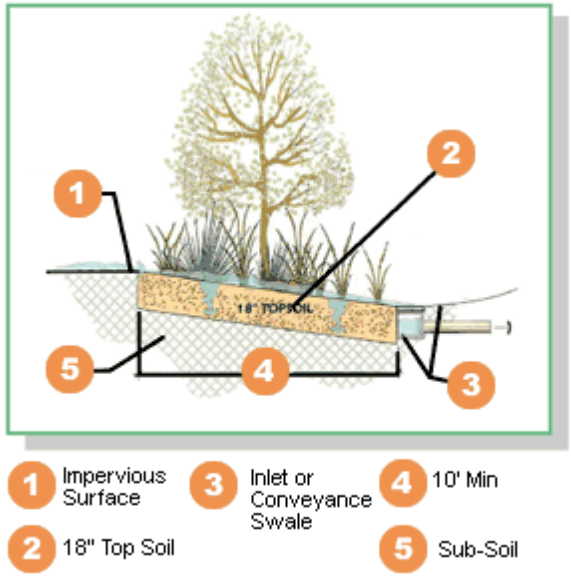
With 60% of the 48th Ward's area consisting of impervious surfaces, the ward could benefit greatly from filter strips. Plus, the area's relatively sandy soil would increase the effectiveness of filter strips.

Filter Strips



Filter strips are vegetated areas that are designed to receive runoff from adjacent impervious surfaces. They work by slowing runoff speed, trapping sediment and other pollutants, and providing some absorption. While frequently planted with turf grass, filter strips may also employ native vegetation, which is more effective in removing nutrients.

Filter strips can reduce both the rate and volume of stormwater runoff on a site. This is achieved principally by absorbing runoff into the soil.

Well maintained filter strips can be very effective in reducing runoff volumes, particularly when the impervious drainage area is not overly large (such as more than 4 to 5 times the filter strip area.) Filter strips are most effective in reducing surface runoff volumes – by up to 40 percent – for small storm events (storms up to the magnitude that may occur, on average, once every year or every other year).

Filter strips remove suspended solids through settling and filtration. Dissolved pollutants are removed and/or transformed as runoff infiltrates into the ground. Effectiveness is improved when there is dense vegetation. The use of native vegetation can provide additional benefits for pollutant filtering and runoff absorption. The plants selected should be able to withstand flowing water, and both wet and dry periods. A properly designed and maintained filter strip may remove up to 70 percent to 95 percent of suspended solids and metals (such as cadmium and lead), 25 percent to 65 percent of nutrients (such as phosphorus and nitrogen), and biochemical oxygen demand (the degree of organic pollution in water leading to the depletion of oxygen). However, soluble inorganic compounds (most notably road salt) are generally not well removed in the soil and will eventually migrate downstream or into deep groundwater.

Filter strips function best when applied on gentle slopes, thereby keeping runoff speed low and maximizing opportunities for absorption of runoff and filtering of pollutants. The longer the water moves through a treatment such as this, the more it can be absorbed and the cleaner it will get. Filter strips must disperse the flow as evenly as possible to avoid straight, deep channels, which can reduce effectiveness. Where feasible, a filter strip width of at least 20 feet is recommended, although narrower widths can be effective on flat slopes.

Applicability
Roof runoff and parking lot runoff can be distributed over the width of lawn areas to promote absorption and filtering. Filter strips are strongly recommended in buffer zones between developed areas and sensitive aquatic environments. They are particularly appropriate as buffers for land uses that generate high pollutant loads, such as roadways and parking lots, and are useful in controlling erosion and sediment wash off during construction. Filter strips are probably most appropriate on developments where there are significant expanses of pervious areas (green spaces) adjacent to impervious surfaces (such as parking lots). Specifically, they may be used in the following applications: *residential (roof runoff), commercial (roof and parking lot runoff) and vegetated buffers (adjacent to stream or wetland areas).*


The Chicago Center for Green Technology uses filter strips to convey runoff on-site.

Maintenance Considerations
Typically, maintenance involves normal activities such as mowing, trimming, removal of invasive species and additional planting if necessary.

Cost Considerations
In most cases there is no additional cost associated with establishing filter strips. Typically, all that is required is to direct runoff to an open vegetated area rather than a storm sewer. If the runoff is concentrated, a level spreader (fanning out the water from the immediate source through the use of a wide-mouthed gutter or small culvert into gravel) may be necessary to evenly spread runoff water. Eliminating the need for a local storm sewer may offset the cost of this device. Although periodic cleaning may be required, filter strips should never need to be "replaced." Since filter strips remove sediment and other pollutants, they should lower maintenance costs for downstream catch basins, detention basins and absorption devices.

Local Examples
When used appropriately, disconnected downspouts in residential and commercial buildings will cause the roof runoff to route over a filter strip in a back, side, or front yard.

48th Ward Contacts:
Alderman's Office; Ernie Constantino, (773) 784-5277

Costs:
Similar to conventional costs.