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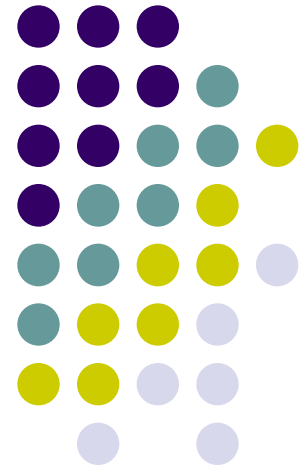


HOSTS



# Re-Imagining Municipal Stormwater Management

TRIECA



*March 23, 2016*



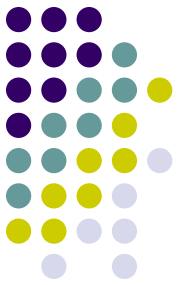


# Presentation Overview

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- **Context or what we know**
  - Conventional vs LID / Green Infrastructure
  - Potential of LID / GI
- **The symptoms**
  - Current approach to SWM
  - Mechanisms to drive uptake of source-level SWM / LID
- **The root of the problem**
  - “Real” value assessments – the truth of ROI
  - The marketplace and market-based economics

# SWM Best Practices



## Better Site Design

Treatment Train Approach:  
provide control at the lot-level and through conveyance (to the  
extent possible) followed by end-of-pipe controls

### Source Controls



### Conveyance



### End of Pipe



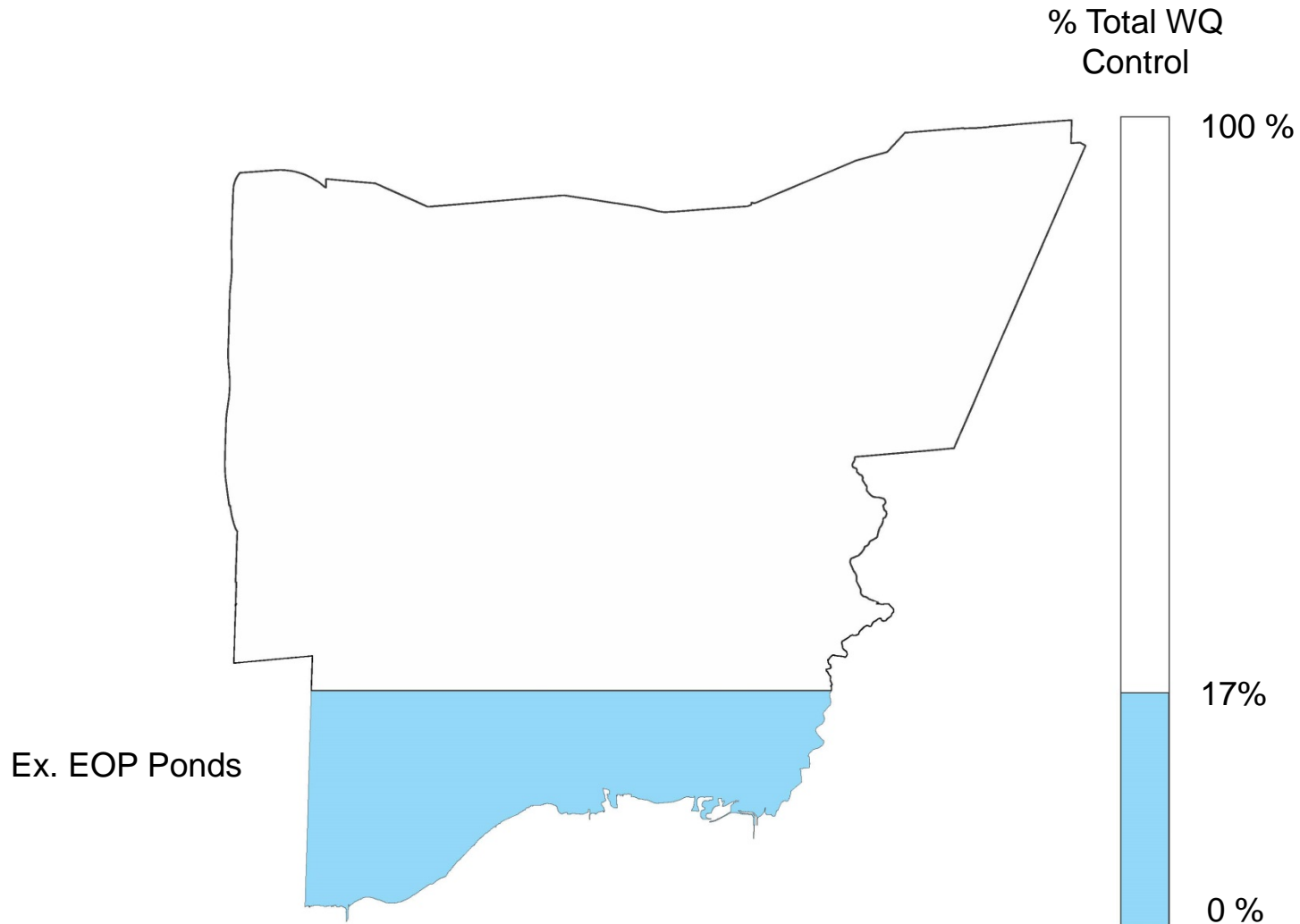
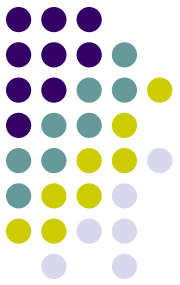
# Typical LID/GI Practices



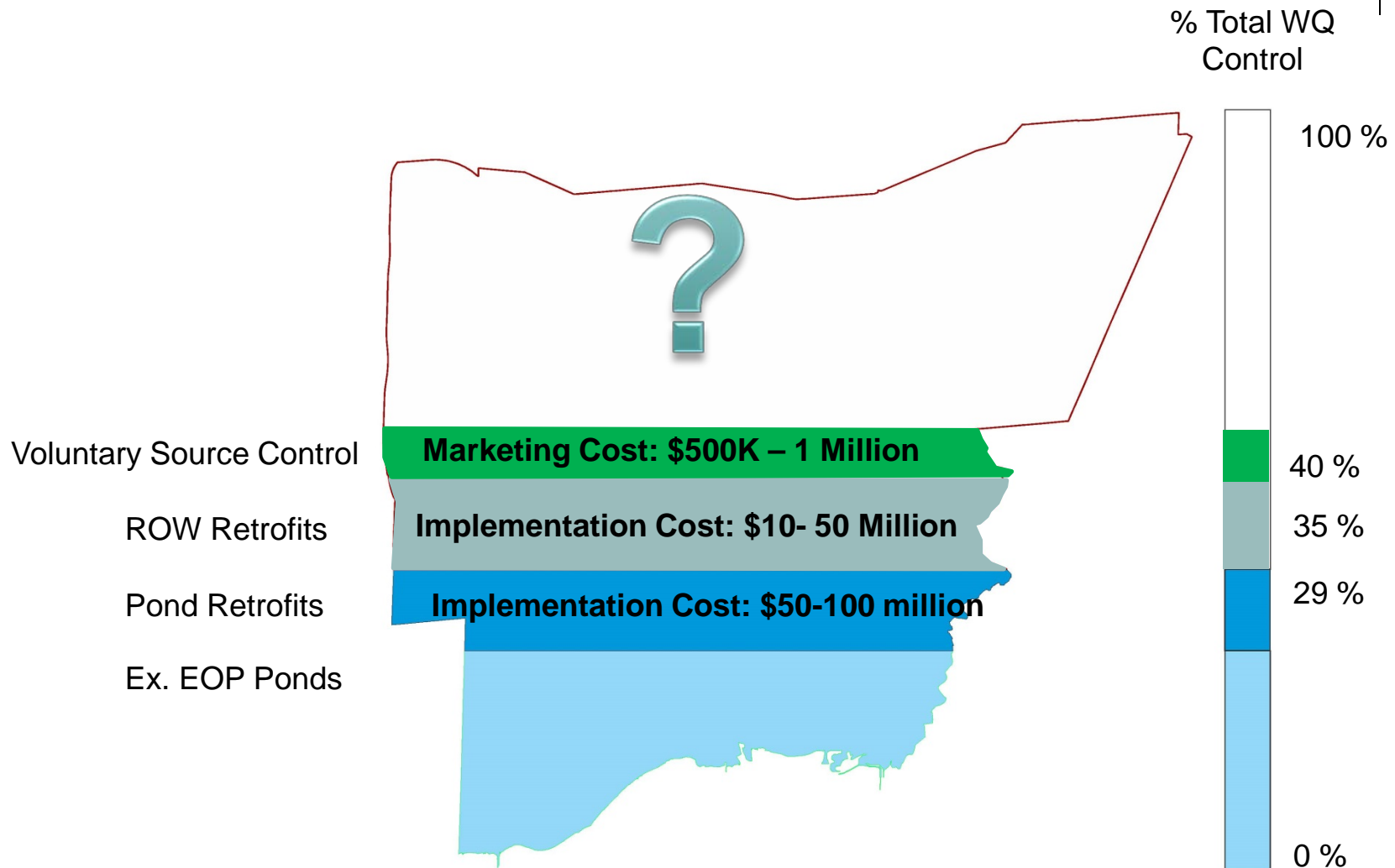
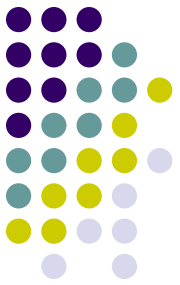
1. Negotiated on an ad hoc basis at application stage for new development/re-development.
2. Stormwater fee with credit or 'feebate'.
3. Public properties/municipal right-of-way – adjunctive approach.
4. Public outreach and education.



# TYPICAL S. ONTARIO APPROACH



# TYPICAL S. ONTARIO APPROACH





# Leading LID/GI Practices

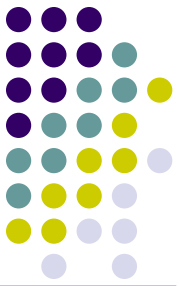
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1. Land Disturbance Triggers
2. Payment for Ecological Services (PES)
3. By-law/ zoning variance allowances
4. Mandatory private stormwater management for Industrial lands
5. Grants
6. Credit trading



# Uptake at Source-level

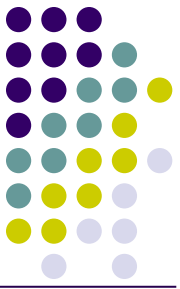
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- Majority of municipalities across NA have participation rates well below 10%
- Municipalities offering SW credits average:
  - Residential uptake = 3% to 7%
  - Non-residential uptake = <1% to 4%

# Market Research

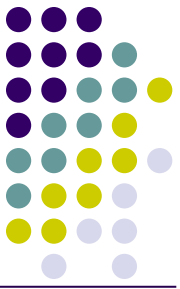
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- Industrial and Commercial:
  - Operational cost reduction major driver for capital investments.
  - Payback on investments (ROI) must be under 2 years, 3 years for significant process changes and/or internal policy alignment.
  - Stormwater not on radar.
  - Liability – pooling in parking lots, flooding, not a significant concern (not a driver).

# Market Research

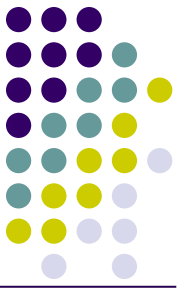
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- New Construction:
  - Single-family home development – business case for LID/GI based on reduction in SW pond = more lots but value for builder often not realized.
  - Municipal requirement for redundancy results in added costs (LID + SWM Pond = higher costs).
  - Commercial development – compliance for approval / strong opposition to green roofs

# The Picture of At-Source SWM

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- Ad hoc
- Low participation amongst residential and non-residential landowners.
- Not economically viable – paybacks on LID/GI investments over 5 years, often over 10 years
- For new development, typically only what is required to gain approval.



# Impediments to SWM Solutions

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1. Uncertainties in performance and cost
2. Insufficient engineering standards and guidelines
3. Fragmented responsibilities;
4. Lack of institutional capacity;
5. Lack of legislative mandate;
6. Lack of funding and effective market incentives; and,
7. Resistance to change.

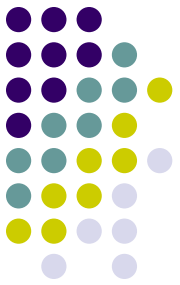
Source: Allison H. Roy; Seth J. Wenger; Tim D. Fletcher;  
Christopher J. Walsh; Anthony R. Ladson; William D. Shuster; Hale W.  
Thurston; Rebekah R. Brown

# The Root of the Problem?



## Municipal Water Management Model





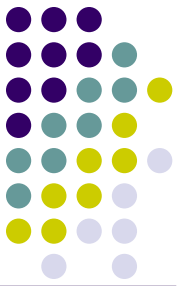
# Municipal SWM Model

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- Publically owned and managed SWM infrastructure funded via tax/fees charged to private landowners.
- Primarily a system of conveyance to an endpoint via command and control infrastructure.
- Centralized approach based on risk mitigation through redundancy.
- Planning focused on publically owned and managed infrastructure (assets) primarily on public lands.
- Historical reliance on development-related revenues – continues in growing municipalities
- Limited integration across municipal departments.

# Parsing the Municipal Model

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- 1 Planning begins with primarily a public land-based solution to problems generated on privately held lands.



- 2 A function for private lands not included in the municipal SWM equation.



- 3 Incomplete analysis of options.



# A Potential Solution?

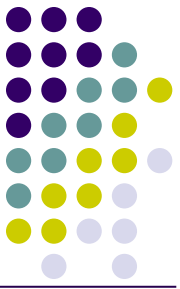
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## Re-imagining Municipal SWM

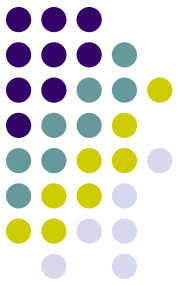
# Instead of How... What if?

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- Whole system analysis
  - Changes the calculation equation.
  - Economic analysis incorporates municipal off-sets.
  - Off-sets provide the basis for development and use of **effective** market-based economic instruments.
  - Integrated planning and analysis imbedded.
- *What if, 25%, 50%, 80% reduction in loading from private non-residential properties could be achieved?*

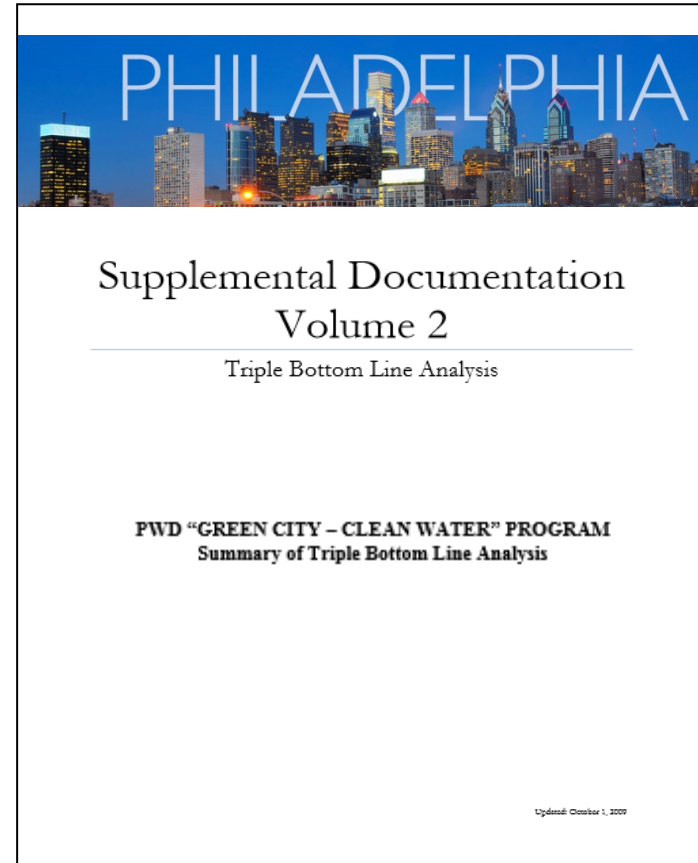
# The New SW Math: ICI



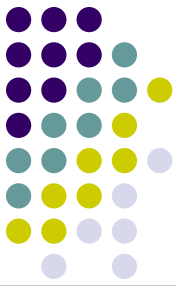
- City of Philadelphia
  - Green infrastructure options - 40 years, total PV benefits of \$1.9 billion (2009 USD) for 25% implementation



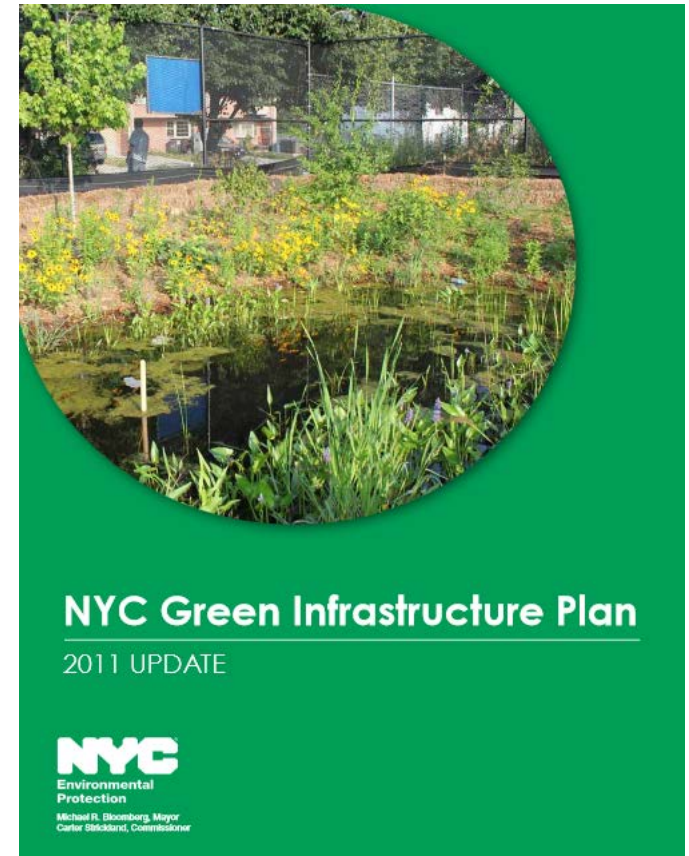
City of  
**Philadelphia**



# The New SW Math: Community / ICI



- New York
  - Green vs. Grey strategy allocation of \$1.5 billion over the next 20 years
    - Eliminated \$1.4 Billion in Grey Infrastructure projects
    - Deferred another \$2 Billion in additional Grey Infrastructure



# The New SW Math: ICI / Community



- Payment for Ecological Services (PES) – Florida @ 0.02 to 0.16/ cu.m = cheaper than conventional SWM
- Portland Floor Area Bonusing – Green Roof = 1 additional floor of development (no cost to the municipality)



# The New SW Math: ROW



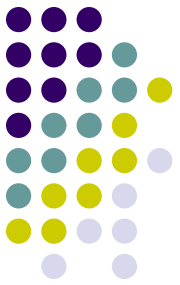
- New Ponds/Retrofits → Average unit costs = \$48,000/ha  
(\$40,000 to \$55,000/ ha)
- ROW LID Retrofits → Average unit costs = \$39,000/ha  
(\$11,500 to 66,000/ha)



$$1 + 1 = 3?$$

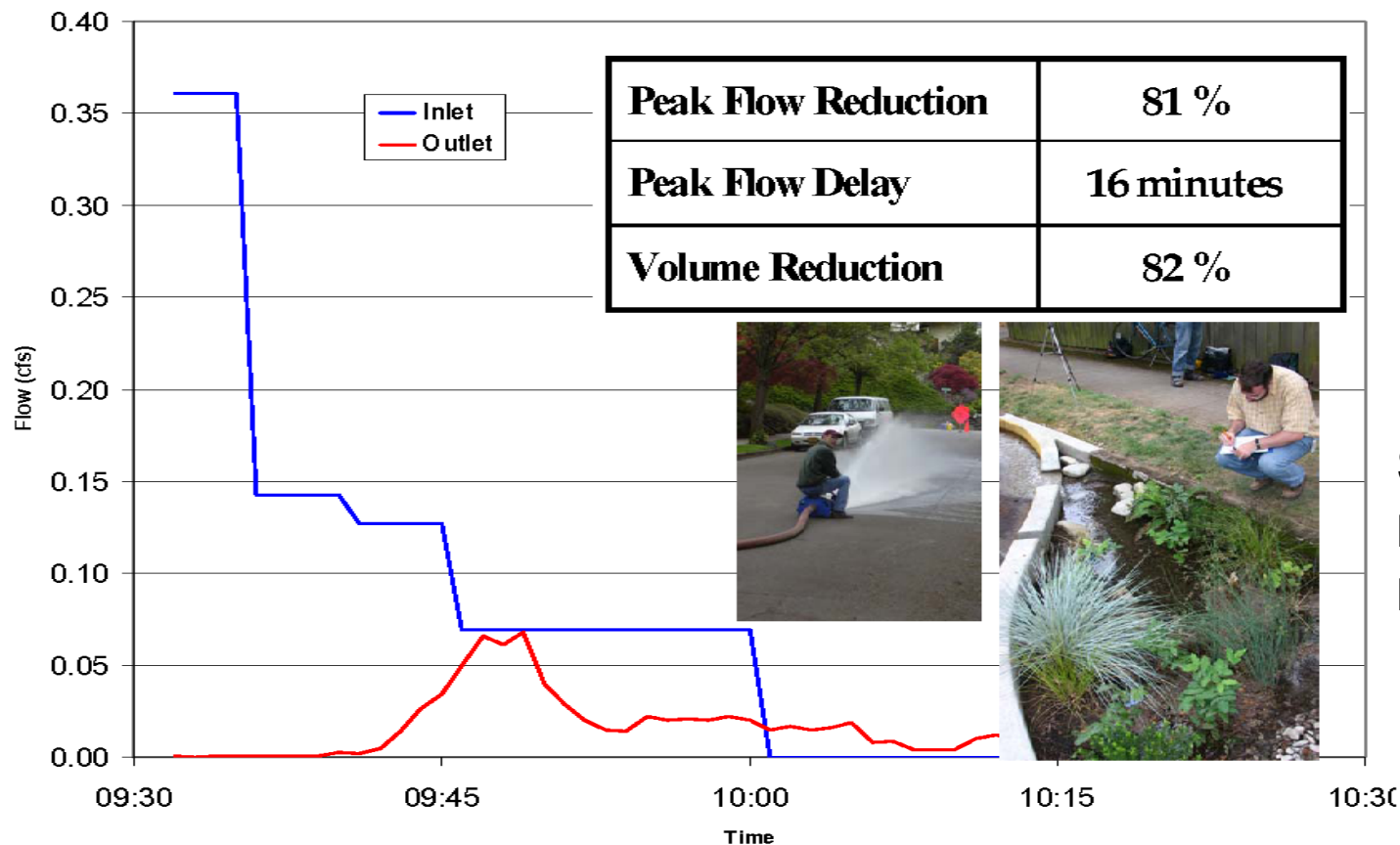


# Effectiveness



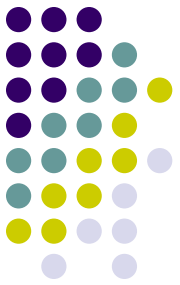
NE Siskiyou Green Street, Portland

25-Year Flow Test / Saturated Conditions (Apr 21, 2005)



Source:  
Kevin Robert Perry  
Nevue Ngan Assoc

# Effectiveness

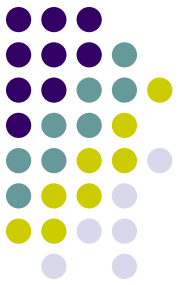


Time Period	% reduction in stormwater runoff
1/20/01-3/31/01 (partial wet season)	99.1%
4/1/01-9/30/01 (dry season)	100%
4/1/01-9/30/01 (dry season excluding Aug storm)	100%
1/20/01-9/30/01 (partial water year)	99.6%
10/1/01-3/31/02 (wet season)	97.6%
1/20/01-3/31/01, 10/1/01-3/31/02 (1 + partial wet season)	97.8%
1/20/01-4/30/02 (current study period)	98.2%

“The Sea Street Site has not discharged since Dec. 2002, even during large rainfalls in the Autumn of 2003.” (Horner, 2004)

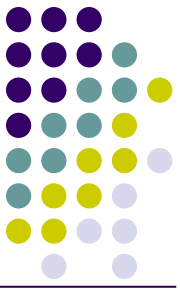


# The New SW Math: Residential



- Target CSO Basins
- Approximately 40,000 single-family residences
- Average rebated \$4,000 per home.
- Homeowner/contractor driven – **Move to the market place**
- 3<sup>rd</sup> party verification

A composite graphic for the RainWise program. At the top, it says "RainWise REBATES!" in large, bold letters. Below that, it states "RainWise will pay for rain gardens and cisterns". A paragraph explains: "The RainWise program provides rebates that cover most or all of the cost of installing cisterns and rain gardens on your property. To receive a rebate, you must live in an eligible combined basin. We'll help you determine qualifies. The average rebate und \$4,000." Below this text is a map of Seattle showing various basins in different colors. To the right of the map is the Seattle Public Utilities logo. At the bottom is a photograph of a two-story house with a blue and white exterior, featuring a well-maintained rain garden in the front yard with various plants and a cistern.

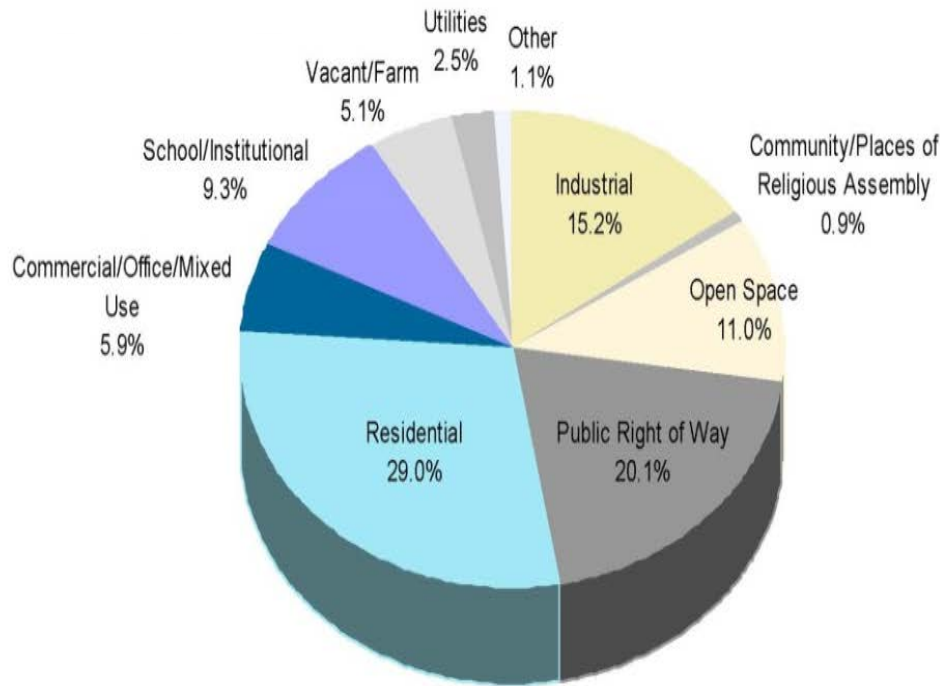


# Added Value of at-Source

- Property owners assumes some of the costs:
  - Capital and O&M
- Community beautification
- Builds relationships with community
- Other benefits
  - Increased tree canopy and vegetative cover
  - Carbon sequestration / reduced heat island
  - Introduction of native and increased biodiversity
  - Groundwater recharge and protection
  - Reduced peak season water use



# Cost Effectiveness



**Land-Use Typical  
S. Ont. Municipality**

- ▶ EOP Program
  - \$48,000/ha WQ
- ▶ 30% of a Municipality is Residential
  - @10% implementation cost = \$1,200/ha







# QUESTIONS ?

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