APPENDIX C
GREEN INFRASTRUCTURE

Appendix – Stormwater Management Model Ordinances

This Appendix includes a 13-page framework for model stormwater ordinances to help communities develop best management practices and policies to limit run-off and improve water quality. Additionally, we provide a two-page PDF summary of Minnesota Pollution Control Agency's Stormwater Model Ordinances and we suggest the following links as references.

The first link considers best management practices and guidelines compiled through the Mid-America Regional Council – directly relevant, of course, to Johnson County, KS, and therefore, one of the best tools available.

http://marc.org/environment/Water/bmps.htm

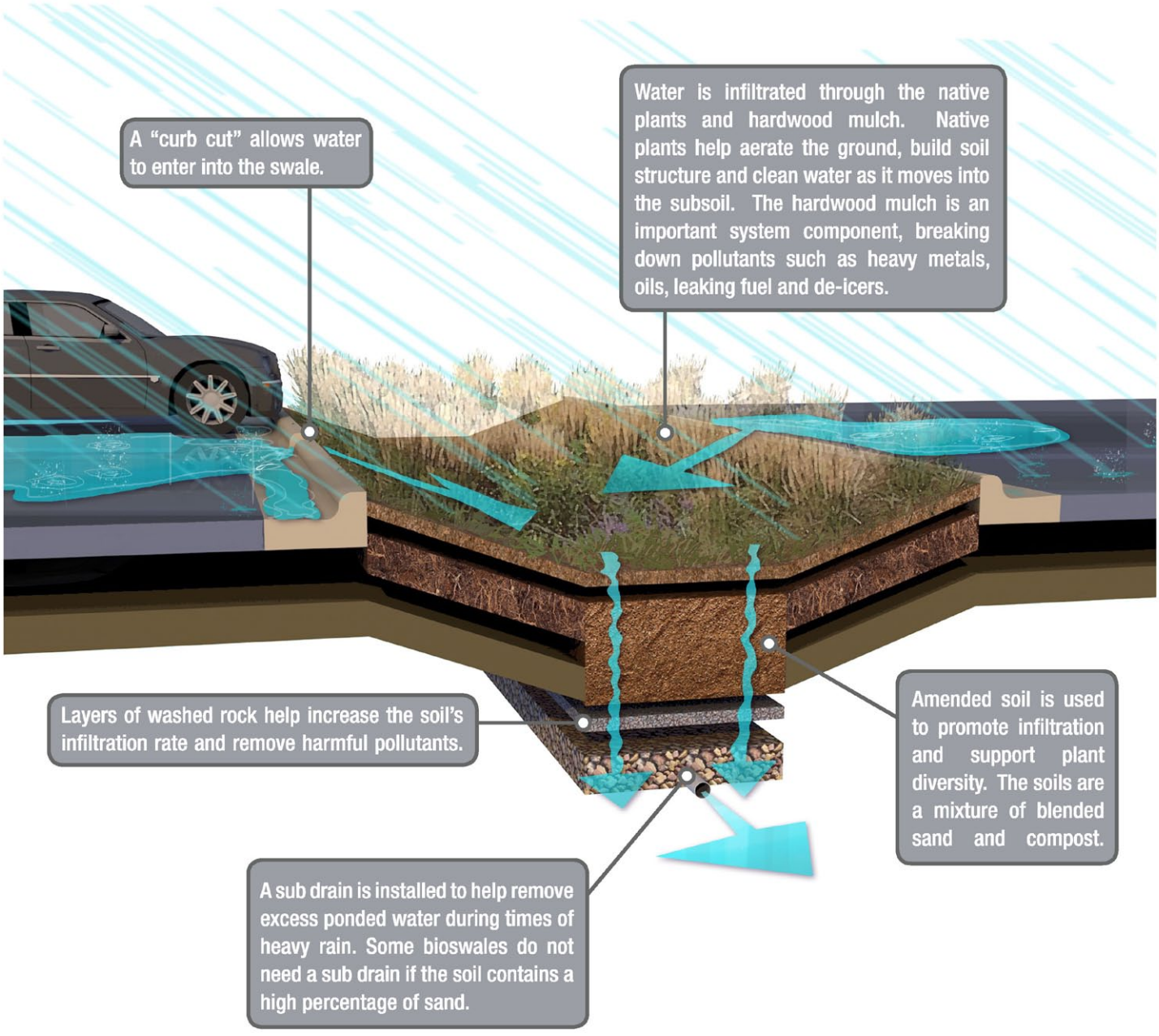
RDG Planning & Design developed an on-line toolkit for the Iowa Chapter of the American Planning Association, specifically focused on using watershed planning (and associated model ordinances and best practices tools) as planning foundation. The link for that toolkit can be found here:

http://rio.urban.uiowa.edu/smart-planning-toolbox

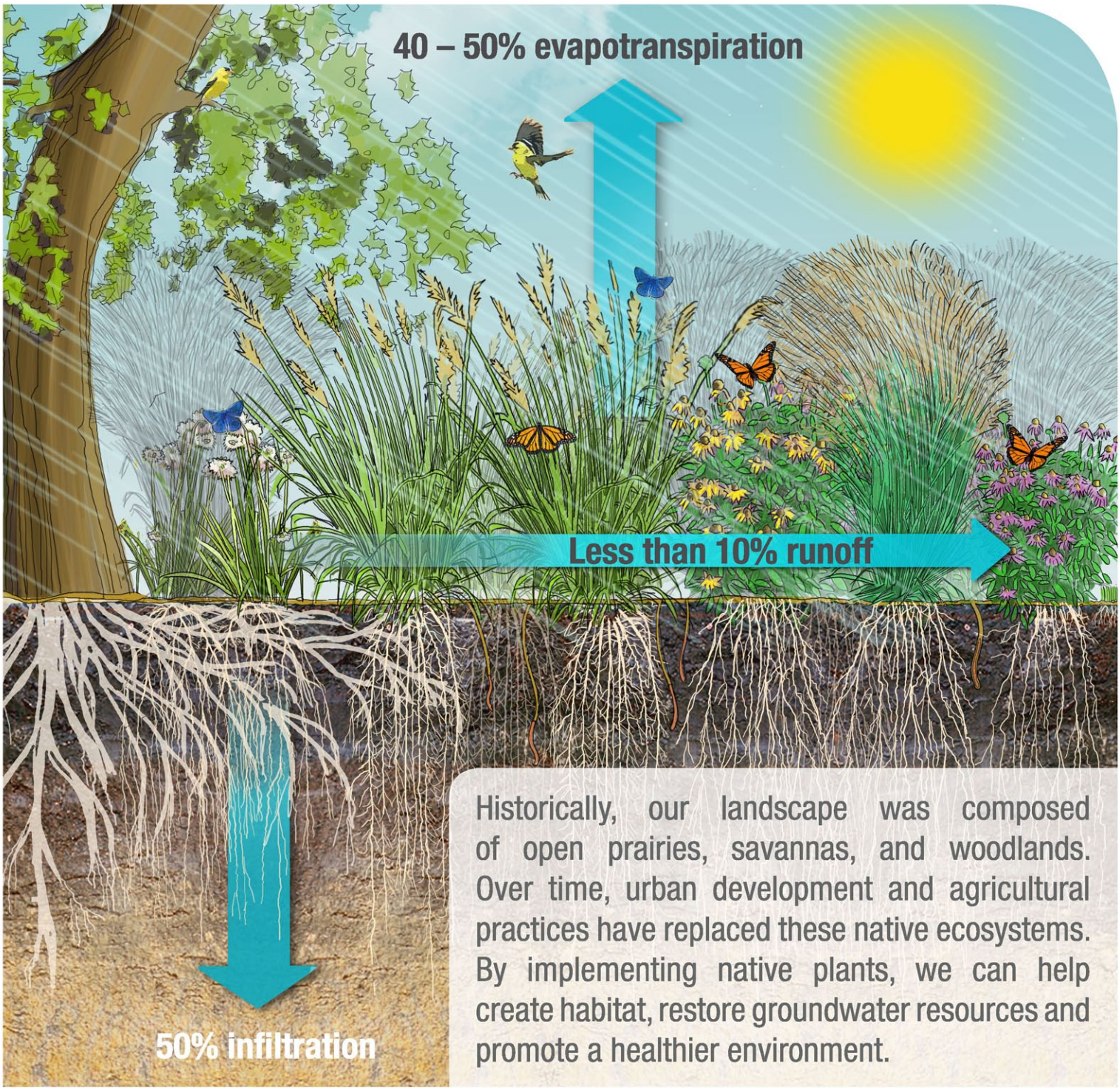
In addition to the materials already developed in the Midwest, Warren County, PA has invested a great deal of effort in the development of a model ordinance available here:

http://www.warrencountypa.net/attach/WARREN%20SWM%20Ordinance.pdf

BIOSWALE

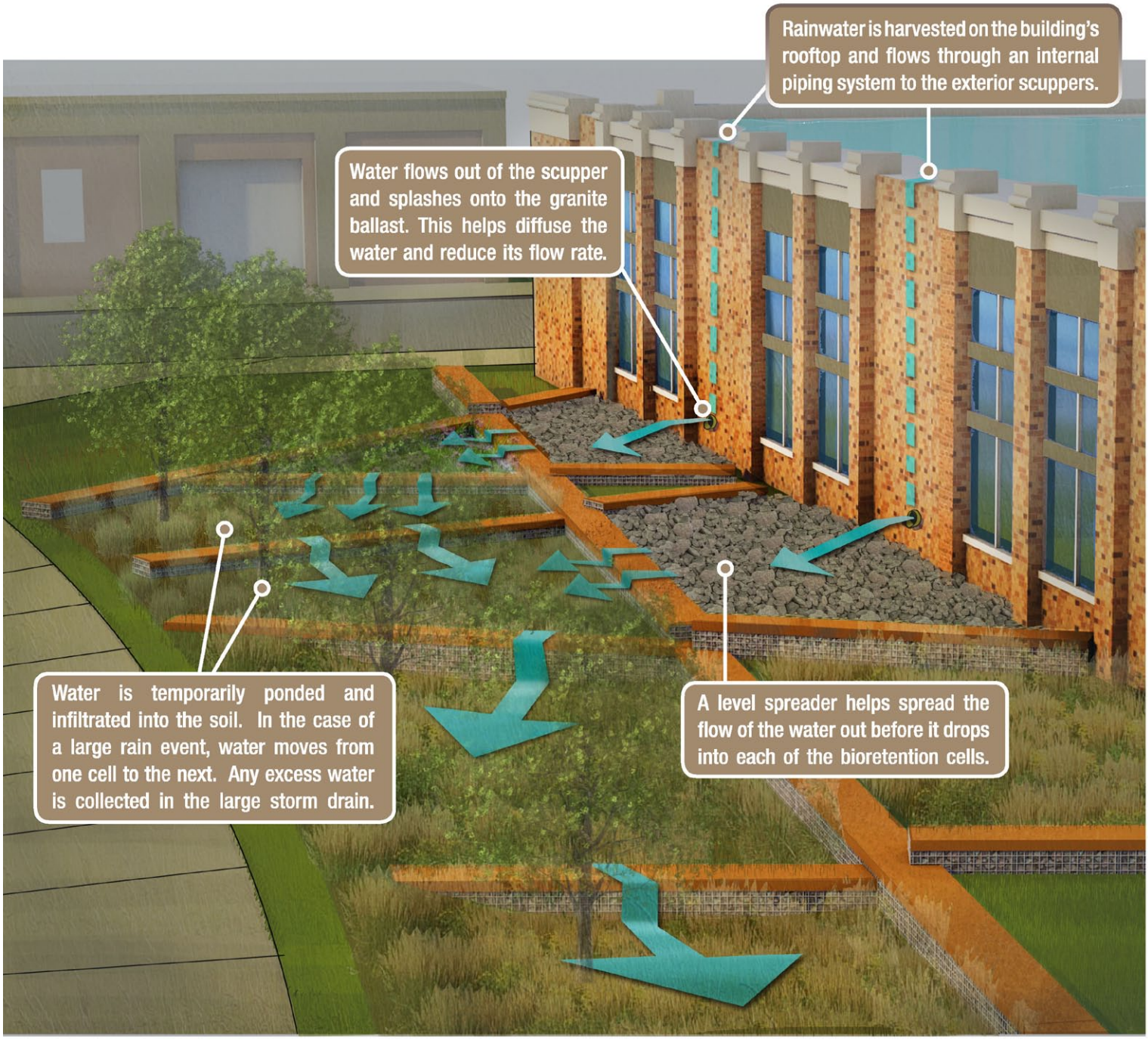

A "curb cut" allows water to enter into the swale.
Water is infiltrated through the native plants and hardwood mulch. Native plants help aerate the ground, build soil structure and clean water as it moves into the subsoil. The hardwood mulch is an important system component, breaking down pollutants such as heavy metals, oils, leaking fuel and de-icers.
Layers of washed rock help increase the soil's infiltration rate and remove harmful pollutants.
Amended soil is used to promote infiltration and support plant diversity. The soils are a mixture of blended sand and compost.
A sub drain is installed to help remove excess ponded water during times of heavy rain. Some bioswales do not need a sub drain if the soil contains a high percentage of sand.

ECOLOGICAL DIVERSITY



Historically, our landscape was composed of open prairies, savannas, and woodlands. Over time, urban development and agricultural practices have replaced these native ecosystems. By implementing native plants, we can help create habitat, restore groundwater resources and promote a healthier environment.

GABION BASKET SYSTEM



Minnesota Pollution Control Agency

Stormwater Model Ordinances

wq-strm2-04 • February 2009

Model Ordinances

Model ordinances are created for municipal officials who want direction in regulating stormwater runoff. The ordinances provide a valuable tool for communities developing stormwater ordinances. With careful adaptation of these models and diligent enforcement, growing cities should be able to prevent serious stormwater runoff issues.

MPCA model ordinance

The MPCA model ordinance was developed in 2000 as an educational aid for Minnesota Pollution Control Agency staff. The model was based on the best parts of existing Minnesota municipal ordinances and from advice gathered from agency staff and other stormwater experts:

www.pca.state.mn.us/publications/wq-strm2-06.pdf

NEMO model ordinances

The more recent set of model ordinances was published in March 2004 by the National Education for Municipal Officials (NEMO). The language in this model is designed to assist local governments with applying the land use and water quality principles promoted in the NEMO program to their unique circumstances.

The basic model ordinance language is adapted from a variety of existing model ordinances and design manuals including those from the MPCA, the Department of Administration (Minnesota Planning), and the Metropolitan Council.

NEMO model ordinances

- Model Stormwater Ordinance: www.pca.state.mn.us/publications/wq-strm2-16a.pdf
- Model Erosion and Sediment Control Ordinance: www.pca.state.mn.us/publications/wq-strm2-16b.pdf
- Model Subdivision Ordinance: www.pca.state.mn.us/publications/wq-strm2-16c.pdf
- Model Shoreland Management Ordinance: www.pca.state.mn.us/publications/wq-strm2-16d.pdf

Minimum requirements

Experience shows that municipal stormwater ordinances should contain at least these essential points:

1. Adequate developer's stormwater controls financial security requirements ($3,000/acre range). This covers both repairing "blown out" controls and remediation costs.
2. Adequately wide grassy buffers between land development and water bodies:
   - 100 feet for rivers and streams
   - 40 feet for wetlands

3. A development's stormwater pollution control plan's protections should be included in the grading plan.

4. If either a trout stream or a 'state outstanding resource value water' is involved, the use of infiltration and/or additional permanent stormwater treatment may be required to protect the resource.

Be careful

No model ordinance meshes perfectly with your existing set of ordinances and perfectly addresses the particular stormwater management needs in your community. Be selective and realistic. These model ordinances represent what the authors considered to be the 'best-of-the-best' ideas in stormwater management at the time of writing.

You're encouraged to use the model ordinances as a reference source for ideas to select from in your process of developing an ordinance customized to your jurisdiction.

To all of those who have assisted us in this effort, we offer our sincere thanks.

Technical assistance

Please call the Stormwater Hotline at 651-757-2119 or toll-free at 800-657-3804.

PERMEABLE PAVING

Spaces between the ***permeable pavers*** direct water to a series of layers below the pavement sub base.

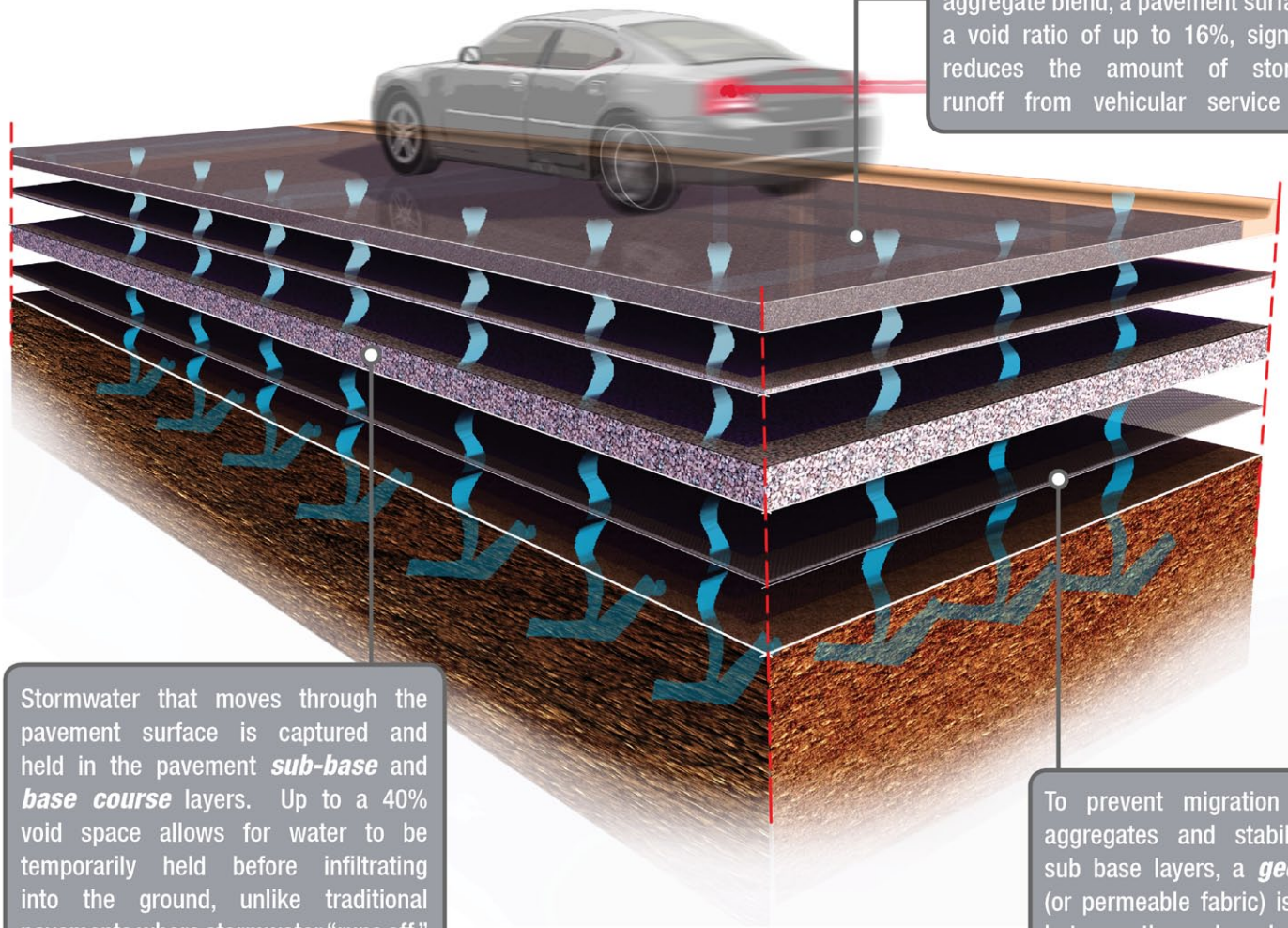
Layers of uniformly graded ***washed rock*** allows water to be temporarily stored below the pavement surface before it infiltrates into the existing soils.

Sandy subsoil has a high infiltration rate allowing water to move through the soil at rates greater than 3" per hour.

Pollutants are removed from the stormwater by small beneficial ***bacteria*** that "digest" and breakdown complex metals and chemicals.

POROUS ASPHALT

Porous asphalt is composed of a highly permeable surface that does not have any "fine sand" or other small aggregates in the pavement. By utilizing an evenly sized aggregate blend, a pavement surface with a void ratio of up to 16%, significantly reduces the amount of stormwater runoff from vehicular service drives.

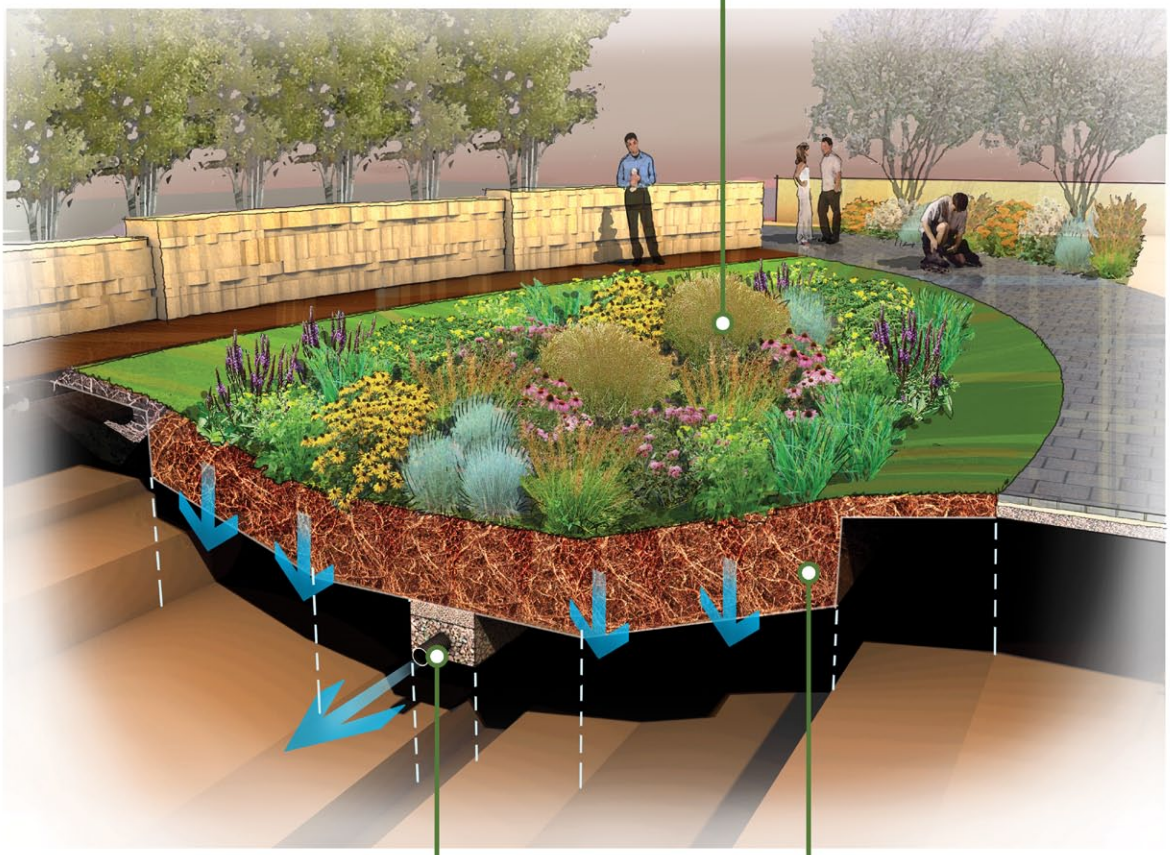


Stormwater that moves through the pavement surface is captured and held in the pavement ***sub-base*** and ***base course*** layers. Up to a 40% void space allows for water to be temporarily held before infiltrating into the ground, unlike traditional pavements where stormwater "runs off."

To prevent migration of the aggregates and stabilize the sub base layers, a ***geotextile*** (or permeable fabric) is placed between the rock and sub soil.

RAINGARDENS

Native Plants help to manage stormwater runoff from buildings, landscapes and the surrounding watershed. The deep rooted native plants and grasses help build soil structure and allow water to infiltrate into the ground better than traditional turf grass. Native plants also are low maintenance, are adapted to the surrounding region, resists pests and diseases as well as provide habitat for local birds and butterflies.



To help remove excess water from the stormwater planter, the ***under drain*** insures that water will not pond on the surface for extended periods of time.

To support plant growth and promote infiltration, rain gardens are often supplemented with organic compost and sand. The ***"amended soil"*** also removes pollutants from contributing waters and helps restore "life" within the soil.

Model Stormwater Management Ordinance

CHAPTER __

Erosion and Sediment Control For Stormwater Management

SECTION _-1. PURPOSE AND AUTHORITY

1. Purpose

A. The purpose of this ordinance is to better manage land development in order to protect, maintain, and enhance the public health, safety, and general welfare of the citizens of (Town Name) by establishing minimum requirements and procedures to control the adverse impacts associated with stormwater runoff.

B. The proper management of stormwater runoff will meet the following objectives:

Reduce the adverse water quality impacts of stormwater discharges to rivers, lakes, reservoirs and streams in order to attain federal water quality standards;
Prevent the discharge of pollutants, including hazardous chemicals, into stormwater runoff;
Minimize the volume and rate of stormwater which is discharged, to rivers, streams, reservoirs, lakes and combined sewers that flows from any site during and following development;
Prevent erosion and sedimentation from land development, and reduce stream channel erosion caused by increased runoff;
Provide for the recharge of groundwater aquifers and maintain the base flow of streams;
Provide stormwater facilities that are attractive, maintain the natural integrity of the environment, and are designed to protect public safety;
Maintain or reduce pre-development runoff characteristics after development to the extent feasible;
Minimize damage to public and private property from flooding;
Ensure that these management controls are properly maintained.

2. Authority

The Department of Public Works shall administer, implement and enforce this ordinance. Any powers granted to or duties imposed upon the Department of Public Works may be delegated in writing by the Board of Public Works to employees or agents of the Department of Public Works.

SECTION _-2. DEFINITIONS

The following definitions describe the meaning of the terms used in this Ordinance:

Authorized Enforcement Agency: The Department of Public Works, its employees or agents designated to enforce this ordinance.

"Adverse impact" means any deleterious effect on waters or wetlands, including their quality, quantity, surface area, species composition, aesthetics or usefulness for human or natural uses which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity, or stability or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation.

"Best management practices (BMP)" are structural or biological devices that temporarily store or treat urban stormwater runoff to reduce flooding, remove pollutants, and provide other amenities. They can also be non-structural practices that reduce pollutants at their source. BMPs are described in a stormwater design manual, Stormwater Management, Volume Two: Stormwater Technical Handbook (March, 1997, Mass. Department of Environmental Protection, as updated or amended).

“Construction activity” is disturbance of the ground by removal of vegetative surface cover or topsoil, grading, excavation, clearing or filling.

"Design storm" is a rainfall event of specified size and return frequency that is used to calculate the runoff volume and peak discharge rate to a BMP.

"Detention" is the temporary storage of storm runoff in a BMP, which is used to control the" peak discharge rates, and which provides gravity settling of pollutants.
extended detention

“Disturbance” is any land clearing, grading, bulldozing, digging or similar activities.

"Drainage area" means that area contributing runoff to a single point measured in a horizontal plane, which is enclosed by a ridgeline.

"Drywell" is similar to an infiltration trench but smaller with inflow from a pipe; commonly covered with soil and used for drainage areas of less than 1 acre such as roadside inlets and rooftops runoff.

"Easement" means a grant or reservation by the owner of land for the use of such land by others for a specific purpose or purposes, and which must be included in the conveyance of land affected by such easement.

"Flow attenuation" means prolonging the flow time of runoff to reduce the peak discharge.

"Hydrology model” may include one of the following:
TR-20, a watershed hydrology model developed by the Natural Resources Conservation Service act that is used to route a design storm hydrograph through a pond;
TR 55, or Technical Release 55, "Urban Hydrology for Small Watersheds" is a publication developed by the Natural Resources Conservation Service to calculate stormwater runoff and an aid in designing detention basins;
Hydrocad.

"Impervious surfaces" are areas, such as pavement or rooftops, which prevent the infiltration of water into the soil.

"Infiltration" is the downward movement of water from the surface to the subsoil.

"Infiltration trench"" is a stormwater management excavation filled with aggregate which removes both soluble and particulate pollutants. Trenches are not intended to trap coarse sediments.

"Outfall" is the terminus of a storm drain or other stormwater structure where the contents are released.

"Peak discharge" is the maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event

"Permeable soils" are soil materials with a sufficiently rapid infiltration rate so as to greatly reduce or eliminate surface and stormwater runoff. These soils are generally classified as NRCS hydrologic soil types A and B.

"Person" is any individual, group of individuals, association, partnership, corporation, company, business, organization, trust, estate, administrative agency, public or quasi-public corporation or body, the Commonwealth or political subdivision thereof.

"Retention" is the holding of runoff in a basin without release except by means of evaporation, infiltration, or emergency bypass.

“Start of construction” is the first land-disturbing activity associated with a development, including land preparation such as: clearing, grading and filling; installation of streets and walkways; excavation for basements; footings, piers or foundations; erection of temporary forms; and installation of accessory buildings such as garages.

"Swale" is a natural depression or wide shallow ditch used to temporarily store, route, or filter runoff.

SECTION _-3. APPLICABILITY

1. Applicability

Prior to the issuance of any site plan approval or development permit for any proposed development listed below, a stormwater management permit, or a waiver of the requirement for a stormwater management permit, must be approved by the applicable Special Permit Granting Authority. No person shall, on or after the effective date of the ordinance, initiate any land clearing, land grading, earth moving or development activities without first complying with this ordinance. The following uses and activities shall be required to submit drainage reports, plans, construction drawings, specifications and as-constructed information in conformance with the requirements of this ordinance:

Multi-family residential developments involving four or more units;
Any new commercial, industrial, and institutional structures under the same ownership, with at least 5,000 square feet of gross floor area, 10,000 square feet of impervious surface, or that require 10 or more parking spaces.
Redevelopment or additions to existing commercial, industrial, and institutional uses which result in an additional impervious surface area or gross floor area of greater than 5,000 square feet, or which results in an increase of 10 or more parking spaces.
Subdivisions and construction activities of any kind disturbing greater than 40,000 square feet.
Development or redevelopment involving multiple separate activities in discontinuous locations or on different schedules if the activities are part of a larger common plan of development that all together disturbs one or more acres.

Exemptions

To prevent the adverse impacts of stormwater runoff, the stormwater performance standards in Section 29-6 must be met at new development sites. These standards apply to construction activities as described under Section 29-3.1. The following activities are exempt from the requirements for submittal and approval of a stormwater management plan under Section 29-4, but must comply with the stormwater performance standards in Section 29-6:
Any agricultural activity which is consistent with an approved soil conservation plan prepared or approved by the Natural Resource Conservation Service;

Any logging which is consistent with a timber management plan approved under the Forest Cutting Practices Act by Massachusetts Department of Environmental Management;
Additions or modifications to existing single family structures;
Developments that do not disturb more than 40,000 square feet of land, provided that they are not part of a larger common development plan;
Repairs to any stormwater treatment system deemed necessary by the (Town Name) Department of Public Works;
Any emergency activity that is immediately necessary for the protection of life, property or the environment, as determined by the Department of Public Works; and
Single family residential uses disturbing less than 40,000 square feet.

Stormwater Design Manual

A stormwater design manual, Stormwater Management, Volume Two: Stormwater Technical Handbook (March, 1997, Mass. Department of Environmental Protection, as updated or amended) is hereby incorporated by reference as part of this ordinance, and shall furnish additional policy, criteria and information including specifications and standards, for the proper implementation of the requirements of this ordinance.

This manual includes a list of acceptable stormwater treatment practices, including the specific design criteria for each stormwater practice. The manual may be updated and expanded from time to time, based on improvements in engineering, science, monitoring and local maintenance experience, at the discretion of the (Town Name) Department of Public Works or Massachusetts Department of Environmental Protection. Stormwater treatment practices that are designed and constructed in accordance with these design and sizing criteria will be presumed to meet the minimum water quality performance standards.

SECTION _-4 . PERMIT PROCEDURES AND REQUIREMENTS

1. Permit Required

No land owner or land operator shall receive any of the building, grading, or other land development permits required for land disturbance activities, and no land owner shall commence land disturbance activities, without approval of a Stormwater Management Permit from the Department of Public Works and meeting the requirements of this ordinance.

Application Requirements

Application for approval of a Stormwater Management Permit shall include the following:

A stormwater management plan or an application for waiver shall be submitted to the (Town Name) Department of Public Works for review and approval for any proposed development specified in Section 3.1. Three copies of the stormwater management plan shall be submitted, and clearly labeled, along with other documents required in this zoning ordinance for site plan review. The plan shall contain supporting computations, drawings, and sufficient information describing the manner, location, and type of measures in which stormwater runoff will be managed from the entire development. The plan shall serve as the basis for all subsequent construction.

An erosion and sediment control plan, which shall contain sufficient information to describe the nature and purpose of the proposed development.

ongoing maintenance agreement

non-refundable permit review fee

The applicant may request, and the (Town Name) Department of Public Works may grant, a waiver from any information requirements it judges to be unnecessary to the review of a particular plan.

3. Procedures for Review and Approval of Stormwater Permits

The procedures for review and approval of stormwater management permits shall be consistent with (review procedures of DPW), as appropriate to the use.

The Department of Public Works shall refer copies to the stormwater management permits to the Town Engineer for review, and shall consider any comments submitted by the Town Engineer during the review period.

The Department of Public Works shall hold a public hearing within twenty-one (21) days of the receipt of a complete application and shall take final action within twenty-one (21) days from the close of the hearing unless such time is extended by agreement between the applicant and [insert appropriate board or department]. Notice of the public hearing shall be given by publication in a local paper of general circulation, by posting and by first-class mailings to abutters at least seven (7) days prior to the hearing.

4. Criteria for Review of Stormwater Permits

In addition to other criteria used by the (Town Name) Department of Public Works in making permit decisions, for the uses specified in this ordinance, the Department of Public Works must also find that the Stormwater Management Plan submitted with the permit application meets the following criteria:

A. the Stormwater Management Plan and the Erosion and Sediment Control Plan are consistent with the Purposes and Objectives of this Bylaw in Section 29-1;

the Stormwater Management Plan meets the Performance Standards described in Section 29-6;

the Erosion and Sediment Control plan must meet the Design Requirements in Section 29-7.

DPW Action

The Department of Public Works' action, rendered in writing, shall consist of either:

Approval of the Stormwater Management Permit Application based upon determination that the proposed plan meets the purposes in Section 29-1 and the standards in Section 29-6 and will adequately protect the water resources of the community and is in compliance with the requirements set forth in this by-law;

Approval of the Stormwater Management Permit Application subject to any conditions, modifications or restrictions required by the Board which will ensure that the project meets the purposes in Section 29-1 and the standards in Section 29-6 and adequately protects water resources, set forth in this by-law;

Disapproval of the Stormwater Management Permit Application based upon a determination that the proposed plan, as submitted, does not meet the purposes in Section 29-1 and the standards in Section 29-6 or adequately protect water resources, as set forth in this by-law.

Failure of the Board to take final action upon an Application within the time specified above shall be deemed to be approval of said Application. Upon certification by the Town Clerk that the allowed time has passed without Board action, the Board must issue a Stormwater Management Permit.

6. Inspections

No Plan will be approved without adequate provision for inspection of the property before development activity commences. The applicant shall arrange with the DPW for scheduling the following inspections:

Initial inspection: prior to approval of any plan
Erosion Control Inspections: after site clearing, rough grading and final grading to ensure erosion control practices are in accord with the plan.
Bury inspection: prior to backfilling of any underground drainage or stormwater conveyance structures;
Final Inspection: when all work, including construction of stormwater management facilities and landscaping have been completed. Final inspection shall include a full, dated TV inspection of all stormwater pipes installed.

The Department of Public Works or its agent shall inspect the work and either approve it or notify the applicant in writing in what respects there has been a failure to comply with the requirements of the approved plan. Any portion of the work which does not comply shall be promptly corrected by the applicant or the applicant will be subject to the bonding provisions of Section 29-9 or the penalty provisions of Section 29-10. The Town may conduct random inspections to ensure effective control of erosion and sedimentation during all phases of construction.

Right-of-Entry for Inspection

When any new drainage control facility is installed on private property, or when any new connection is made between private property and a public drainage control system or sanitary sewer, the filing of an application shall be deemed as the property owner's permission to the (Town Name) Department of Public Works for the right to enter the property at reasonable times and in a reasonable manner for the purpose of the inspection. This includes the right to enter a property when it has a reasonable basis to believe that a violation of this ordinance is occurring or has occurred, and to enter when necessary for abatement of a public nuisance or correction of a violation of this ordinance.

Application Review Fees

The fee for review of any land development application shall be based on the amount of land to be disturbed at the site and the fee structure established by the (Town Name) Board of Public Works. All of the monetary contributions shall be credited to the utility enterprise fund, and shall be made prior to issuance of any building permit for development.

Section _-5. The Stormwater Management and Erosion Control Plan

Contents of the Stormwater Management and Erosion Control Plan

The application for a stormwater management permit shall consist of submittal of a stormwater management and erosion control plan, prepared by a professional engineer licensed by the Commonwealth of Massachusetts, which meets the design requirements provided by this

Ordinance. The plan shall include sufficient information to evaluate the environmental characteristics of the affected areas, the potential impacts of the proposed development on water resources; and the effectiveness and acceptability of measures proposed for managing stormwater runoff. The Plan must be designed to meet the Massachusetts Stormwater Management Standards as set forth in Section 29-6 of this ordinance and the DEP Stormwater Management Handbook Volumes I and II. The applicant shall certify on the drawings that all clearing, grading, drainage, construction, and development shall be conducted in strict accordance with the plan. The minimum information submitted for support of a stormwater management plan shall be as follows:

A. A locus map,
The existing zoning, and land use at the site,
The proposed land use,
The location(s) of existing and proposed easements,
The location of existing and proposed utilities,
The site's existing & proposed topography with contours at 2 foot intervals,
The existing site hydrology,
A description & delineation of existing stormwater conveyances, impoundments, and wetlands on or adjacent to the site or into which storm water flows.
A delineation of 100-year flood plains, if applicable
Estimated seasonal high groundwater elevation (November to April) in areas to be used for storm water retention, detention, or infiltration.
The existing and proposed vegetation and ground surfaces with runoff coefficient for each,
A drainage area map showing pre and post construction watershed boundaries, drainage area and storm water flow paths,
A description and drawings of all components of the proposed drainage system including:
locations, cross sections, and profiles of all brooks, streams, drainage swales and their method of stabilization,
all measures for the detention, retention or infiltration of water,
all measures for the protection of water quality,
the structural details for all components of the proposed drainage systems and storm water management facilities,
notes on drawings specifying materials to be used, construction specifications, and typicals, and expected hydrology with supporting calculations.
Proposed improvements including location of buildings or other structures, impervious surfaces, and drainage facilities, if applicable,
A description of construction and waste materials expected to be stored on-site, and a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, and spill prevention and response.
Timing, schedules, and sequence of development including clearing, stripping, rough grading, construction, final grading, and vegetative stabilization, and
A maintenance schedule for the period of construction

Section _-6. Stormwater Management Performance Standards

1. Minimum Control Requirements

Projects must meet the Standards of the Massachusetts Stormwater Management Policy. These Standards are:

A. No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or water of the Commonwealth.

B. Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

C. Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge rate from the pre-development or existing site conditions, based on soil types.

For new development, stormwater management systems must be designed to remove 80% of the average annual load (post development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when:

(1) Suitable nonstructural practices for source control and pollution prevention and implemented;
(2) Stormwater management best management practices (BMPs) are sized to capture the prescribed runoff volume; and
(3) Stormwater management BMPs are maintained as designed.

E. Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs (see Stormwater Management Volume I: Stormwater Policy Handbook). The use of infiltration practices without pretreatment is prohibited.

F. Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas (see Stormwater Management Volume I: Stormwater Policy Handbook). Critical areas are Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries and recharge areas for public water supplies.

G. Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

H. Erosion and sediment controls must be implemented to prevent impacts during disturbance and construction activities.

I. All stormwater management systems must have an operation and maintenance plan to ensure that systems function as designed.

When the proposed discharge may have an impact upon a sensitive receptor, including streams, storm sewers, and/or combined sewers, the DPW may require an increase in these minimum requirements, based on existing stormwater system capacity.

2. Stormwater Management Measures

A. Stormwater management measures shall be required to satisfy the minimum control requirements and shall be implemented in the following order of preference:

Infiltration, flow attenuation, and pollutant removal of runoff on-site to existing areas with grass, trees, and similar vegetation and through the use of open vegetated swales and natural depressions;
Use of stormwater on-site to replace water used in industrial processes or for irrigation;
Stormwater detention structures for the temporary storage of runoff which is designed so as not to create a permanent pool of water; and
Stormwater retention structures for the permanent storage of runoff by means of a permanent pool of water.

Retention and evaporation of stormwater on rooftops or in parking lots;

B. Infiltration practices shall be utilized to reduce runoff volume increases. A combination of successive practices may be used to achieve the applicable minimum control requirements. Justification shall be provided by the applicant for rejecting each practice based on site conditions.

C. Best Management Practices shall be employed to minimize pollutants in stormwater runoff prior to discharge into a separate storm drainage system or water body.

D. All stormwater management facilities shall be designed to provide an emergency overflow system, and incorporate measures to provide a non-erosive velocity of flow along its length and at any outfall.

E. The designed release rate of any stormwater structure shall be modified if any increase in flooding or stream channel erosion would result at a downstream dam, highway, structure, or normal point of restricted stream flow.

3. Specific Design Criteria

Additional policy, criteria, and information including specifications and design standards may be found in the Stormwater Design Manual.

Infiltration systems

Infiltration systems shall be equipped with clean stone and or filter fabric adjacent to the soil or other sediment removal mechanisms;
Infiltration systems greater than 3 feet deep shall be located at least l0 feet from basement walls;
Due to the potential for groundwater contamination from dry wells, they shall not be an acceptable method for management runoff containing pollutants;
Infiltration systems designed to handle runoff from commercial or industrial impervious parking areas shall be a minimum of 100 feet from any drinking water supply well;
Infiltration systems shall not be used as sediment control basins during construction unless specific plans are included to restore or improve the basin surface;
Infiltration basins shall be constructed with a three foot minimum separation between the bottom of the structure and the seasonal high groundwater elevation, as determined by a certified soil evaluator; and
Provisions shall be made for safe overflow passage, in the event of a storm which exceeds the capacity of an infiltration system.

Retention and detention ponds shall be designed and constructed in accordance with the criteria of the Stormwater Management, Volume Two: Stormwater Technical Handbook (March, 1997, Mass. Department of Environmental Protection, as updated or amended).

C. The applicant shall give consideration in any plan to incorporating the use of natural topography and land cover such as natural swales, and depressions as they exist prior to development to the degree that they can accommodate the additional flow of water.

D. The Department of Public Works shall give preference to the use of swales in place of the traditional use of curbs and gutters based on a case by case review of stormwater management plans by the Town Engineer and Department of Public Works.

E. The applicant shall consider public safety in the design of any stormwater facilities. The banks of detention, retention, and infiltration basins shall be sloped at a gentle grade into the

water as a safeguard against personal injury, to encourage the growth of vegetation and to allow the alternate flooding and exposure of areas along the shore. Basins shall have a 4:1 slope to a depth two feet below the control elevation. Side slopes must be stabilized and planted with vegetation to prevent erosion and provide pollutant removal The banks of detention and retention areas shall be designed with sinuous rather than straight shorelines so that the length of the shoreline is maximized, thus offering more space for the growth of vegetation;

F. Where a stormwater management plan involves direction of some or all runoff off of the site, it shall be the responsibility of the applicant to obtain from adjacent property owners any easements or other necessary property interests concerning flowage of water. Approval of a stormwater management plan does not create or affect any such rights.

G. All applicants for projects which involve the storage or use of hazardous chemicals shall incorporate handling and storage "best management practices" that prevent such chemicals from contaminating runoff discharged from a site into infiltration systems, receiving water bodies or storm drains, and shall include a list of such chemicals in the application.

H. Runoff from parking lots shall be treated by oil and water separators or other controls to remove oil and sediment;

I. The basic design criteria methodologies, and construction specifications, subject to the approval of the Department of Public Works and Town Engineer, shall be those generally found in the most current edition of the Stormwater Management, Volume Two: Stormwater Technical Handbook (March, 1997, Mass. Department of Environmental Protection, as updated or amended).

Section _-7. Design Requirements for Erosion and Sediment Control Plan

1. The design requirements of the Erosion and Sediment Control Plan are:

Minimize total area of disturbance

Sequence activities to minimize simultaneous areas of disturbance.

Minimize peak rate of runoff in accordance with the MA DEP Stormwater Policy.

Minimize soil erosion and control sedimentation during construction. Prevention of erosion is preferred over sedimentation control.

Divert uncontaminated water around disturbed areas

Maximize groundwater recharge.

Install, and maintain all Erosion and Sediment Control measures in accordance with the manufacturers specifications and good engineering practices

Prevent off-site transport of sediment.

Protect and manage on and off-site material storage areas (overburden and stockpiles of dirt, borrow areas, or other areas used solely by the permitted project are considered a part of the project).

Comply with applicable Federal, State and local laws and regulations including waste disposal,

sanitary sewer or septic system regulations, and air quality requirements, including dust control

Prevent adverse impact from the proposed activities to habitats mapped by the Massachusetts Natural Heritage & Endangered Species Program as Endangered, Threatened or of Special concern, Estimated Habitats of Rare Wildlife and Certified Vernal Pools, and Priority Habitats of Rare Species.

Institute interim and permanent stabilization measures. The measures shall be instituted on a disturbed area as soon as practicable but no more than 14 days after construction activity has temporarily or permanently ceased on that portion of the site.

Properly manage on-site construction and waste materials.

Prevent off-site vehicle tracking of sediments.

Section _-8 Maintenance

1. Operation, Maintenance and Inspection Agreement

Prior to issuance of any building permit for which stormwater management is required, the Department of Public Works shall require the applicant or owner to execute an operation, maintenance and inspection agreement binding on all subsequent owners of land served by the private stormwater management facility. The agreement shall be designed to ensure that water quality standards are met in all seasons and throughout the life of the system. Such agreement shall provide for access to the facility at reasonable times for regular inspections by the Town or its authorized representative and for regular or special assessments of property owners to ensure that the facility is maintained in proper working condition to meet design standards and any provision established. The agreement shall include:

The name(s) of the owner(s) for all components of the system.
Maintenance agreements that specify:
The names and addresses of the person(s) responsible for operation and maintenance.
The person(s) responsible for financing maintenance and emergency repairs.
A Maintenance Schedule for all drainage structures, including swales and ponds.
A list of easements with the purpose and location of each.
The signature(s) of the owner(s).
Stormwater management easements as necessary for:
Access for facility inspections and maintenance.
Preservation of stormwater runoff conveyance, infiltration, and detention areas and facilities, including flood routes for the 100-year storm event.
Direct maintenance access by heavy equipment to structures requiring regular cleanout.
(4) Stormwater management easement requirements:
The purpose of each easement shall be specified in the maintenance agreement signed by the property owner.
Stormwater management easements are required for all areas used for off-site stormwater control, unless a waiver is granted by the Town.
Easements shall be recorded with the Registry of Deeds prior to issuance of a Certificate of Completion.
(5) Changes to Operation and Maintenance Plans
The owner(s) of the stormwater management system must notify the Department of Public Works] of changes in ownership or assignment of financial responsibility.
The maintenance schedule in the Maintenance Agreement may be amended to achieve the purposes of this by-law by mutual agreement of the Department of Public Works] and the

Responsible Parties. Amendments must be in writing and signed by all Responsible Parties. Responsible Parties must include owner(s), persons with financial responsibility, and persons with operational responsibility.

B. The agreement shall be recorded by the applicant and/or owner in the land records of the Registry of Deeds.

C. The agreement shall also provide that, if after notice by the Town Engineer to correct a violation requiring maintenance work, satisfactory corrections are not made by the owner(s) within thirty days, the Department of Public Works may perform all necessary work to place the facility in proper working condition. The owner(s) of the facility shall be assessed the cost of the work and any penalties.

2. Maintenance Responsibility

A. The owner of the property on which work has been done pursuant to this Ordinance for private stormwater management facilities, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sediment control measures and other protective devices. Such repairs or restoration and maintenance shall be in accordance with approved plans.

B. A maintenance schedule shall be developed for the life of any stormwater management facility and shall state the maintenance to be completed, the time period for completion, and who shall be legally responsible to perform the maintenance. This maintenance schedule shall be printed on the stormwater management plan.

C. Records of installation and maintenance

D. Failure to maintain practices

Section _-9. Performance Bond

The Department of Public Works shall require from the developer a surety or cash bond, irrevocable letter of credit, or other means of security acceptable to the Department of Public Works prior to the issuance of any building permit for the construction of a development requiring a stormwater management facility. The amount of the security shall not be less than the total estimated construction cost of the stormwater management facility. The bond so required in this section shall include provisions relative to forfeiture for failure to complete work specified in the approved stormwater management plan, compliance with all of the provisions of this Ordinance and other applicable laws and regulations, and any time limitations. The bond shall not be fully released without a final inspection of the completed work by the Town Engineer, submission of" As-built" plans, and certification of completion by the Department of Public Works of the stormwater management facilities being in compliance with the approved plan and the provisions of this Ordinance.

Section _-10. Enforcement and Penalties

1. Violations
Any development activity that has commenced or is conducted contrary to this Ordinance may be restrained by injunction or otherwise abated in a manner provided by law.

2. Notice of Violation

When the (Town Name) Department of Public Works determines that an activity is not being carried out in accordance with the requirements of this Ordinance, it shall issue a written notice of violation to the owner of the property. The notice of violation shall contain:
the name and address of the owner applicant;
the address when available or the description of the building, structure, or land upon which the violation is occurring;
a statement specifying the nature of the violation;
a description of the remedial measures necessary to bring the development activity into compliance with this Ordinance and a time schedule for the completion of such remedial action;
a statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;
a statement that the determination of violation may be appealed to the municipality by filing a written notice of appeal within fifteen (15) days of service of notice of violation.

3. Stop Work Orders

Persons receiving a notice of violations will be required to halt all construction activities. This "stop work order" will be in effect until the (Town Name) Department of Public Works confirms that the development activity is in compliance and the violation has been satisfactorily addressed. Failure to address a notice of violation in a timely manner can result in civil, criminal, or monetary penalties in accordance with the enforcement measures authorized in this Ordinance.

4. Criminal and Civil Penalties

Any person who violates any provision of this ordinance, valid regulation, or the terms or conditions in any permit or order prescribed or issued thereunder, shall be subject to a fine not to exceed $300.00 for each day such violation occurs or continues or subject to a civil penalty, which may be assessed in an action brought on behalf of the Town in any court of competent jurisdiction.

5. Non-Criminal Disposition

As an alternative to criminal prosecution or civil action, the Town of (Town Name) may elect to utilize the non-criminal disposition procedure set forth in (Town Name) Town ordinances ~~G.L. Ch.. 40, §21D~~. The Department of Public Works shall be the enforcing entity. The penalty for the 1st violation shall be up to $100. The penalty for the 2nd violation shall be up to $200. The penalty for the 3rd and subsequent violations shall be $ 300.00. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

6. Restoration of Lands

Any violator may be required to restore land to its undisturbed condition. In the event that restoration is not undertaken within a reasonable time after notice, the (Town Name) Department of Public Works may take necessary corrective action, the cost of which shall become a lien upon the property until paid.

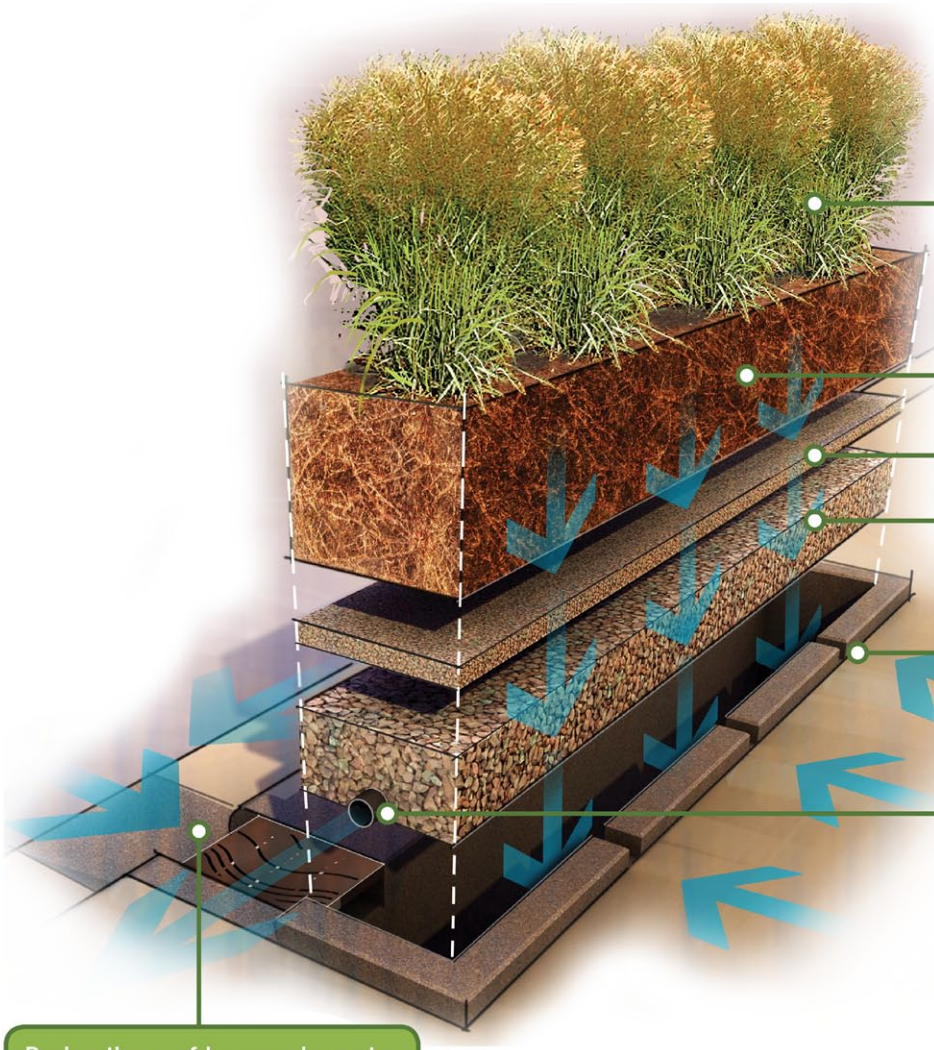
7. Holds on Occupancy Permits

Occupation permits will not be granted until corrections to all stormwater practices have been made and accepted by the (Town Name) Department of Public Works.

Section _-11. Severability

The invalidity of any section or provision of this Ordinance shall not invalidate any other section or provision thereof.

STORMWATER PLANTERS



Salt tolerant ***native plants*** stabilize the soils and provide habitat for native organisms.

Plant growth and stormwater infiltration are enhanced by ***amended soil*** and layers of open graded ***washed rock***.

Stormwater that collects on the sidewalk is direct to the planters through a series of ***curb cuts***.

To help remove excess water from the stormwater planter, the ***under drain*** insures that water will not pond on the surface for extended periods of time, creating an unhealthy soil for plants.

During times of heavy rain, water flows into the ***curb inlets*** and flows into the stormwater planter.