

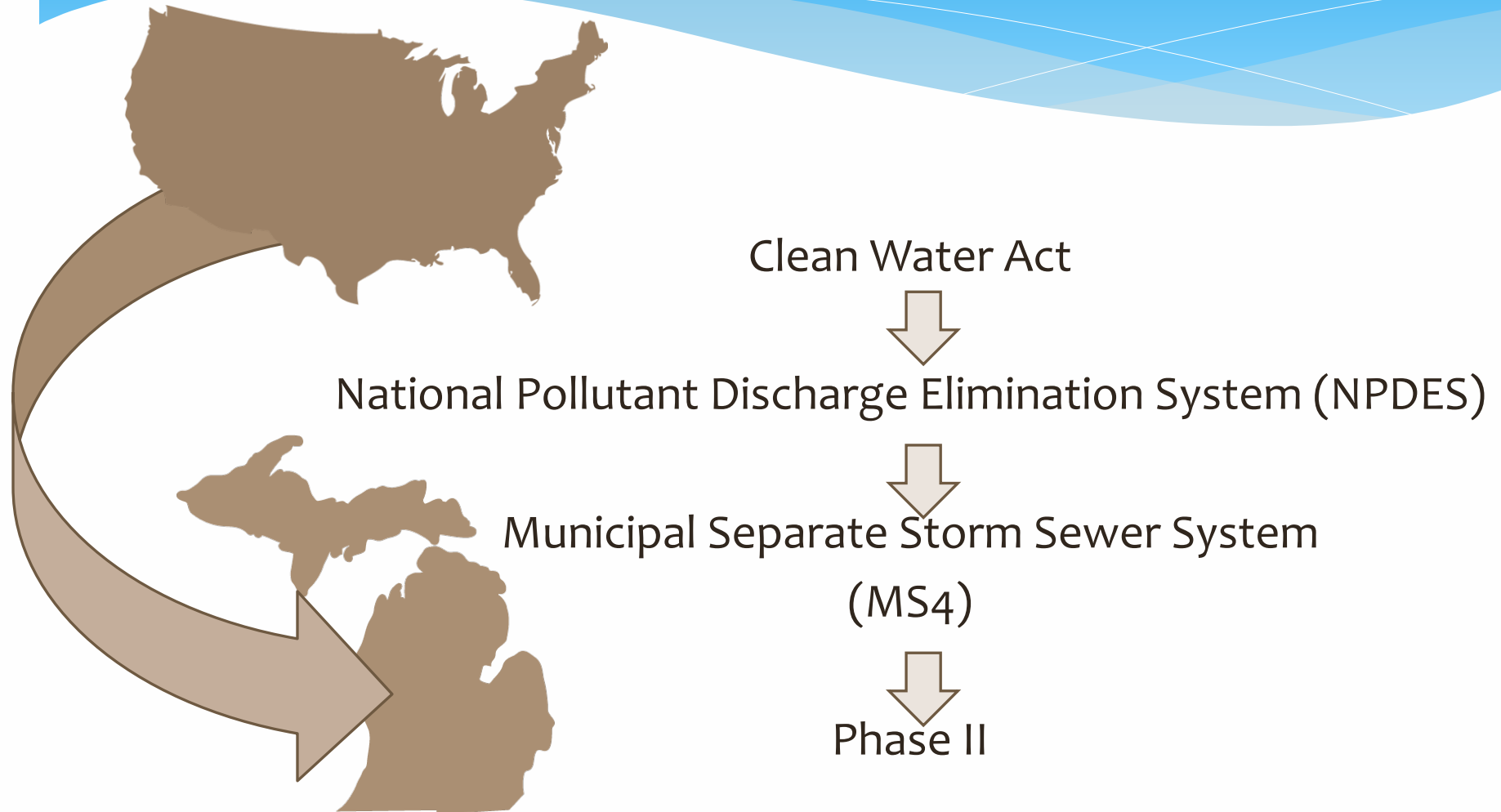
# Regional Stormwater Ordinances

Bonnie Broadwater, Michigan Department of  
Environmental Quality

Carrie Rivette, City of Grand Rapids



# Stormwater Regulation

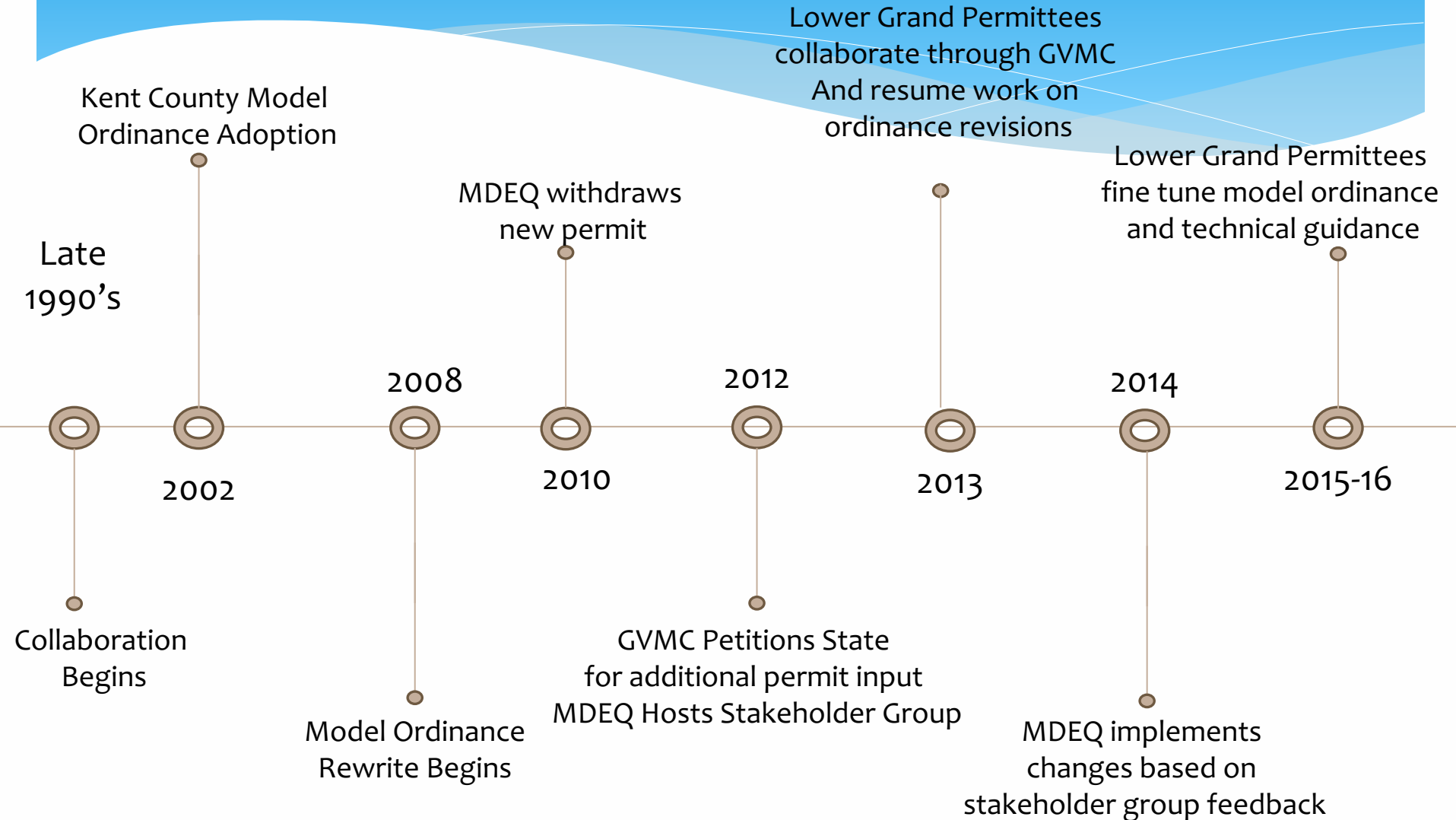


# Permitting and Collaboration Working as a Watershed

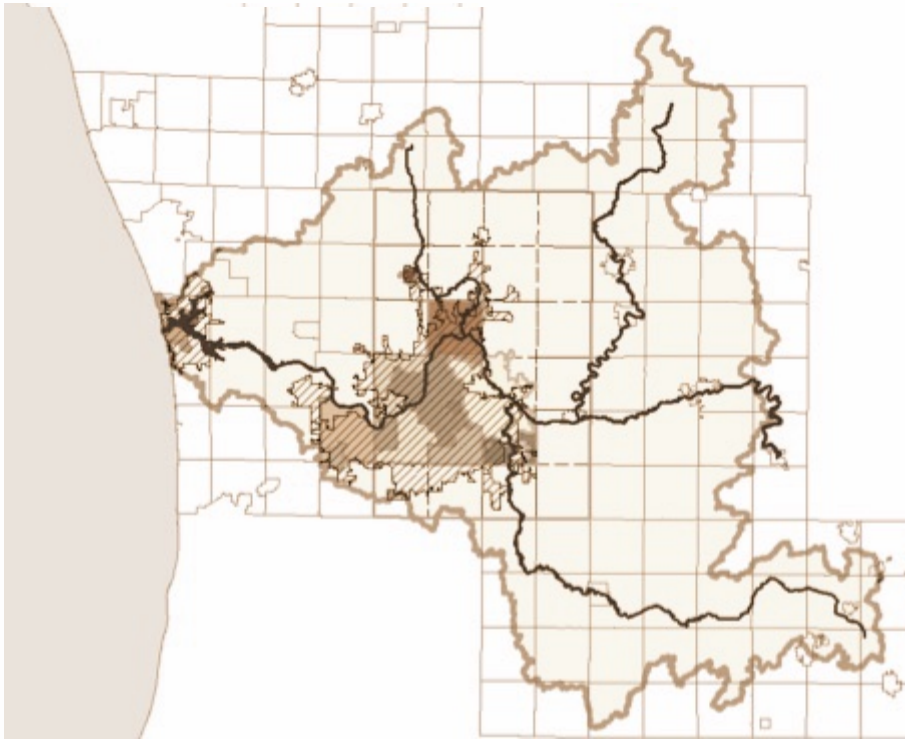


- LGROW 
- Permit process
  - Collaboration starts with a shared strategy
- Implementation for compliance
  - Sharing tools
  - Meeting goals
- Going above and beyond
  - Watershed Data Repository
  - Regional Stormwater Management Policy

# 20 Years of Collaboration



# Lower Grand River Watershed



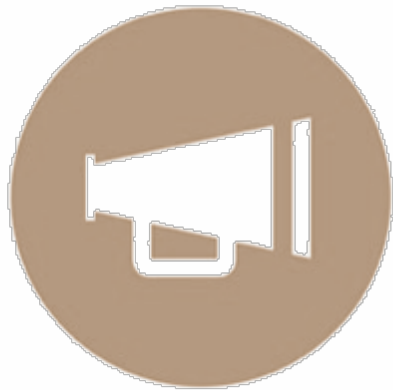
## 27 Permitted Agencies

- \* Cities
- \* Villages
- \* Townships
- \* Counties
- \* Public School Districts
- \* University

# Goal: Reduce Non-Point Source Pollution with these programs:

- \* Public Education and Outreach
- \* Public Participation and Involvement
- \* Illicit Discharge Detection and Elimination
- \* Construction Site Runoff Control
- \* Post-Construction Runoff Control
- \* Pollution Prevention and Good Housekeeping

# Regional Efforts



Public Outreach  
and Education



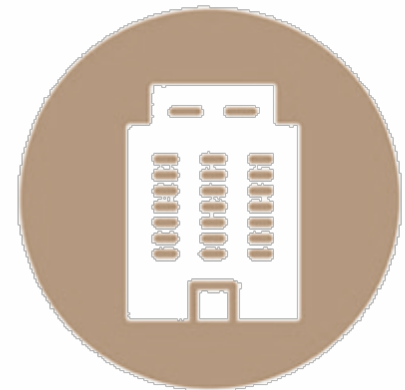
Shared, Consistent  
Messaging



Water Quality  
Analysis



Outfall Testing  
TMDL Monitoring



Development  
Standards



Design, Approval,  
and Maintenance



# Regional Stormwater Ordinances

WITH CONSISTENT DEVELOPMENT STANDARDS

Water Quantity

Water Quality

Flood Control



# Model Ordinance

## **Proposed Model Stormwater Ordinance For Kent County and Ottawa County Local Governments**

**Prepared by the Stormwater Ordinance Committee  
Of the Lower Grand River Watershed**



- \* Basic Framework
- \* Regulatory Authority
- \* Basic Design Standards
- \* Operation & Maintenance Requirements

# Water Quality



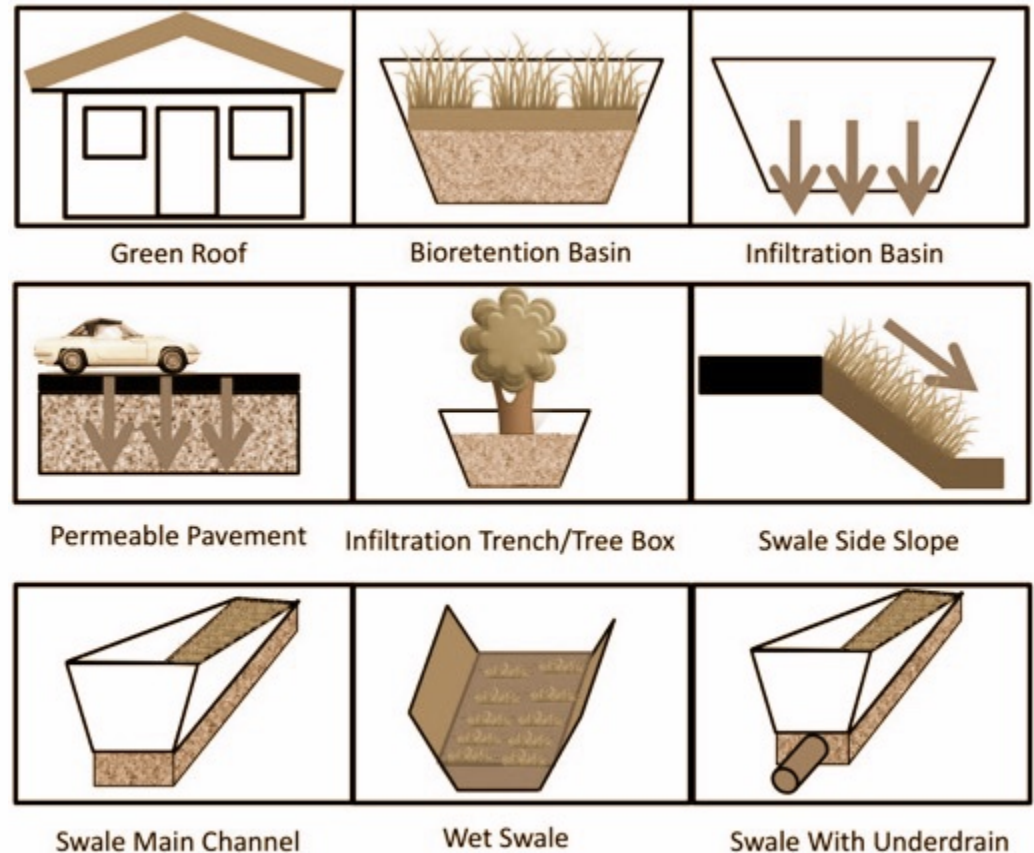
## Total Suspended Solids (TSS)

- \* Treat the first inch of rain (first flush)
- \* Reduce TSS 80% or below 80 mg/L

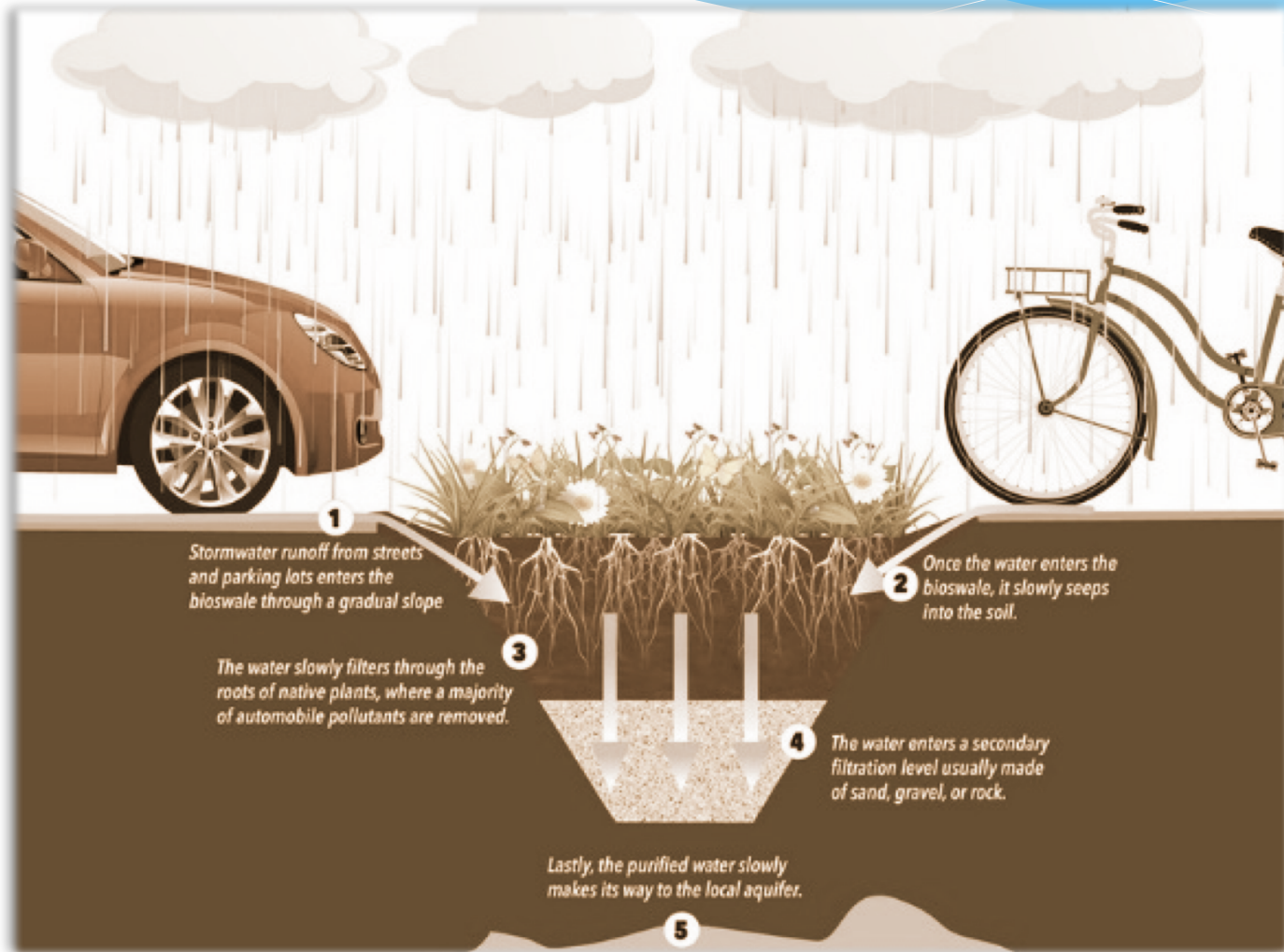
# Water Quality

**Treatment may be provided through:**

- Settling (permanent pool or extended detention)
- Filtration
- Infiltration
- Absorption, or chemical/mechanical treatment



# Green Infrastructure



From Tip of the Mitt Watershed Council

# Water Quality

Stormwater BMP	TSS Reduction
Minimize Soil Compaction	
Protect Natural Flow Paths	
Protect Sensitive Areas	
Native Revegetation	
Stormwater Disconnection	
Storm Sewer	(22)
Culvert or Bridge	
Open Channel	
Detention Basin (dry)	(49)
Detention Basin (wet)	(80)
Detention Basin (extd/wetland)	(72)
Retention Basins	(89)
Infiltration Practices	(89)
Bioretention/Rain Garden	(86)
Constructed Filter	(86)
Planter Box*	(59)
Pervious Pavement	(84)
Pervious Pavement* (roof discharge to stone)	(50)
Capture Reuse	(*)
Vegetated Roof	(*)
Water Quality Device	(*)
Sediment Forebay	(50)
Spill Containment Cell	(50)
Vegetated BMP (sized for pretreatment)	(50)
Water Quality Swale	(81)
Vegetated Swale	(81)
Vegetated Filter Strip	(81)
Level Spreader	



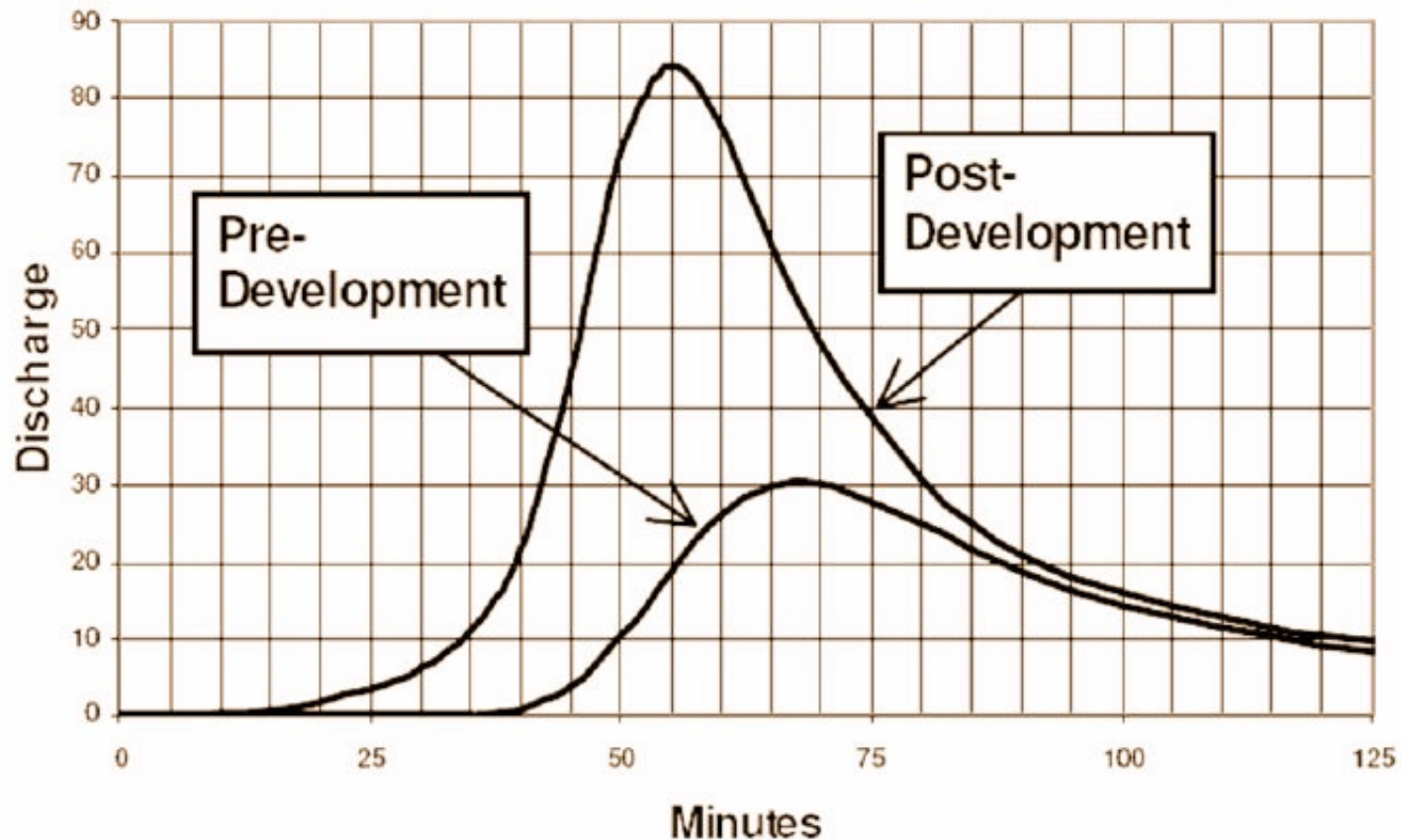
# Water Quantity (Channel Protection)



Large volumes of stormwater over extended periods can worsen channel erosion

- \* Retain new or additional runoff onsite from the 2-year, 24 hour event
- \* Infiltrate ALL of that water into the ground

# Development Increases Runoff



# Rainfall Intensity is Increasing

- Rainfall: 5% - 12%
- Rational Method correction factors:
  - 35% - 50% (for 25-yr and 100-yr standard respectively)

Event	24 Hour Precipitation Depth [in]		
	Bulletin 71 (Zone 8)	Atlas 14	
		GR Intl AP	West Olive
2 year	2.37	2.56	2.59
5 year	3.00	3.18	3.26
10 year	3.52	3.77	3.91
25 year	4.45	4.66 (5%)	4.95 (11%)
50 year	5.27	5.43 (3%)	5.87 (11%)
100 year	6.15	6.27 (2%)	6.90 (12%)



# 1 CARLTON

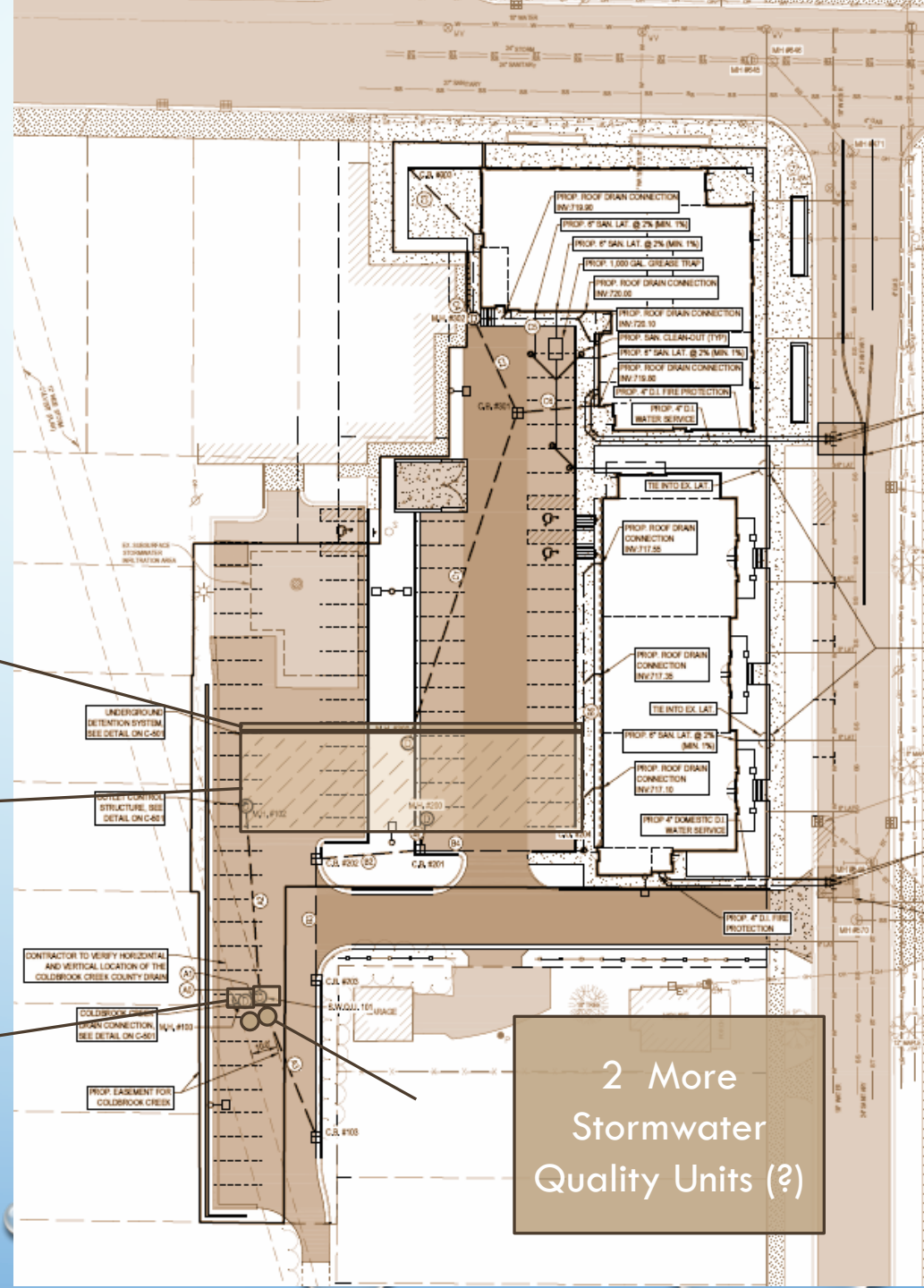
WATER QUALITY & 100 YEAR STORAGE VOLUME

Atlas 14  
Additional  
Storage (6.5%)

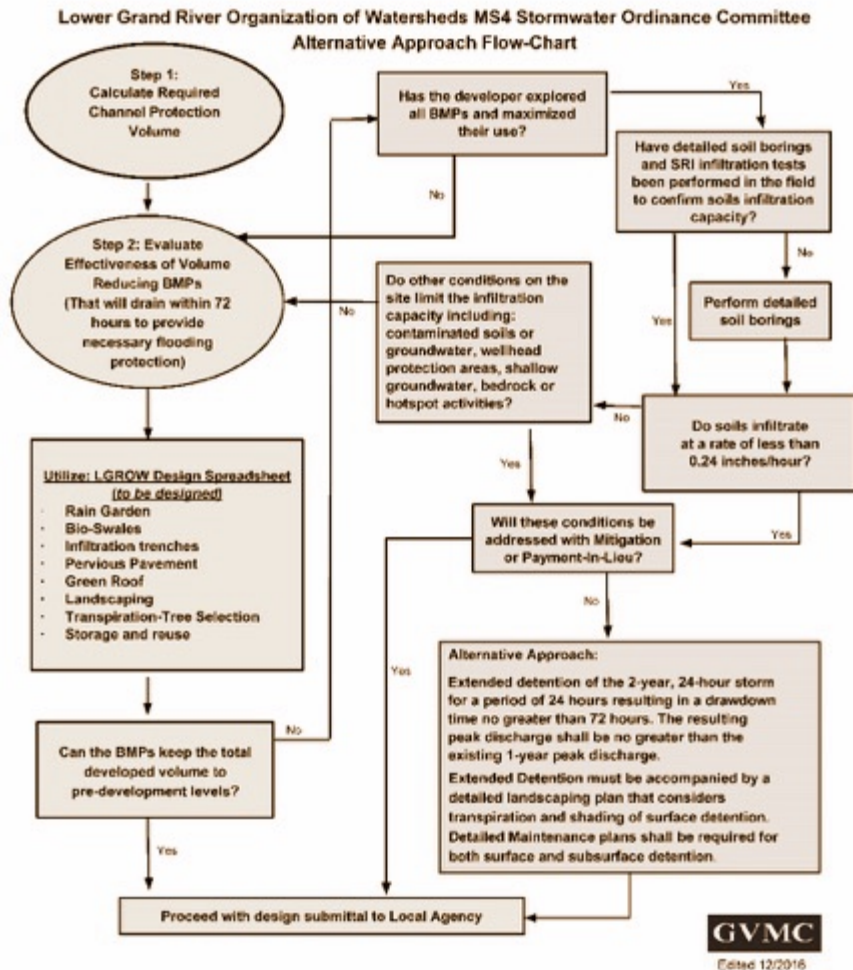
Stormwater  
Detention Area

2 Stormwater  
Quality Units

2 More  
Stormwater  
Quality Units (?)



# Alternative Approach



Problem Areas Include

- \* Poorly Infiltrating Soils
- \* High Groundwater
- \* Soil Contamination



- \* Extended Detention with Controlled Release

# Standards Manual

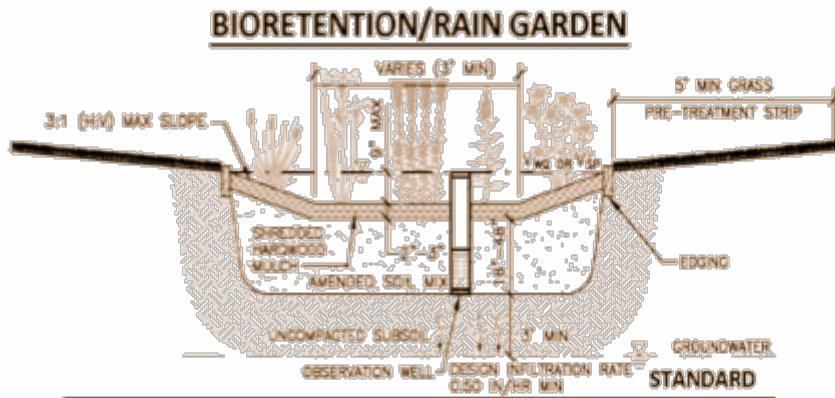
Table 3 – Stormwater BMP Matrix

Stormwater BMP	Treatment			
	Requires Pretreatment	Provides Water Quality	Provides Pretreatment	Provides Spill Containment
<b>Non-Structural BMPs</b>				
Minimize Soil Compaction				
Protect Natural Flow Paths			X	
Protect Sensitive Areas				
Native Revegetation			X	
Stormwater Disconnection				
<b>Structural BMPs – Conveyance and Storage</b>				
Storm Sewer		(22)		X
Culvert or Bridge				
Open Channel				
Detention Basin (dry)	X	(49)		
Detention Basin (wet)	X	(80)		
Detention Basin (extd/wetland)	X	(72)		
Retention Basins	X	(89)		
<b>Structural BMPs – LID and Small Site</b>				
Infiltration Practices	X	(89)		
Bioretention/Rain Garden	X	(86)		
Constructed Filter	X	(86)		X
Planter Box*		(59)		
Pervious Pavement		(84)		

## Detailed Technical Guidance

- \* Performance Standards
- \* Design Specifications
- \* Calculation Methodology

## Checklists & Applications



# Design Spreadsheet

## LGROW Design Spreadsheet

[Click here for documentation](#)

### 4. Channel Protection Volume

#### 4a. Required Channel Protection Volume

2-year, 24-hour runoff volume for proposed development condition [cft]	0
2-year, 24-hour runoff volume for pre-development condition [cft]	0
<b>Minimum Required Channel Protection Volume [cft]</b>	<b>0</b>

#### 4b. Structural BMP used to meet Channel Protection Volume

Structural BMP	Data Columns Required	A Area of BMP [sqft]	V Available Water Storage Volume [cft]	i Design Infiltration Rate [in/hr]	Volume Provided [cft]
					0
					0
					0
					0
					0
					0
					0
					0
					0
					0
<b>Total Channel Protection Volume Provided</b>					<b>0</b>
<b>Percentage of Channel Protection Volume met by retention</b>					<b>100%</b>

#### 4c. Extended Detention for Channel Protection Volume not met by Structural BMPs

Minimum Required Extended Detention Volume [cft]	N.A.
Maximum Allowable Extended Detention Release Rate [cfs]	N.A.

# Successful Site Design



# Long Term Success Means Regular Maintenance



- \* Scheduled Inspection
- \* Cleaning
- \* Weeding
- \* Debris Removal
- \* Dealing with clogs

# Questions?

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