



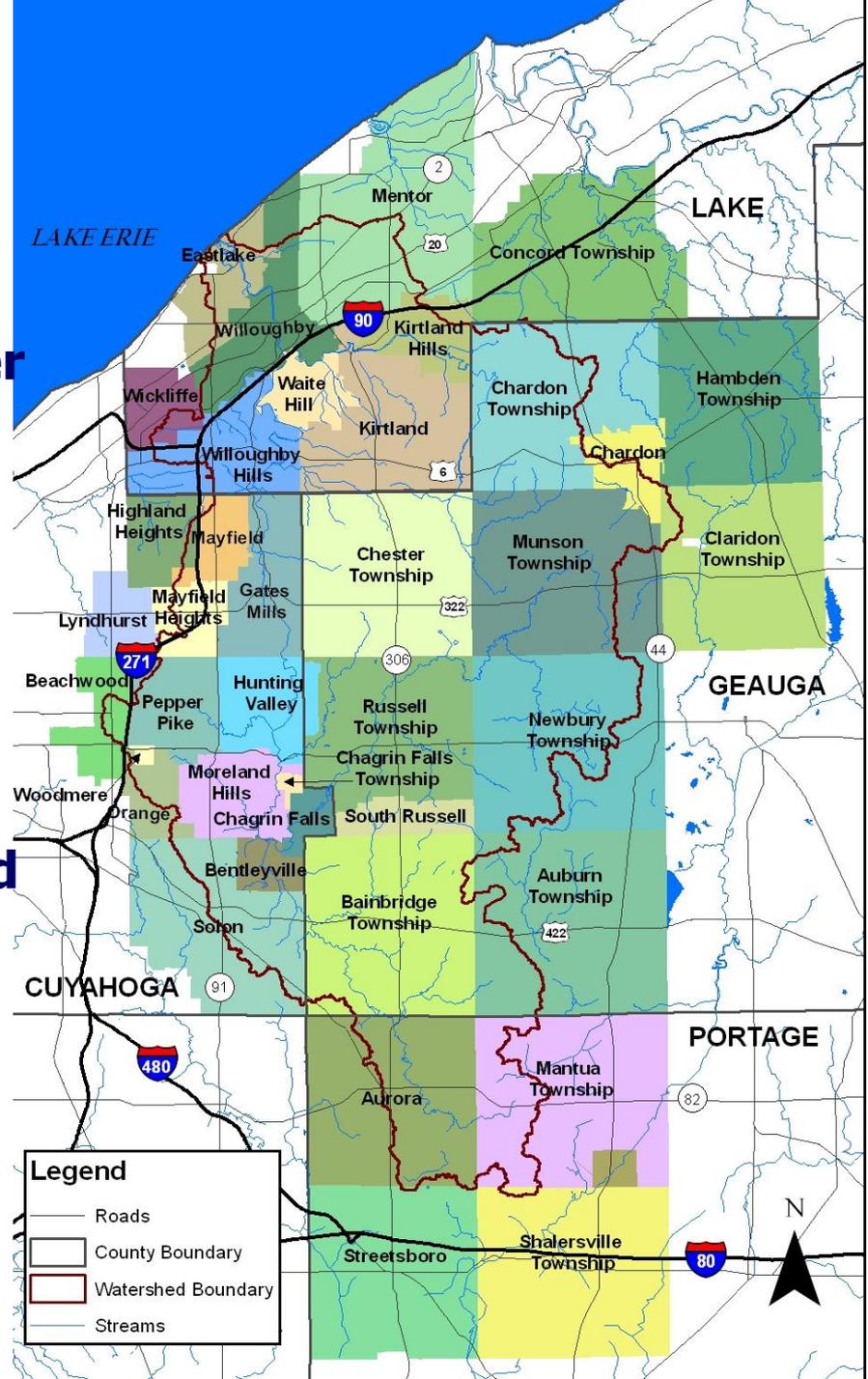
***Chagrin River  
Watershed Partners, Inc.***

***Cost Analysis of  
Low Impact Development  
Best Management Practices***

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# Chagrin River Watershed Partners

- Formed in 1996 by watershed communities. Supported by member dues and grants.
- Comprised of 36 cities, villages, counties, townships, and park districts
- Improve development practices and site design to reduce long term infrastructure costs.
- Majority of members required to comply with Ohio EPA's Phase II requirements.



# CRWP Sponsoring Members



Western Reserve Land Conservancy  
OUR LAND. OUR LEGACY.

# What Does CRWP Do?

## ■ Member Services:

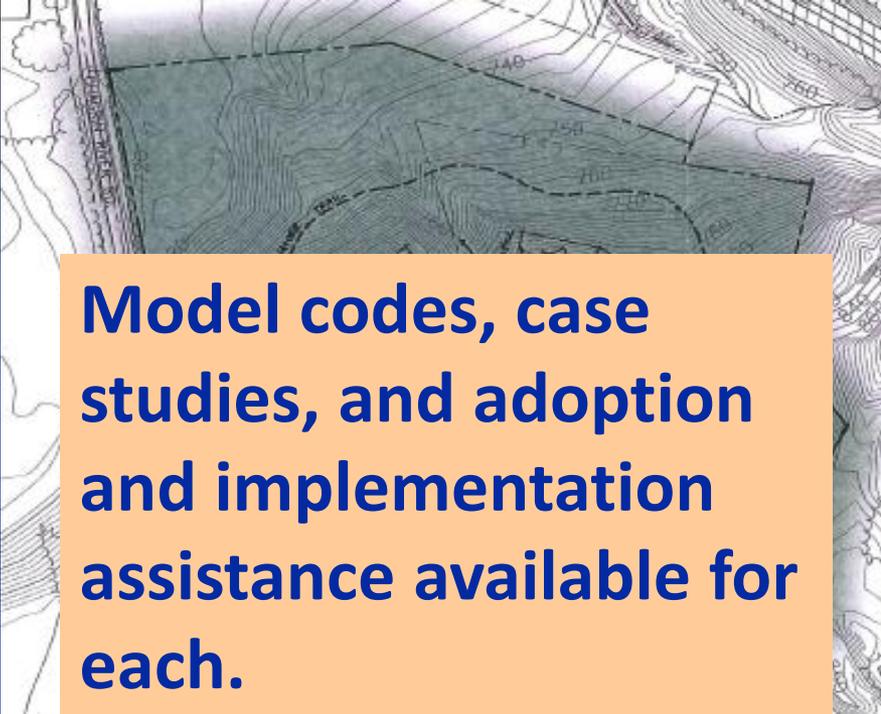
- Grants for open space and stormwater management.
- Development plan review and technical testimony.
- Model regulation adoption and implementation.
- Landowner assistance.

## ■ Watershed Initiatives: Activities to support the public health and safety basis for member planning and zoning.

- Chagrin River Watershed Balanced Growth Plan: Local planning framework to coordinate decisions about how growth and conservation should be promoted by State and local policies and investments.
- Low Impact Development: Provide guidance on model regulations, site design assistance, construction of four demonstration projects.
- Chagrin River Watershed Action Plan: Continue to implement the Plan and provide revisions as appropriate.
- Dam Removal and Stream Restoration Projects: Various projects across watershed.

# CRWP Member Recommendations...

- Comprehensive planning
- Open space acquisition
- Riparian & wetland setbacks
- Erosion & sediment control
- Comprehensive storm water management
- Conservation development
- Alternative energy
- Flood damage reduction
- Off Street parking

A topographic map showing contour lines and elevation markers, such as 140, 150, and 260. The map is partially obscured by a blue vertical bar on the left and an orange text box on the right.

**Model codes, case studies, and adoption and implementation assistance available for each.**

A photograph of an outdoor scene showing a paved road with a white curb, green grass, and trees in the background. The scene is partially obscured by a blue vertical bar on the left and an orange text box on the right.

**In partnership with Planning Commission, Soil & Water Conservation District, Engineer, Water Resources, others.**

# Cost of LID BMPs

## ■ Data from:

- CRWP's Low Impact Development Demonstration Project – Funded by USEPA
- Stormwater Retrofits under Ohio EPA Section 319 and Surface Water Improvement Grants
- Details from bids from 8 projects in Chagrin River watershed communities



# Ohio EPA SWIF/319: LID Cost Summary

- Bioswale per sq. ft.
  - Range \$2.75 - \$41.95
  - Average \$16.25
- Green Roof per sq. ft.
  - Range \$15.18 - \$18.87
  - Average \$17.03
- Permeable Pavement per sq. ft.
  - Range \$3.80-\$26.00
  - Average \$13.53
- Rain Garden per sq. ft.
  - Range \$4.66 - \$29.00
  - Average \$14.35



# Chagrin River Watershed: LID Cost Summary

## ■ Bioretention per sq. ft.

- Range \$2.22 - \$30.00
- Average \$13.19

## ■ Bioswale per linear ft.

- Range \$24.70 - \$385.00
- Average \$89.52

## ■ Pervious Concrete per sq. ft.

- Range \$9.89 - \$16.00
- Average \$12.36

## ■ Pervious Pavers per sq. ft.

- Range \$8.86 - \$18.30
- Average \$11.19

## ■ Tree Vault

- Range \$501.75 - \$3,200.00
- Average \$1,317.08

## ■ Rain Garden per sq. ft.

- Range \$6.50 - \$130.00
- Average \$46.32

## ■ Subsurface Gravel Wetland

per sq. ft.

- Average \$2.0

# **Low Impact Development Demonstration Project**

**CRWP received US EPA grant *Demonstrate  
Innovative Approaches to Distributed Storm  
Water Management in Northeast Ohio***

**Funded by: US EPA National Community  
Decentralized Demonstration Project**

# Cawrse and Associates



**2009: Runoff reduction = 33%**

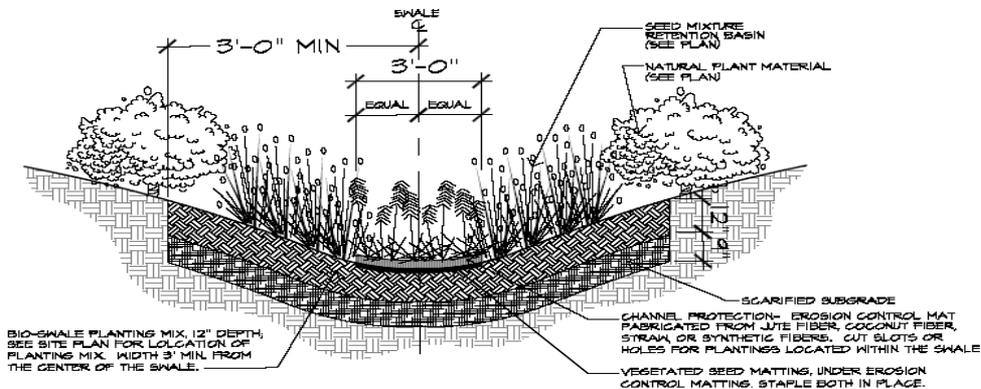
**2010: Runoff reduction = 60%**



**Parking Lot and Drive: \$72,000**

- Paver system, earthwork, excavation, curb, soil borings
- Pavers: \$7-8/SF - product, stone and labor

# Vegetated Swale



NOTE: INSTALL EROSION CONTROL MAT PER MANUFACTURER'S RECOMMENDATIONS

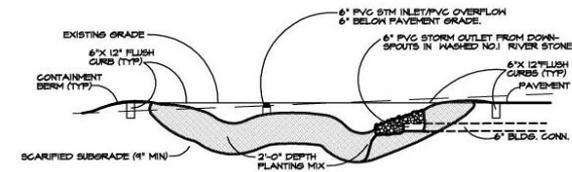
**TYPICAL BIO SWALE SECTION**

NOT TO SCALE



**Swale - \$21,000: \$42 LF**  
**Cost includes vegetation,  
planting, soil mix, soil  
stabilization, rock and  
earthwork**

# Rain Garden



**Rain Garden: \$8,600**

- \$26.87/SF
- Vegetation, planting, earthwork, and soil mix

# Pepper Pike Retrofit Project

- Modify existing drainage swale and install bioretention in residential & public areas.
  - Fox Hollow Drive – Residential Subdivision
  - Chagrin Boulevard – Orange Campus High School



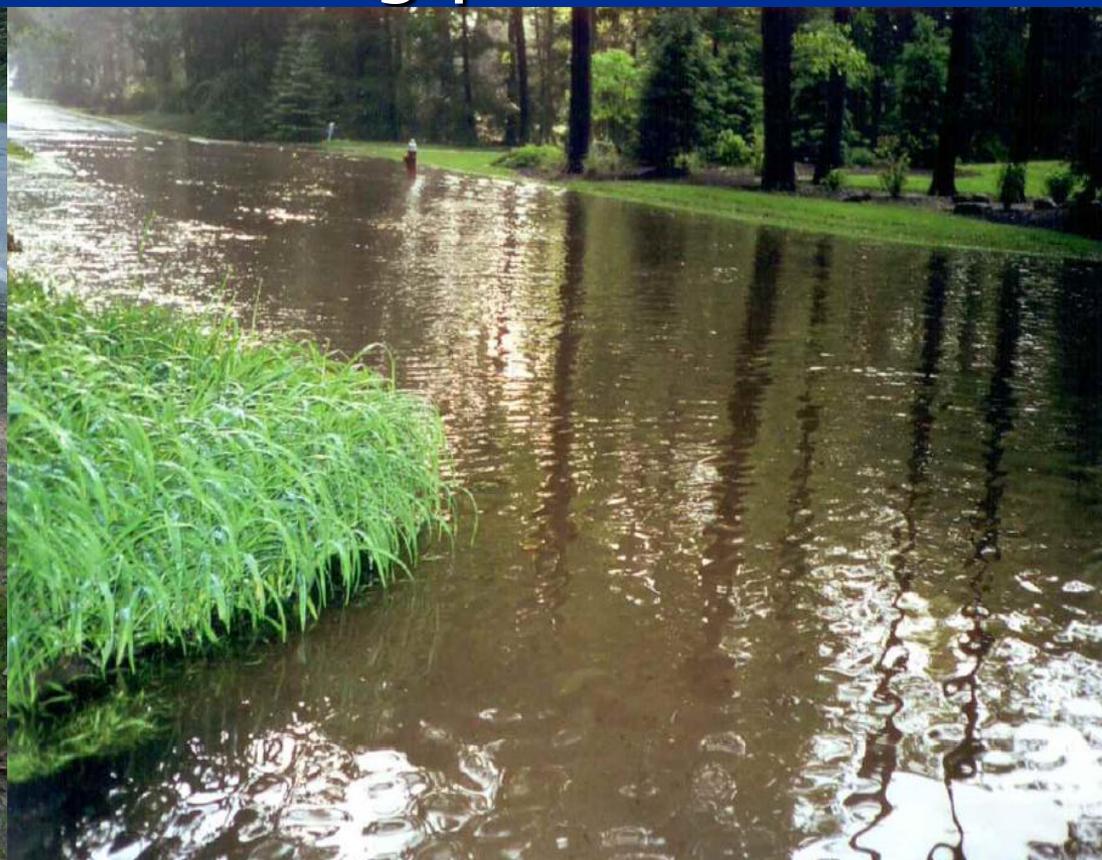
- Goal: Provide an option to culverting roadside ditches and swales.

# Pepper Pike Retrofit Project

- City approached homeowners for involvement
- Maintained by City for 3 years
  - Landscaping becomes responsibility of homeowner
- Develop a planting plan for installers and homeowners
- Cost to Install: \$57/LF
  - 800 LF of Bioretention
  - Installed by City Service Department
  - Project total \$45,000

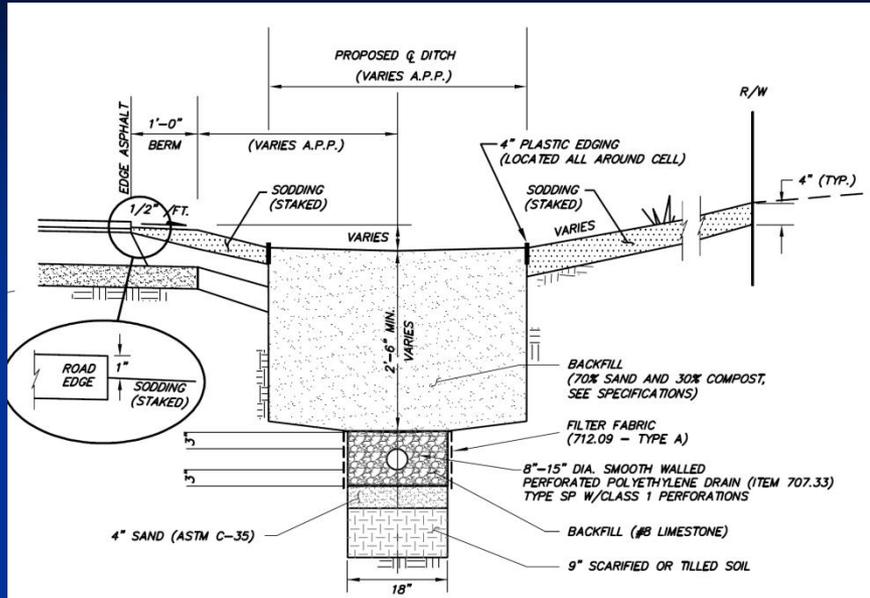
# Orange Village – Sterncrest Retrofit

Replace existing storm system with bioswale system along the north and south sides of Sterncrest Road to fix flooding problems.



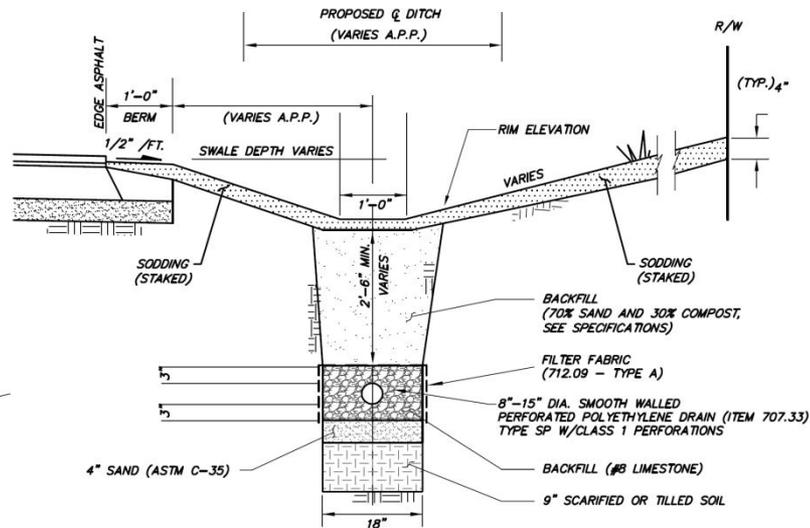
Moreland Hills provided additional funding.

# Sterncrest Bioretention



**BIORETENTION CELL DETAIL**

N.T.S.



**TYPICAL SWALE DETAIL**

N.T.S.



# Sterncrest Bioretention

- Cost to Install: \$115/LF
  - 1100 LF of Bio-Swale
  - 1100 LF storm sewer pipe
  - 9 Bioretention Areas
  - Sod installation for swales – immediate stabilization
  - Project total \$126,000
- Can save on cost by having the service department install plants

# Mayfield Heights SWIF Grant

**Project BMPs:** Bioswales – 6 parking islands

    Porous Concrete – 3,380 sq.ft.

    Tree Vaults – 9 vaults

**OEPA Grant Award Amount:** \$231,900

**Project Design:** Completed by URS

**Project Status:** Completed July 2011

**Featured on NEOSWTC Tour for stormwater retrofits**







# Eastlake SWIF Grant

**Project BMPs:** 2 Bioretention Cells – 2,700 ft<sup>2</sup>

**OEPA Grant Award Amount:** \$64,479 for \$19.59/square foot

**Project Design:** Completed by CT Consultants

**Project Status:** Completed September 2011



# Wiley Park 319

Mayfield Village

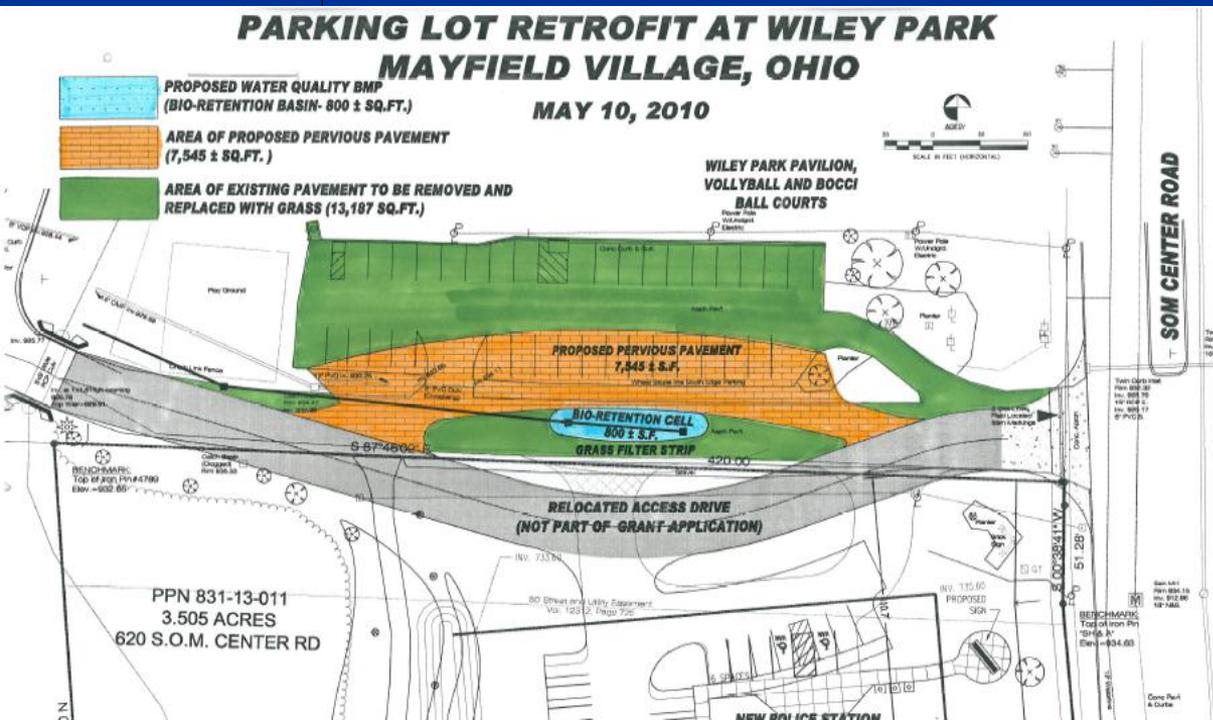
**Project BMPs:** Bioretention Cell – 650 square feet

Pervious Pavers Parking Area – 8,000 square feet

**OEPA Grant Award:** \$184,429 **Local Share:** \$46,108 **Total:** \$230,537

**Project Design:** Completed by Stephen Hovancsek & Associates, Inc.

**Project Construction:** September – October 2011



➤ **Bioretention Cell:**  
Bids from \$19.91 to \$7.67/Square foot

➤ **Pervious Pavers:**  
Bids from \$8.86- \$18.30/square foot

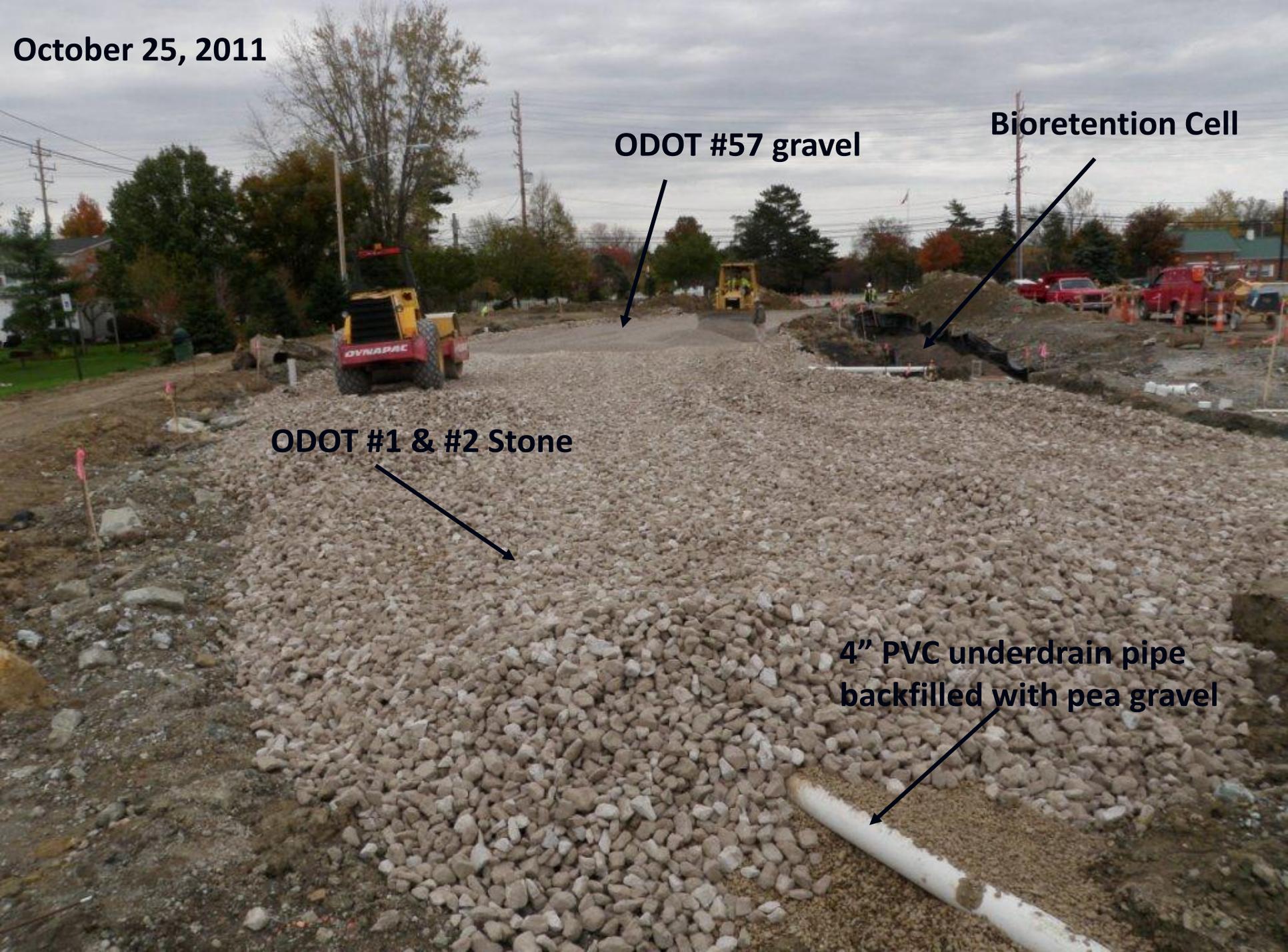
October 25, 2011

ODOT #57 gravel

Bioretention Cell

ODOT #1 & #2 Stone

4" PVC underdrain pipe  
backfilled with pea gravel



**November 7, 2011**



**Rolled curb cuts**

# Top Gun Supply

Chester Township

- Approximately 15,000 square feet of pavers
- Installed for approximately \$5.00 square foot.



# Chester Township SWIF Grant

**Project BMPs:** 3 Bioretention Cells – 1,300 sq. ft.

Pervious Paver Parking Area – 3,806 sq. ft.

West Geauga H.S. Rain Garden – 1,000 sq. ft.

**OEPA Grant Award Amount:** \$77,250

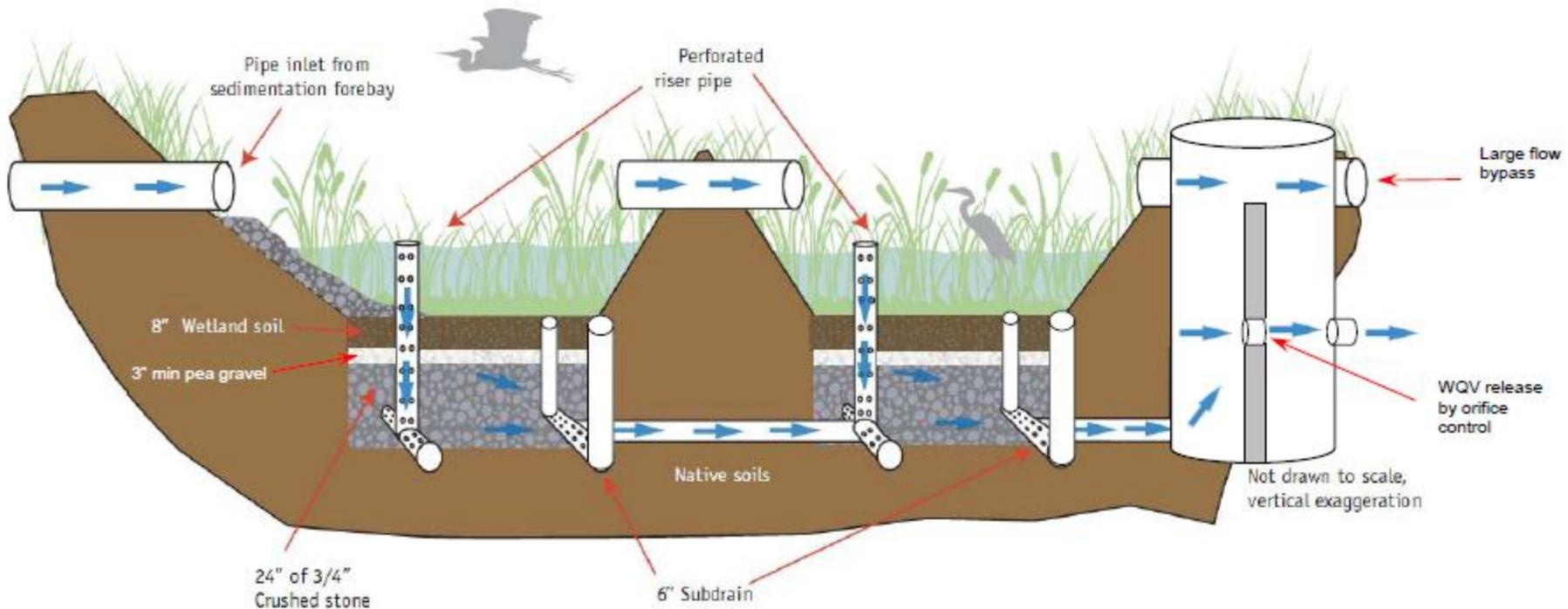
**Project Design:** Completed by Land Design Consultants, Inc.

**Project Status:** Scheduled construction – Spring 2012



# Concord Township: Gravel Wetland

- First gravel wetland constructed in Northeast Ohio
- Followed design from University of New Hampshire
- Only 2 contractors bid on project





# What Affects Cost?

- Under drains and catch basins
- Edge Treatments – curbs
- Soil media in bioretention and bioswales
- Regrading/Excavation
- Installation methodology
- Contractor Experience
- Size
  - Bioretention
  - Permeable pavements



# Next Steps?

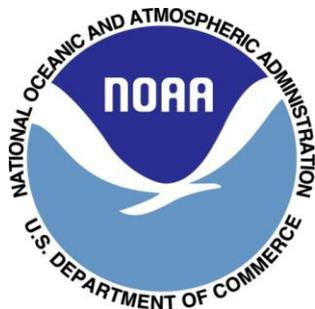
- **CRWP is still collecting information**
- **Possible Analysis**
  - Additional data on BMPs
  - Compare different pavement treatments
  - Compare costs based on size, features, year constructed

# National Estuarine Research Reserve System Science Collaborative

- NOAA Funds administered by the University of New Hampshire
- Program supports science-based projects that address local coastal management problems.
- Ensure researchers and intended users work together to describe science and technology needs related to specific problems, define research questions, design and implement projects using appropriate approaches and methodology, and apply the results.
- Proposals must incorporate collaboration and applied science to address a coastal management problem that has been identified as a priority.

# Project Partners

- Chagrin River Watershed Partners, Inc.
- Old Woman Creek National Estuarine Research Reserve
- Ohio Department of Natural Resources, Division of Soil and Water Resources
- Firelands Area Coastal Tributaries/Erie SWCD



# CRWP NERR Science Collaborative Project

- Modeling peak discharge and runoff reduction using local case studies and provide training on methods and results.
- Quantify BMP specific and site level hydrology for local soil and climate characteristics.
  - Monitor 6 LID BMPs
  - Test in situ soil conditions
- Build Capacity among Design and Community Engineers
- Develop Implementation Tools
  - Technical Guidance
  - Revisions for local codes
  - Recommendations for stormwater utility credit programs and watershed specific permits
- Explore the role of LID as a climate adaptation strategy

# Questions?

