

# Asking the Right Questions in Stormwater Review

Rutgers Cooperative Extension Water Resources Program and  
Association of New Jersey Environmental Commissions

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# Why are we here?

The approval of a developer's stormwater management plans lies **solely** with the municipality.

Municipalities are **required** under their *Municipal Stormwater General Permit* to enforce statewide basic requirements for post-construction stormwater management in new development and redevelopment.

# Purpose of Workshop

This workshop is intended to help you understand if a developer is in compliance with the NJ Stormwater Management Regulations so you can be comfortable in approving or rejecting the developer's plan.

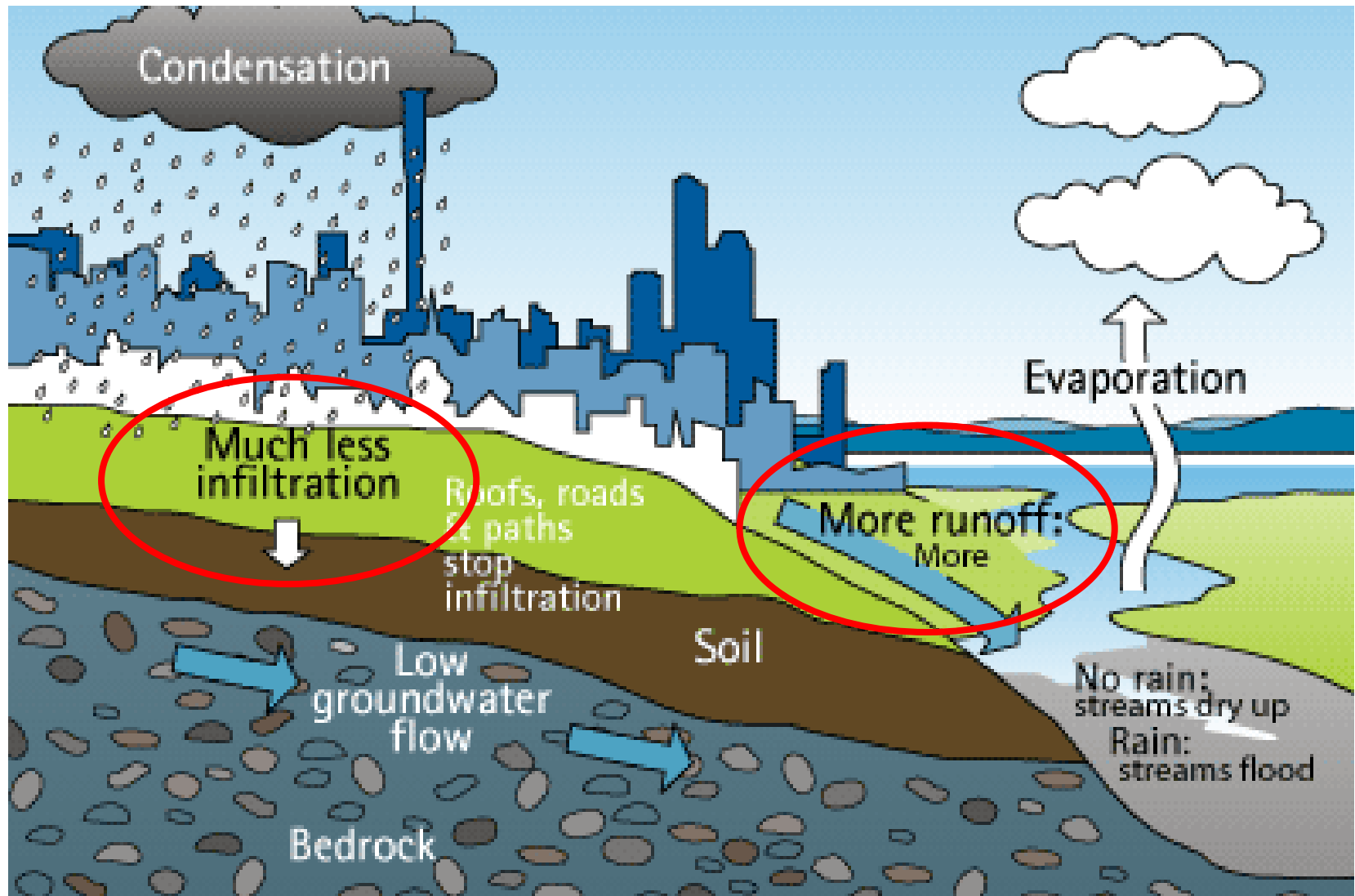
# The Impact of Development on Stormwater Runoff



*More development* → *More impervious surfaces* → *More stormwater runoff*



# The Urban Hydrologic Cycle



- New Jersey's total impervious footprint as of 2007 was **508,681 acres or nearly 800 square miles** (about 11% of the State's land area) is rooftop, concrete and asphalt
- That equates to about **2439 square feet** of impervious surface per person
- Assuming precipitation of 48 inches per year, each person's impervious cover produces about **72,990 gallons of run-off per year**, almost enough to fill an olympic swimming pool
- Other large areas produce run-off from **compacted soils**

- During the 2002-2007 period, New Jersey added **21,348 acres (33.4 square miles)** of additional impervious surface.
- Statewide, this is an **annual** rate of 4,270 acres of impervious surface increase per year or **9 football fields of new impervious surface per day (including end zones)**.

# Resulting In Annual Increased Run-off of: 5,454,263,223.1 gallons per year



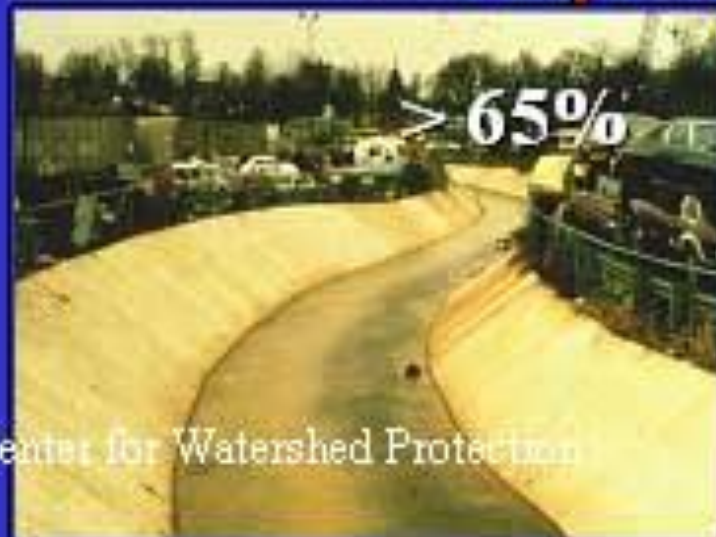
- This is an annual increase large enough to cover 16,571 acres of land ( about the size of Bernards Twp.) to a depth of one foot
- Climate change may increase this volume and flooding frequency



# Geomorphological Impacts



**Impervious Cover**





# History of Stormwater Management



# 1<sup>st</sup> Attempt at Stormwater Management

*Capture all runoff, pipe it, and send it directly to the river . . . prior to mid 1970's*



# 2<sup>nd</sup> Iteration of Stormwater Management

*Capture runoff, detain it, release it slowly to the river...mid 1970's to 2004*

- Detain peak flow during large storm events
- Reduce downstream flooding during major storms
- Use concrete low flow channels to minimize erosion, reduce standing water, quickly discharge low flows
- Does not manage runoff from smaller storms
- Directly discharges stormwater runoff to nearby stream, waterway, or municipal storm sewer system (at a controlled/managed rate)



# 2004 NJ Stormwater Regulations

## Municipal “Phase II” NJPDES Stormwater Permitting Rules

(N.J.A.C. 7:14a)

- Municipalities and large public complexes must obtain NJPDES permits for their storm sewer system
- Permittees must develop, implement, and enforce a stormwater program that protects water quality
- Permittees must prepare and implement a Stormwater Pollution Prevention Plan (SPPP):
  - Municipal stormwater management plan
  - stormwater control ordinance
  - public education program

## Stormwater Management Rules (N.J.A.C. 7:8)

- Sets forth stormwater management goals for new development:
  - Reduce flood damage
  - Reduce soil erosion
  - Protect public safety through proper design and operation of stormwater management basins
  - Minimize increases in peak runoff
  - Maintain groundwater recharge
  - Protect water quality
- Sets forth the required components of regional and municipal stormwater management plans

# 3<sup>rd</sup> Generation of Stormwater Management

- Reduce peak flows
- **...and....**
- Maintain infiltration and groundwater recharge
- Reduce pollution discharged to local waterways



*abc Action News, August 27, 2012*



# Stormwater Management

## Key Objectives

- Use nonstructural management strategies
- Protect communities from increases in stormwater volume and peak flows as a result of new development
- Maintain groundwater recharge
- Protect waterways from pollution carried in stormwater runoff



*NJ.com, August 28, 2011*

# Nonstructural Strategies

- Plan the project using Low Impact Development (LID) Principles
- Collect, infiltrate and where possible reuse stormwater near its source
- Capture runoff from small storm events in vegetated systems to protect water quality and promote recharge
- Minimize and disconnect impervious surfaces



# Water Quantity Performance Standards

## *Water Quantity*

- Demonstrate that post-development 2, 10, and 100-year storm event hydrographs do not exceed pre-development hydrographs

*or*

- Demonstrate that hydrograph peaks will not increase and that increase in volume or change in timing won't increase flood damage downstream

*or*

- Design BMPs so that 2, 10, and 100-year pre-development hydrographs are reduced to 50%, 75%, and 80%, respectively
  - 2-year rainfall (3.3 inches)
  - 10-year rainfall (5.0 inches)
  - 100-year rainfall (8.3 inches)

# Groundwater Recharge Performance Standards

## *Groundwater Recharge*

- Maintain 100% of average annual groundwater recharge volume

*or*

- Infiltrate increase in the post development runoff volume for the 2-year storm

# Water Quality Performance Standards

## *Water Quality*

- Install BMPs to reduce at least 80% of total suspended solids (TSS) loads
- Install BMPs to provide nutrient removal to maximum extent feasible

| <u>BMP</u>               | <u>TSS Removal Rate</u> |
|--------------------------|-------------------------|
| Bioretention             | 90%                     |
| Constructed Wetlands     | 90%                     |
| Forested Buffers         | 70%                     |
| Extended Detention Basin | 40-60%                  |
| Infiltration Structure   | 80%                     |
| Sand Filter              | 80%                     |
| Vegetative Filter Strip  | 50%                     |
| Wet Pond                 | 60-90%                  |

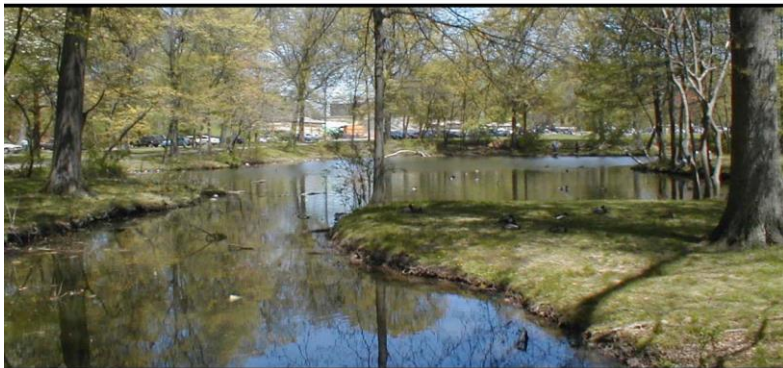
SOURCE: NJ Stormwater Management Rules  
and BMP Manual

# NJ Stormwater Guidance



## Tier A

Municipal Stormwater Guidance Document  
NJPDES General Permit No NJ0141852



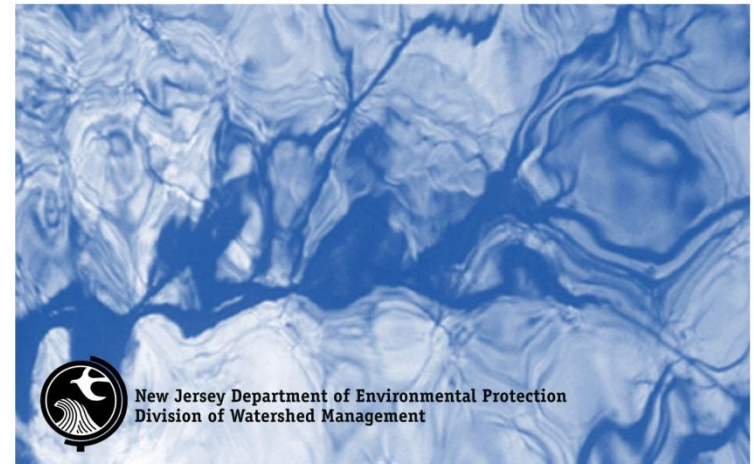
New Jersey Department of Environmental Protection  
Division of Water Quality  
Municipal Stormwater Regulation Program



New Jersey

## Stormwater

Best Management Practices Manual



New Jersey Department of Environmental Protection  
Division of Watershed Management

For more information, visit: [www.njstormwater.org](http://www.njstormwater.org)

The approval of a developer's stormwater management plans lies **solely** with the municipality.

# As municipal officials...what is NOT your responsibility...

- You do NOT need to know how to meet required nonstructural management strategies
- You do NOT need to know how to design or use BMPs
- You do NOT need to know how to maintain BMPs

# The Role of Municipal Officials...

- You need to know how to ask the right questions of the professionals and the applicant
- Clearly understand that all applicants have to satisfy standards for:
  - Nonstructural Stormwater Management Strategies
  - Stormwater Quantity
  - Groundwater Recharge
  - Stormwater Quality
  - Stormwater Maintenance Plan
- Have confidence that your questions have been adequately answered by the professionals and the applicant so that approval can be given

# Who approves a developer's stormwater management plan?

The approval of a developer's stormwater management plans lies solely with the municipality.

A permit from NJDEP is not an approval of the applicant stormwater management plan.

**ONLY** the municipality can approve a developer's stormwater management plan.



# Bottom line - what does the developer really need to do?

1. Maintain groundwater recharge on the site
2. Reduce sediment and nutrient runoff from the site
3. Reduce the peak stormwater runoff rates from the site

## How should a developer do this?

- 1<sup>st</sup> Use Nonstructural Strategies to achieve 1, 2, and 3

| No. | Nonstructural Strategy  | Yes | No |
|-----|---|-----|----|
| 1.  | Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss  |     |    |
| 2.  | Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces   |     |    |
| 3.  | Maximize the protection of natural drainage features and vegetation   |     |    |
| 4.  | Minimize the decrease in the pre-construction time of concentration   |     |    |
| 5.  | Minimize land disturbance including clearing and grading  |     |    |
| 6.  | Minimize soil compaction  |     |    |
| 7.  | Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides |     |    |
| 8.  | Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas   |     |    |
| 9.  | Provide preventative source controls  |     |    |

**Explain why any one of these is “NO.” Engineering, environmental and/or safety reasons are only acceptable.**

# Bottom line - what does the developer really need to do?

1. Maintain groundwater recharge on the site
2. Reduce sediment and nutrients runoff from the site
3. Reduce the peak stormwater runoff from the site

## How should a developer do this?

- 2<sup>nd</sup>. Focus on incorporating systems that address water quality and groundwater recharge



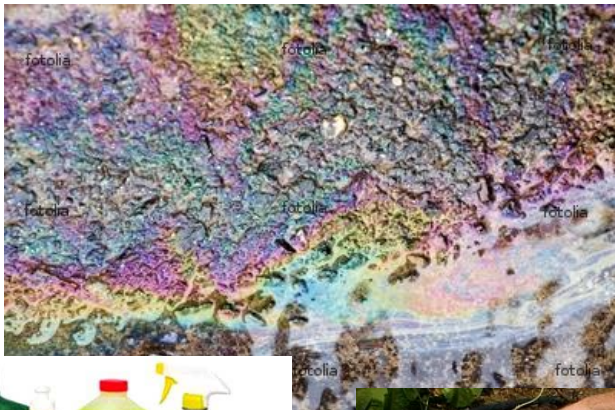
# Nonpoint Source Pollution

- Nonpoint Source (NPS) Pollution is pollution associated with stormwater runoff
- NPS occurs when runoff collects pollutants on its way to a collection system or water body
- NPS pollution cannot be traced to a direct discharge point such as a wastewater treatment facility



# Examples of NPS

- Oil and grease from cars
- Fertilizers
- Animal waste
- Grass clippings
- Septic systems
- Sewage leaks
- Household cleaning products
- Litter
- Agriculture
- Sediment



# Table 2: TSS Removal Rates for BMPs

| <u>Best Management Practice Rate</u> | <u>TSS Percent Removal</u> |
|--------------------------------------|----------------------------|
| Bioretention Systems                 | 90                         |
| Constructed Stormwater Wetland       | 90                         |
| Extended Detention Basin             | 40-60                      |
| Infiltration Structure               | 80                         |
| Sand Filter                          | 80                         |
| Vegetative Filter Strip              | 60-80                      |
| Wet Pond                             | 50-90                      |
| Manufactured Treatment Device        | See N.J.A.C.<br>7:8-       |

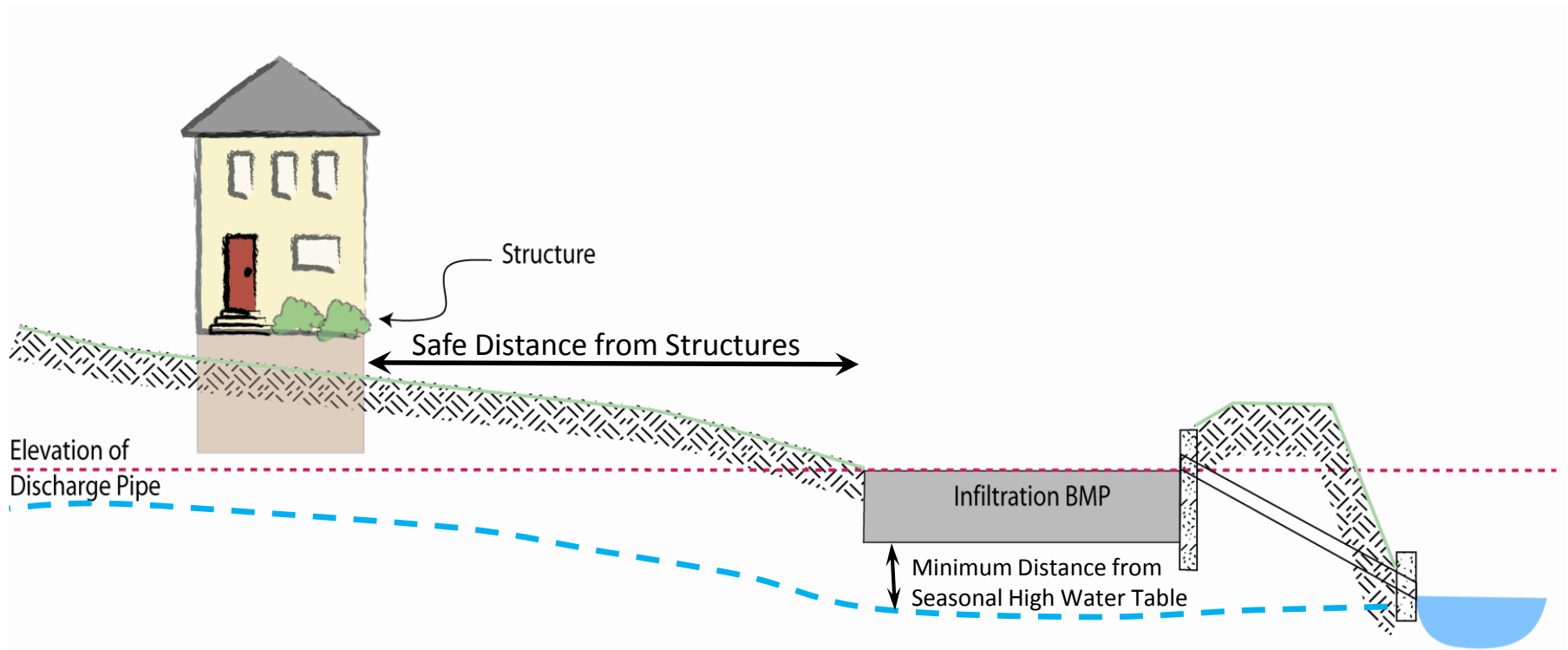
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# Groundwater Recharge Requires...

- Healthy soils
  - Permeability
  - Hydraulic conductivity
- Vertical separation from seasonable high water table or groundwater table
- Suitable distance from foundations,



# Groundwater Recharge...





# Bottom line - what does the developer really need to do?

1. Maintain groundwater recharge on the site
2. Reduce sediment and nutrients runoff from the site
3. Reduce the peak stormwater runoff from the site

## How should a developer do this?

- 3<sup>rd</sup>. Design systems that reduce peak stormwater runoff rates and meet water quantity requirements.



# WATER QUANTITY (NJAC 7.8-5.4(a)3)

- 1. Has the applicant calculated stormwater runoff using NJDEP approved assumptions and factors?**

These assumptions and factors can be found in the regulations under section NJAC 7:8-5.6. The Township Engineer or Review Engineer should be able to verify that the calculations were done correctly.

If yes, go to Question #2. If no, application is incomplete at this time.

# Summary

The best way for an applicant to meet the NJ Stormwater Management regulations is to:

1. Incorporate *nonstructural* strategies
2. Address water *quality* and groundwater *recharge* requirements
3. Ensure that proposed designs meet water *quantity* requirements

# One Last Question:

Who approves the developer's stormwater management plan?

**YOU DO!**

# How do we integrate these tools into the review process?

- All questions should be publicly available for all applicants, review engineers, and residents
- Members of the planning and/or zoning boards and/or environmental commission should be prepared to ask these questions of the Township's review engineer and applicant
- Understand that these questions outline the minimum requirements as defined in the NJ Stormwater Management Rules



# E-learning Tool Available Online

- An interactive E-learning tool was developed for municipal officials as part of a grant awarded by the New Jersey Department of Environmental Protection (NJDEP).
- The tool uses workshop material to help all New Jersey municipal officials ensure stormwater plans comply with New Jersey stormwater regulations.
- <http://water.rutgers.edu/E-learning.html>

The screenshot shows a web-based interface for an interactive E-learning tool. The title bar reads "Asking the Right Questions in Stormwater Review" and "Resources" is in the top right corner. The main content area features the heading "The 2004 Stormwater Management Regulations Address Four Objectives:" followed by four teal-colored boxes, each containing a checkbox and a text description:

- Use nonstructural management strategies
- Protect communities from the impact of new development
- Maintain groundwater recharge volumes
- Protect waterways from pollution carried in stormwater runoff

To the right of these boxes is a photograph of a flooded street with buildings and a water tower in the background. A caption below the photo reads "NJ.com, August 28, 2011". At the bottom of the interface is a video player control bar with a play button, a progress bar, a refresh button, and "PREV" and "NEXT" navigation buttons.

# Questions?

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