

# City of Franklin

## Integrated Water Resources Plan

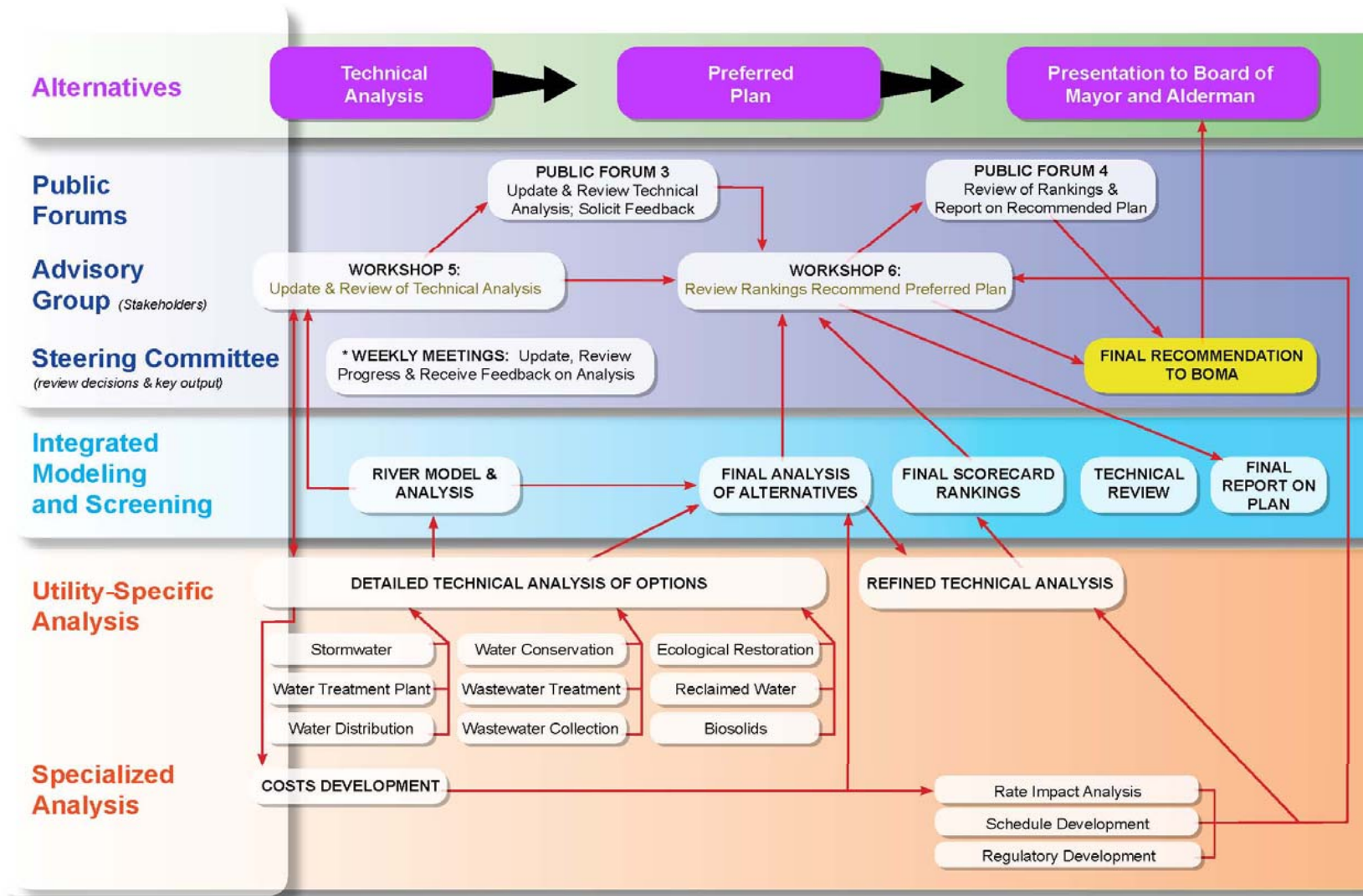
July 12, 2011



BOMA Meeting Update

**CDM**

# Franklin IWRP Phase II Work Plan



# Upcoming Presentations for On-Going Technical Evaluations

1. **Stormwater/ Ecological Restoration Update – July 12<sup>th</sup>**
2. Water Treatment/ Distribution Update - August 9<sup>th</sup>
3. Wastewater/ Biosolids Update – August 23<sup>rd</sup>
4. Technical Analysis Summary – September 13<sup>th</sup>

# Meeting Agenda

- Stormwater Management
- Traditional Stormwater BMPs
- Ecological Restoration
- Green Infrastructure & Rainwater Harvesting
- Water Conservation



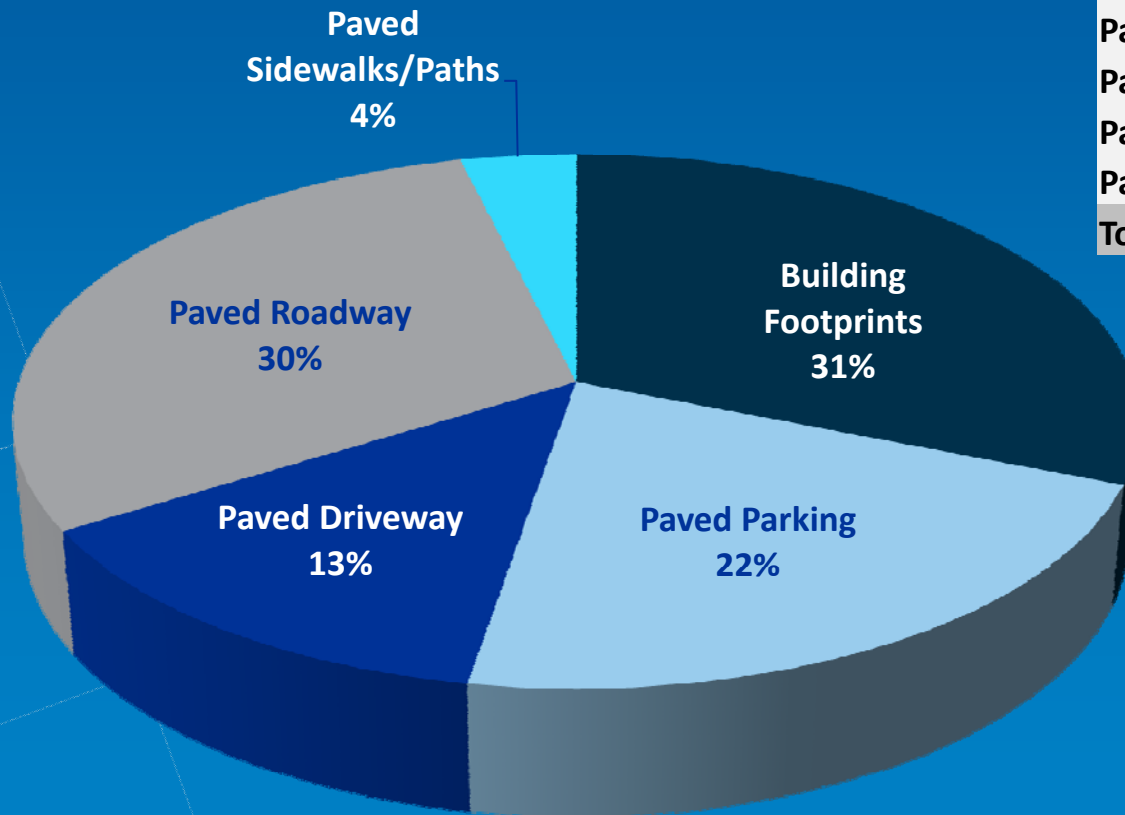
*City of Franklin Integrated Water Resources Plan*

**STORMWATER MANAGEMENT**

# Background

- MS4 Permit Requirements (New permit issued October 2010)
  - New monitoring and stream assessments on 87 miles of impaired streams in the City
  - Higher level of effort required for City to ensure maintenance of private stormwater best management practices
  - New green infrastructure requirements to treat first 1.1” of rain in new developments
- City Ordinances
  - Updated ordinance per permit to meet green infrastructure requirements one year early (January 2013)

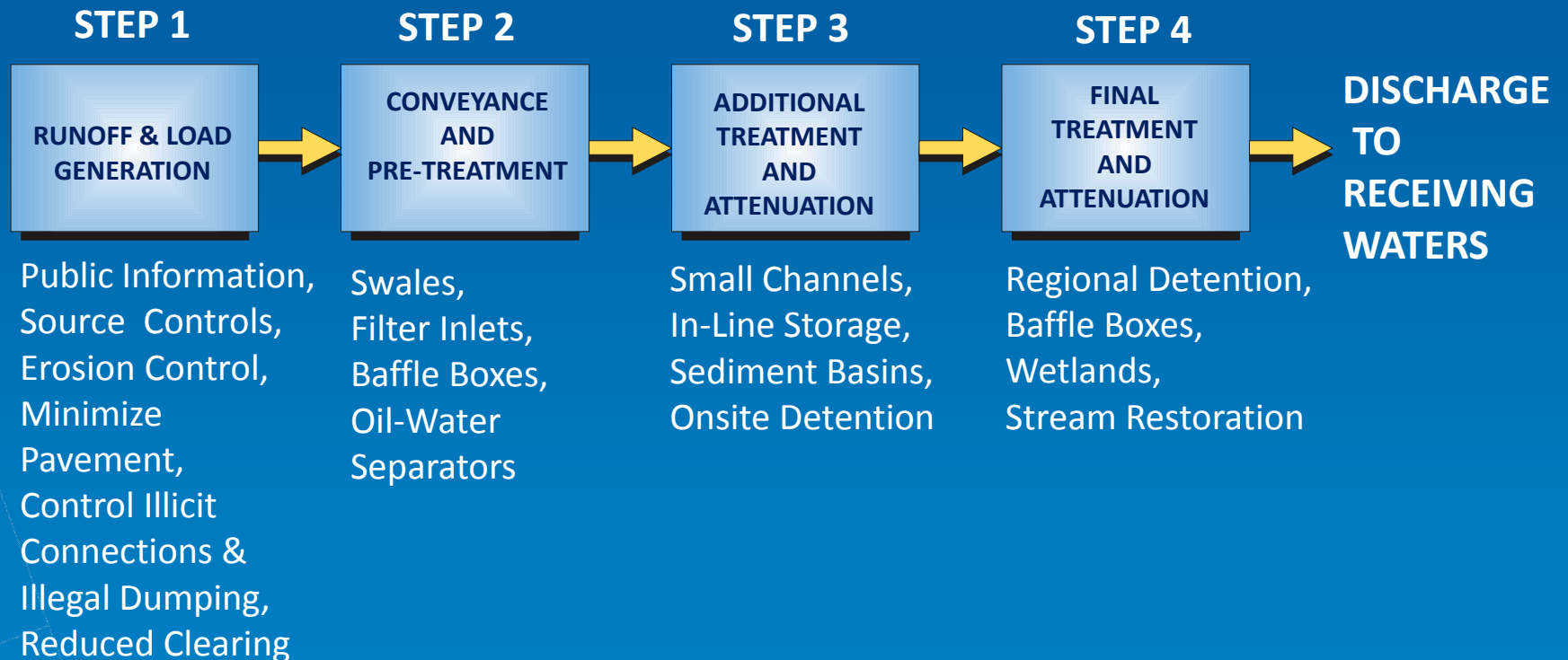
# How Much Impervious Area Are We Talking About?



Impervious Cover (by type)	Area (sq. ft.)
Building Footprints	84,000,000
Paved Parking	58,000,000
Paved Driveway	36,000,000
Paved Roadway	81,000,000
Paved Sidewalks/Paths	10,000,000
<b>Total</b>	<b>269,000,000</b>

# What Tools Do We Have To Control Runoff?

## *The BMP Treatment Train*



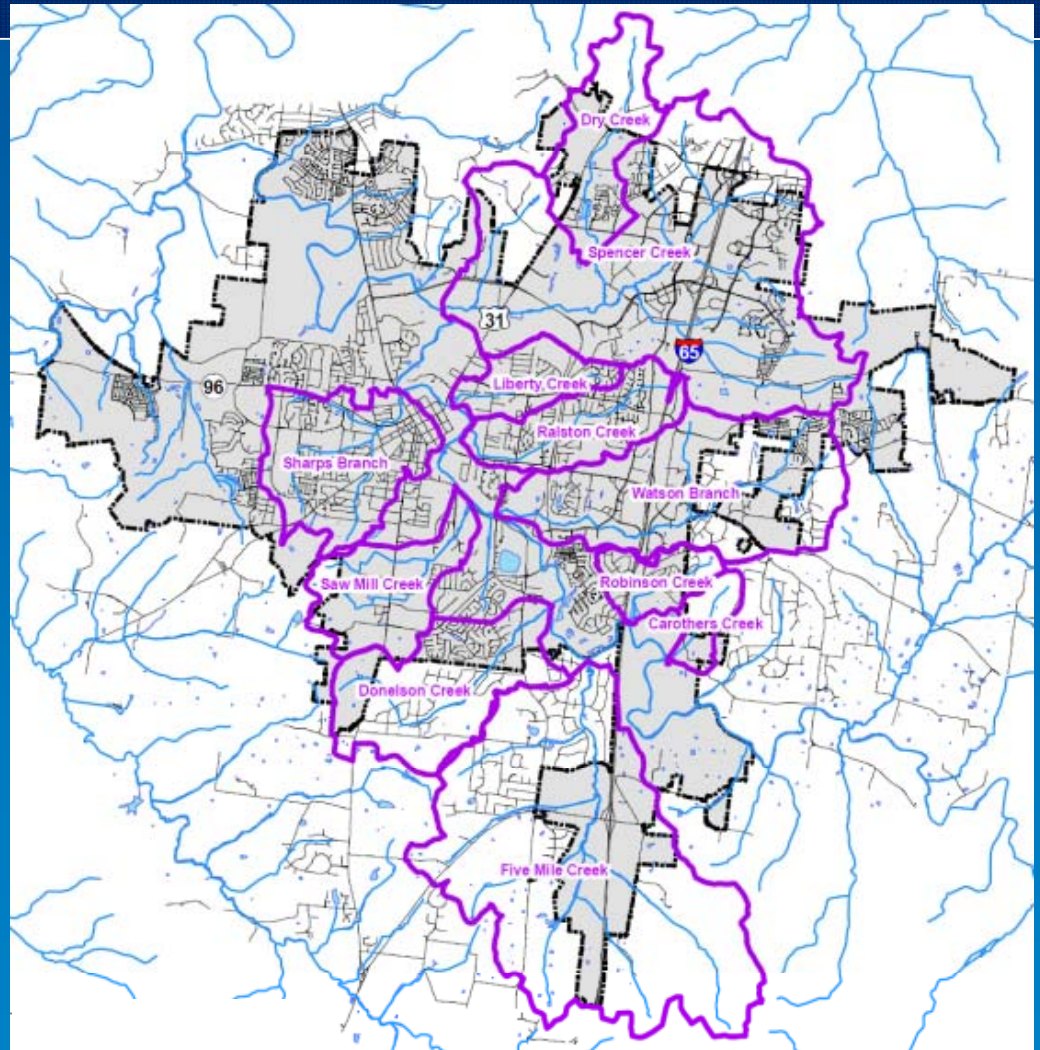


*City of Franklin Integrated Water Resources Plan*

**TRADITIONAL STORMWATER BMP  
TREATMENT OPTIONS**

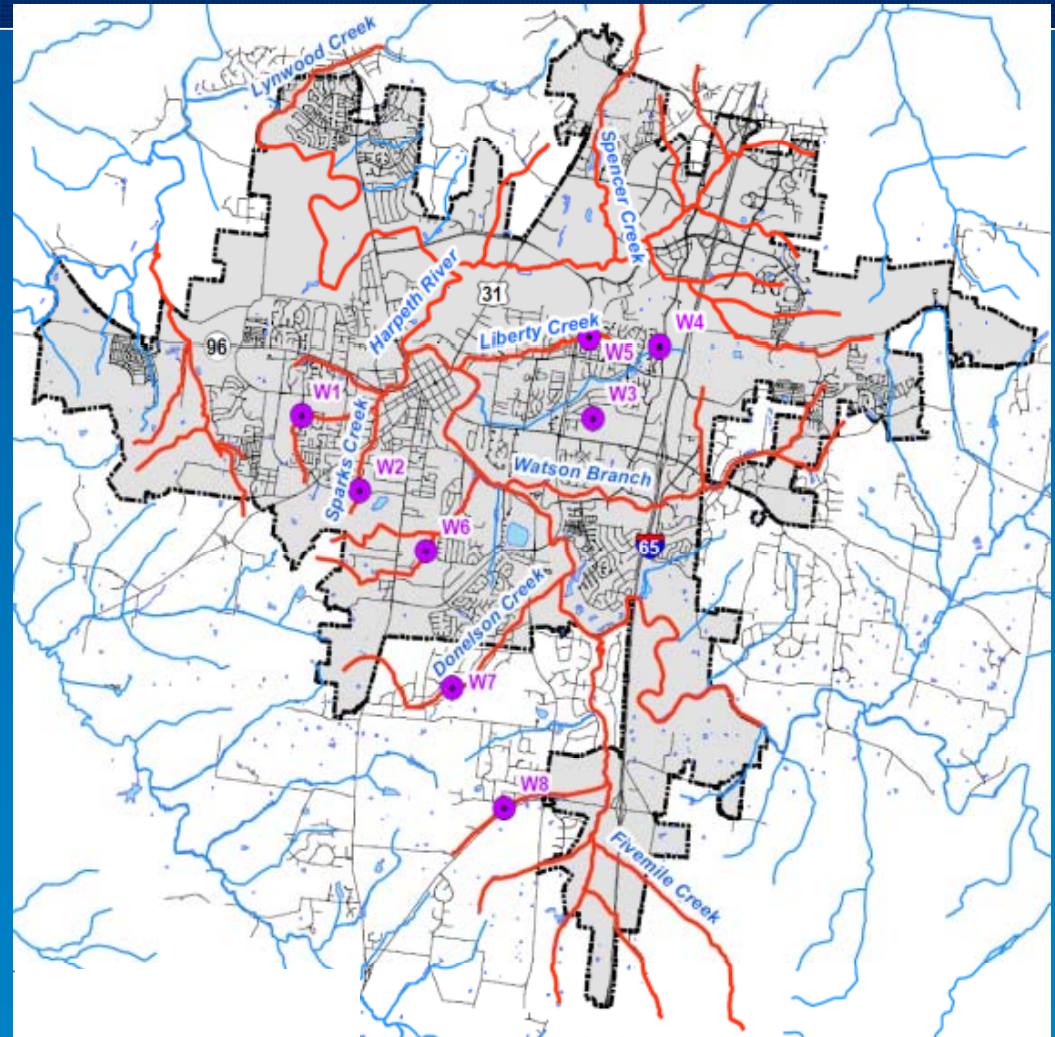
# Stormwater Master Planning for Franklin

- 11 subbasins
- Studied by CDM between 1998 and 2006
- Primarily focused on flooding issues
- Re-evaluate to consider potential water quality improvements



# Water Quality Impairments and Proposed BMP Locations

- 87 miles of stream are listed as “impaired” within City limits
  - Siltation, nutrients, habitat loss, low DO, bacteria, etc.
- 8 potential BMP opportunities (from stormwater plans)





# Potential Pollutant Removal Benefits of Proposed BMP Projects

## Capital Costs and Benefits

- Total Nitrogen Reduction Potential:
  - 7 to 16 lbs/d
  - \$9/lbs/d removed
- Total Phosphorus Reduction Potential:
  - 1.1 to 3.3 lbs/d
  - \$24/lbs/d removed
- Total Sediment Reduction Potential:
  - 1600 to 1900 lbs/d
  - \$0.06/lb/d removed



*Estimated Project  
Construction Costs  
= \$14 - 16 million*

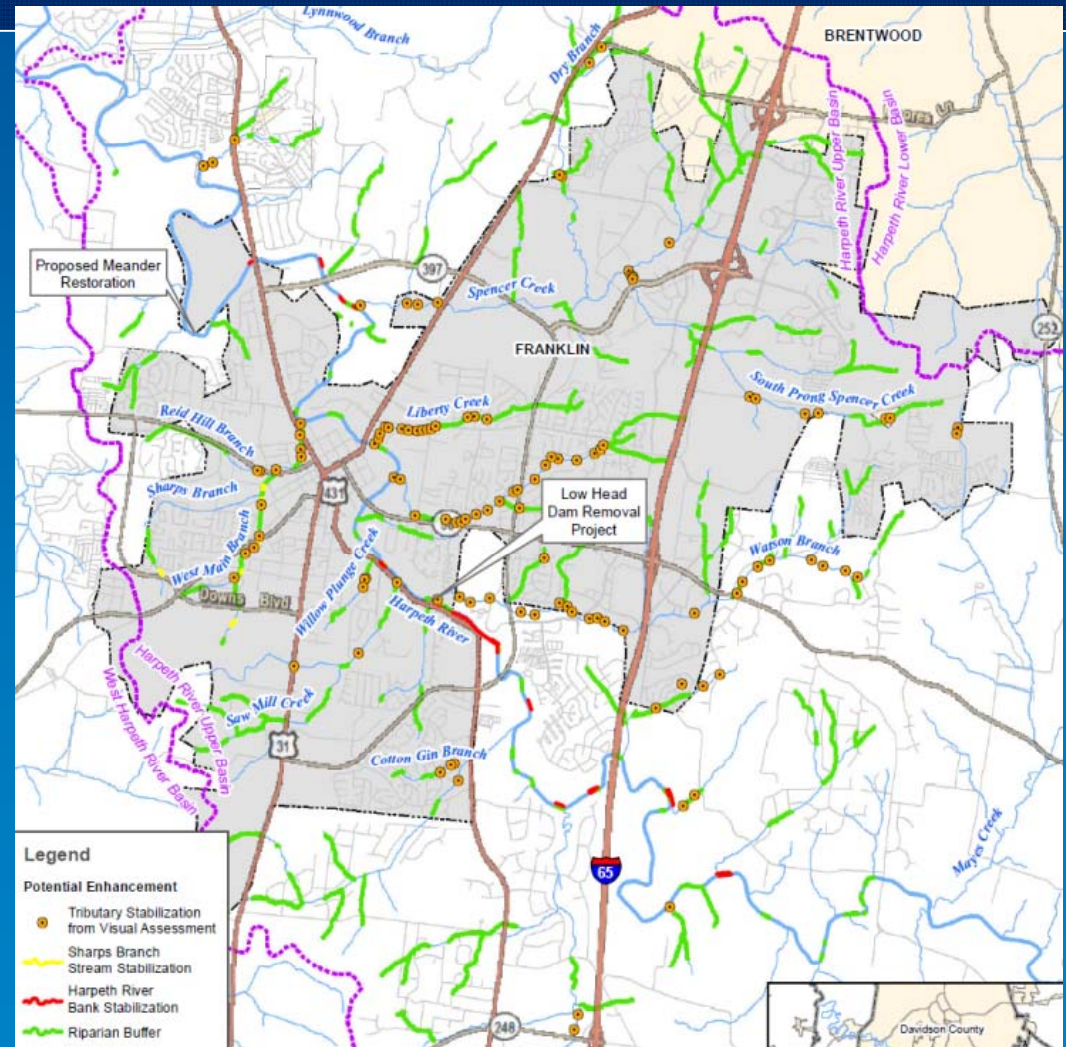
*City of Franklin Integrated Water Resources Plan*

**ECOLOGICAL RESTORATION**



# What is the Potential for Ecological Restoration?

- CDM collected data from a variety of local sources:
- Previous CDM drainage basin studies
  - Visual Stream Assessments (VSA) performed by City staff
  - HRWA studies
  - Desktop GIS evaluation with aerial photography
  - 26,000 feet of stream identified for restoration



# Applicable Treatment to Address Impairments

- Stream restoration (\$400 - 1,000/ft)
  - Return pre-disturbance hydrologic function
- Bank stabilization (~ \$400/ft)
  - Restore conveyance functions, reduce erosion, improve condition
- Riparian restoration (~ \$100/ft)
  - Planting of native vegetation to provide buffer
- Cattle exclusion (~ \$4/ft)
  - Cost effective; applicable to less impacted reaches



# Benefits of Restoration/Stabilization

- Reduced bank erosion and subsequent channel sedimentation
- Filtering of runoff before it enters the stream
- Improved wildlife habitat
- Improved aesthetics for recreation



Source: Volunteer Stream Bank Erosion Study (HRWA)



# Preliminary Cost versus Benefit Analysis

- Estimated cost of restoration/bank stabilization projects
  - \$12 million for 26,000 feet of stream (average \$460 per foot)
- Pollutant removal benefits
  - Nitrogen: 1.4 lb N/d
  - Phosphorus: 0.25 lb P/d
  - Sediment: 180 lb Sediment/d
- Cost/Benefit analysis
  - Nitrogen: \$63 per lb/d
  - Phosphorus: \$364 per lb/d
  - Sediment: \$0.50 per lb/d



Source: NCSU BAE Stream Restoration Project

*City of Franklin Integrated Water Resources Plan*

**GREEN INFRASTRUCTURE & RAINWATER  
HARVESTING**



# What Can Green Do for You?

(apologies to UPS!)

Benefit	Reduces Stormwater Runoff				Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO <sub>2</sub>	Reduces Urban Heat Island	Improves Community Livability					Improves Habitat	Cultivates Public Education Opportunities
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding								Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture		
Practice																		
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◐	●	◐	◐	●	●
Tree Planting	●	●	●	●	○	◐	○	●	●	●	●	●	●	●	●	◐	●	●
Bioretention & Infiltration	●	●	●	●	◐	◐	○	○	●	●	●	●	●	◐	◐	○	●	●
Permeable Pavement	●	●	●	●	○	◐	●	◐	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◐	○	◐	◐	◐	○	○	○	○	○	○	○	●

● Yes

◐ Maybe

○ No

Source: The Value of Green Infrastructure (Center for Neighborhood Technology)

# Runoff Capture Potential for Municipal Properties via Low Impact Development/Green Infrastructure

- Assume retrofit of 50% of existing impervious areas for treatment
- Potential runoff capture of 90% for treated areas
- Total potential rainfall capture is 103 million gallons annually
- Corresponding capture of associated pollutants

Impervious Cover (by type)	Area (sq. ft.)	Area (acres)
Building Footprints	2,000,000	46
Paved Parking/Driveways	3,600,000	83
Paved Roadway	400,000	9.2
Paved Sidewalks/Paths	800,000	18
<b>Total</b>	<b>6,800,000</b>	<b>156</b>



# Municipal Rainwater Harvesting Potential

- Two million square feet (46 acres) of rooftop on all municipally-owned facilities
- Approximately 57 million gallons available for annual capture
- 100% retrofit of municipal facilities could result in a 2% reduction in total demand city-wide

City of Franklin Police Headquarters



## GREEN FEATURES

- Storm water runoff reduces 30% from pre-development conditions using green roof and rainwater cistern system.
- 250,000 gallons per year in irrigation water and waste water intake savings via harvesting



# Option Case Study: Neighborhood Scale Rain Barrel Program

- Example: Chestnut Bend
  - 185 homes or 600,000 sq. ft.
  - Assume 2 rain barrels per home
  - Assume 40% participation (based on other studies)
  - 1.6 million gallons captured
- Approximate cost:
  - \$22,000
  - \$0.01 per gallon captured



*City of Franklin Integrated Water Resources Plan*

**WATER CONSERVATION**



# Effective Conservation Programs

- Hardware Replacement and Rebates
- Irrigation Technologies
- Education, Information, and Awareness
- Audits and Accountability Measures
- Conservation Rate Structures



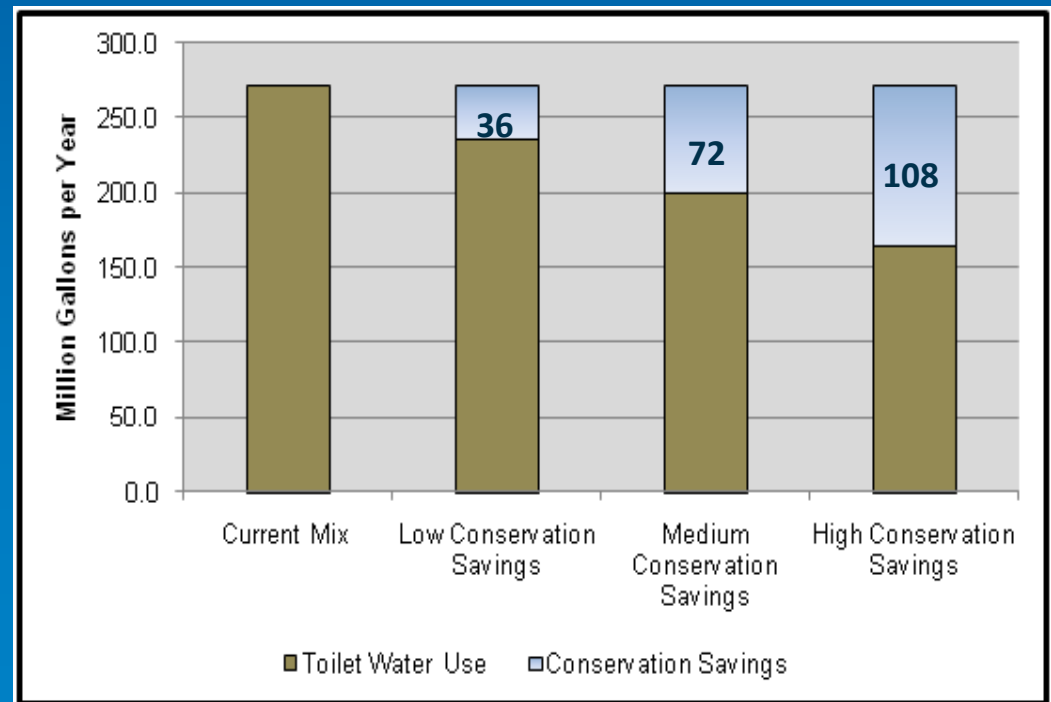
# Benefits of Water Conservation

- Reduction in operation and maintenance costs:
  - Lower user of energy for pumping
  - Less chemical use in treatment and disposal
- Reduced purchases from wholesalers
- Delaying of capital facilities projects



# Option Case Study: Toilet Replacement Rebate Program

- Offer \$100 rebate per High Efficiency Toilet (HET) replaced
- Alternative participation scenarios evaluated:
  - 25%
  - 50%
  - 75%
- Range of Water Savings
  - 36 to 107 MG annually
- Implementation Cost
  - \$1.4 to \$4.5 million over 10 years
- Approximately \$4.00 per 1,000 gallons saved



# Summary Considerations

- Preventative/source controls are a more cost effective approach for pollutant reduction
- Stormwater/conservation controls may require significant financial incentives or regulatory action to achieve beneficial results
- These items may not replace other strategies, but can enhance the overall management strategy

# Next Steps

- Completion of Stormwater/ Ecological Technical Evaluations
  - Finalize study of green infrastructure alternatives/cost
  - Additional case study regarding irrigation controls
  - Incorporate into STELLA and Harpeth River Models
- Additional BOMA Updates
  - August 9<sup>th</sup>            Water Treatment/ Distribution Update
  - August 23<sup>rd</sup>        Wastewater/ Biosolids Update
  - September 13<sup>th</sup>    Technical Analysis Summary