Regulatory Framework to Support Green Infrastructure

May 9, 2014

NPDES Permits

NPDES discharge permit is required if:

- There is a discharge of pollutants
- From a point source
  - A pipe or drainage ditch
- To "Waters of the United States"
  - Rulemaking in process to help define what is a water of the U.S.
- Under the Federal Clean Water Act Nonpoint runoff does not need to have permit coverage
- Most agricultural activities not required to have permit coverage

Many Stormwater Discharges Are Regulated Under the NPDES Program

- **Confirmed in 1987 amendments to CWA**
  - **Stormwater contains pollutants**
    - **National Urban Run-off study and other monitoring data**
  - **Stormwater is discharged through pipes and ditches**
    - **Which are Point Sources**
- **EPA focuses on 3 types of stormwater sources:**
  - **Industrial sites**
  - **Construction sites**
  - **Municipal storm sewer systems**

Discharges of Stormwater Associated with Industrial Activity

- 11 categories of industrial activities
  - Related to manufacturing, processing, or materials storage areas

Stormwater Runoff from Construction Sites

- NPDES requirements cover construction sites that disturb > 1 acre
  - Includes activities part of a larger common plan of development
- Why construction sites?
  - Erosion rates from construction sites are typically 10 X higher than from other land uses

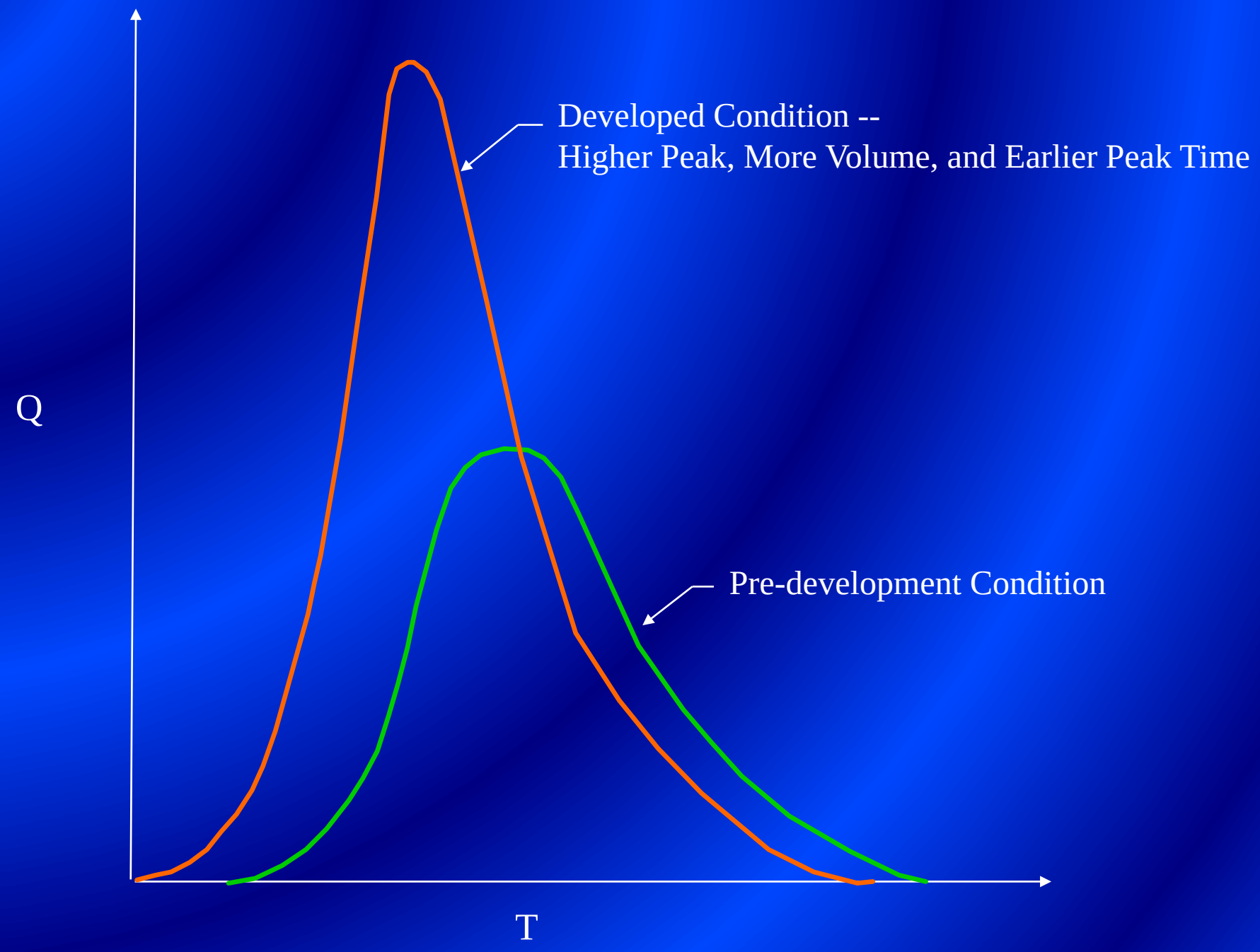
Municipal Separate Storm Sewer Systems (MS4s)

Six Minimum Control Measures:

- Public Education and Outreach
- Public Involvement/Participation
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Stormwater Management in New and Redevelopment
- Pollution Prevention/Good Housekeeping for Municipal Operations

Federal and State Environmental Agencies, and Green Infrastructure

Stormwater Discharges Change Stream Flow Characteristics



Increased Run-off due to Impervious Surfaces

Higher Flow Volumes Cause Water Quality Problems

Pollutant effects:

- Increased temperatures
- Increased sediment loadings

Stream channel damage:

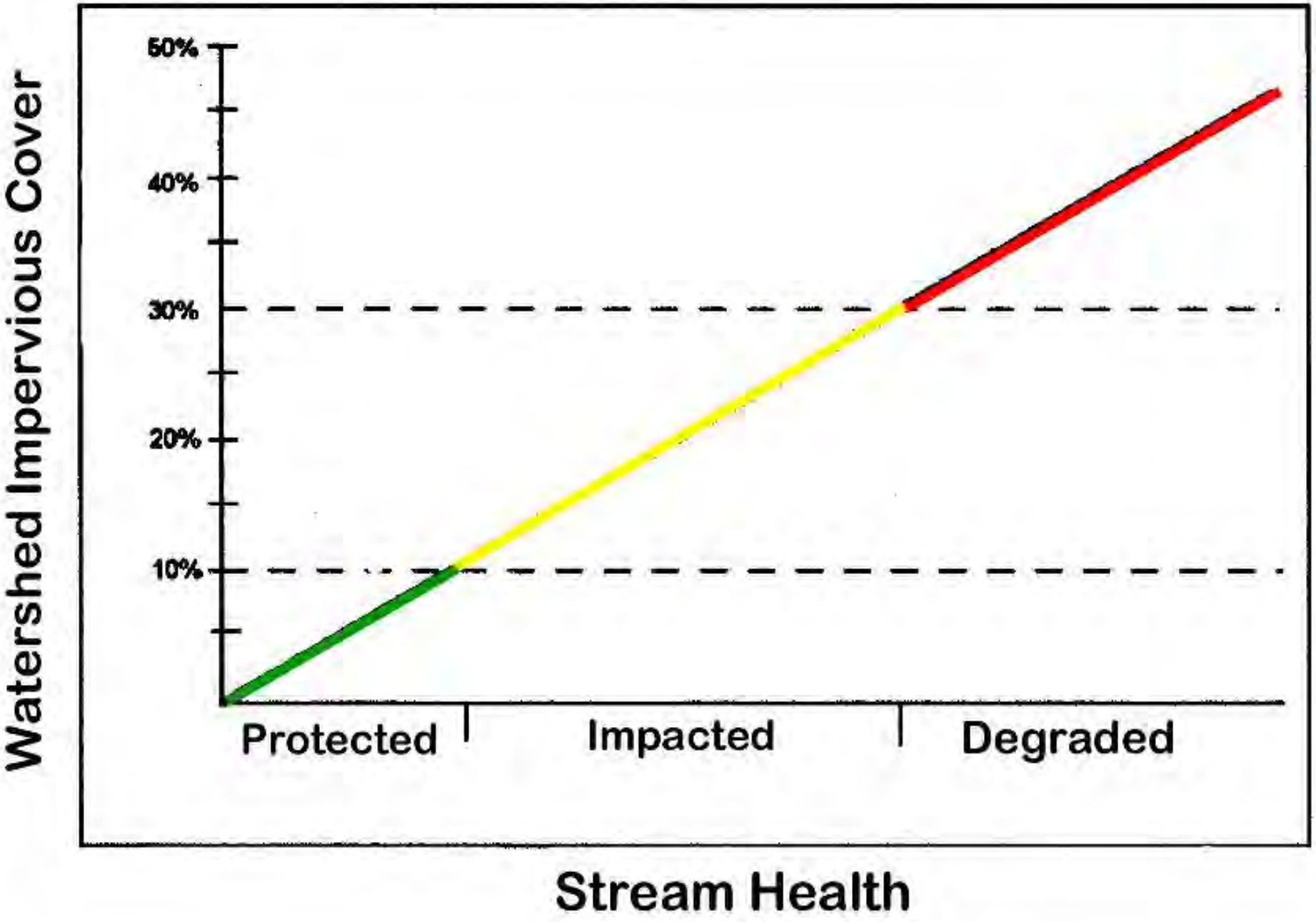
- Stream widening and erosion
- Decreased channel stability
- Loss of riparian tree canopy

Degraded habitat:

- Loss of pool-riffle structure
- Lower summer base flows
- Decreased substrate quality

Stream Corridor Degradation due to Stormwater

Stormwater Volumes and Pollutant Loads Result in Water Quality Degradation



Center for Watershed Protection

Green Infrastructure Practices

- Increase Infiltration
- Increase Evapotranspiration
- Store and reuse stormwater
- Reduce the volume of runoff
- Help reduce water quality and habitat-related impacts

Originating Documents

- Memo from EPA Assistant Administrator Ben Grumbles to EPA Regional Administrators, March 5, 2007, *Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint Source and other Water Programs*
- *Green Infrastructure Statement of Intent*, signed by NRDC, NACWA, LID Center, ASIWPCA and EPA on April 19, 2007

Initial Agency Approaches

Initial efforts aimed at advancing green infrastructure implementation centered around:

- Education and outreach
- Sponsoring research, compiling data, sharing data
- Participating in pilot/demonstration projects

Energy Independence and Security Act of 2007

Sec. 438. Storm Water Runoff Requirements for Federal Development Projects

The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.

Stormwater Runoff Performance Standards for Development Sites

Why?

- Because in most cases it is when we do new development (or in some cases redevelopment) that we create expanses of imperviousness and alter the natural hydrology
- It is almost always less expensive to do it right the first time, vs. retrofitting BMPs in later

Post-Development Stormwater Performance Standards

Who should pay for stormwater controls?

- The developer creating the impervious surfaces, and altering the hydrology
- Or the public, via taxes or sewer fees
- Or a downstream entity who experiences flooding

Regulatory Approaches
Wisconsin - NR 151

- Performance standards include requirements for total suspended solids runoff and infiltration
- The infiltration performance standard requires that, to the MEP, a portion of the runoff volume be infiltrated:
  - Residential – 90 percent of pre-development infiltration volume or 25 percent of the 2 year-24 hour design storm
  - Non-residential – 60 percent of predevelopment infiltration volume or 10 percent of the 2 year-24 hour design storm

New Jersey

The New Jersey Stormwater Management Rules require that a "major development" project must comply with one of the following groundwater recharge requirements:

- ***Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual preconstruction groundwater recharge volume for the site;***

  or

- ***Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated***

West Virginia
MS4 Permit

West Virginia DEP issued a MS4 general permit with performance standards for new and redevelopment projects (2009):

The permittee must implement and enforce via ordinance and/or other enforceable mechanism(s) the following requirements for new and redevelopment: […] Site design standards for all new and redevelopment that require, in combination or alone, management measures that infiltrate, evapotranspirate and reuse of, at a minimum, the first one inch of rainfall from a 24-hour storm. This first one inch of rainfall must be 100% managed with no discharge to surface waters

West Virginia Permit – Incentives for Sustainable Development Practices

A *credit* of 0.2 inches from the one inch runoff reduction standard may be applied to any of the following types of development:

- Redevelopment
- Brownfield redevelopment
- High density (>7 units per acre)
- Vertical Density (Floor to Area Ratio of 2 or >18 units per acre)
- Mixed use and Transit Oriented Development (within ½ mile of transit)

California – Another Metric for Promoting Green Infrastructure

The Los Angeles Regional Water Quality Control Board included the following standard in a MS4 permit for Ventura County:

Permittees shall require that new development and redevelopment projects control pollutants, pollutant loads, and runoff volume emanating from impervious surfaces through percolation, infiltration, storage, or evapotranspiration, by reducing the percentage of Effective Impervious Area to less than 5 percent of total project area

California - San Diego County

The following LID BMPs shall be implemented at all Priority Development Projects where applicable and feasible:

i. Conserve natural areas, including existing trees, other vegetation, and soils

ii. Construct streets, sidewalks, or parking lot aisles to the minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised

iii. Minimize the impervious footprint of the project

iv. Minimize soil compaction

v. Minimize disturbances to natural drainages (e.g., natural swales, topographic depressions, etc.)

Requirements in *Construction* General Permits

Ohio – Big Darby Watershed

Groundwater Recharge Requirements

- **The SWPPP shall ensure that the overall site post-development groundwater recharge equals or exceeds the pre-development groundwater recharge**
- **The SWPPP shall describe the conservation development strategies, BMPs and other practices deemed necessary by the permittee to maintain or improve pre-development rates of groundwater recharge**

Requirements in *Construction* General Permits

Minnesota

PERMANENT STORMWATER MANAGEMENT SYSTEM

- **The Permittee(s) shall design the project so that all stormwater discharged from the project during <u>and after</u> construction activities does not cause a violation of state water quality standards, including nuisance conditions, erosion in receiving channels, or a significant adverse impact to wetlands caused by inundation or decrease of flow**

Requirements in Construction General Permit
Minnesota

- Where a project's ultimate development replaces vegetation and/or other pervious surfaces with one or more acres of cumulative impervious surface, the Permittee(s) must design the project so that the water quality volume of one inch of runoff from the new impervious surfaces created by the project is retained on site (i.e. infiltration or other volume reduction practices) and not discharged to a surface water.

Addressing Site Constraints in Permits
Minnesota CGP

- The Permittee(s) shall employ appropriate on-site testing consistent with the recommendations found in the Minnesota Stormwater Manual to verify soil type and to ensure a minimum of 3 feet of separation from the seasonally saturated soils or from bedrock and the bottom of the proposed infiltration/filtration system
- Other Site Constraints:
  Karst topography; upgradient of a sensitive area such as a fen; source water protection areas?

Maintenance and Assurances

Language In Wisconsin CGP

- For any permanent structures, provisions shall be made for long-term maintenance with the municipality or other responsible party
- For an NOI submitted to the Department, **a copy of the signed long-term maintenance agreement shall be submitted to the Department with the NOI** unless the Department agrees that it may be submitted by an alternative date prior to termination of permit coverage
- The Department may withhold permit coverage until the long-term maintenance agreement is submitted to the Department

Maintenance of BMPs

San Diego County MS4 Permit

e. TREATMENT CONTROL BMP MAINTENANCE TRACKING

(1) Each Copermittee shall develop and utilize a watershed-based database to track and inventory approved treatment control BMPs and treatment control BMP maintenance within its jurisdiction

(2) Each Copermittee shall develop and implement a program to verify that approved treatment control BMPs are operating effectively and have been adequately maintained

Preservation of Green Infrastructure
Big Darby Creek CGP

- Protection of open space (infiltration areas) shall be by binding conservation easements that identify a third party management agency, such as a homeowners association/ condominium association, political jurisdiction or third party land trust

Illinois MS4 General Permit
Retrofit Language

Develop and implement a program to minimize the volume of stormwater runoff and pollutants from public highways, streets, roads, parking lots, and sidewalks through the use of BMPs

- Program should result in physical, chemical, or biological pollutant load reductions, increased infiltration, increased evapotranspiration, and/or reuse of stormwater

The program shall include:

- Training for MS4 employees
- Training for contractors
- Ensure adequate long-term maintenance of BMPs

Michigan MS4 Permit 2003

Develop and implement a comprehensive stormwater management plan for development, implementation, and enforcement of controls across the permittee's urbanized area to protect the designated uses in receiving waters from the effects commonly associated with urbanization.

- Stream "flashiness" (higher peak flow and lower base flow);
- Stream-bank erosion;
- Increased stream temperature and pollutant load;
- Reduced stream-bank vegetation; and
- Degraded fish and aquatic habitat.

Michigan MS4 Permit (2003)

Example comprehensive management plan controls include policies and ordinances that provide requirements and standards for:

- **Directing growth to identified areas;**
- **Protecting sensitive areas such as wetlands and riparian areas;**
- **Maintaining and/or increasing open space;**
- **Encouraging infill development;**
- **Establishing in-stream maximum flow targets designed to minimize stream bank erosion and maintain healthy fish populations, and coordinating release volumes and rates from detention basins to achieve in-stream maximum flow targets.**

EPA Stormwater Rulemaking

Establish a size of storm that must be managed (retained) on site ("stay-on value")

- 95th percentile storm?
- 90th percentile storm?
- 85th percentile storm?
  - This amount of water would approximate the water quality volume, i.e., it would tend to be protective of receiving in terms of pollutant loadings
  - But there could be some stream corridor erosion

Performance Standards Considerations

Discharges from New Development Sites

- Likely want the standard to accommodate site constraints
  - Volume that cannot be retained onsite could be handled through off-site mitigation, payment in lieu, and/or treatment

Discharges from Redeveloped Sites

- Likely a less stringent standard for redevelopment sites
  - Recognizes the difficulties associated with installing stormwater controls due to site constraints

Federal Stormwater Rulemaking

- Education, Technical Assistance and Engagement with Key Partners
- Recognition/Incentive Programs
  - Regulated MS4s
  - Unregulated MS4s
  - Builders and Developers
- Continue Effective Use of the MS4 Program, Construction General Permits

Recognition/Incentive Programs

Blue Star Award Program (MN)

Recognizing Excellence in Community Stormwater Management

- Assess community policies and practices in three core areas:
  - Water-Friendly Planning & Preservation
  - Stormwater Management Standards & Practices
    - Impervious Cover Management
    - Stormwater Management Polices
    - Green Streets For Cleaner Water
  - Stormwater Pollution Prevention

Green Infrastructure in CSO Communities

Milwaukee Metropolitan Sewerage District

- Tunnel already constructed and in operation
- MMSD has achieved a high level of CSO performance: 2-3 overflow events in a typical year; 98.5% level of control in 2013
- Green Infrastructure Provisions in New Permit

Milwaukee Metropolitan Sewerage District

- The District, working with partners as appropriate, will ensure that green infrastructure practices are put in place in the MMSD service area
  - Each year - 1 million gallons of design retention capacity
  - Up to 75% of the total green infrastructure retention capacity requirement can be met through capture at GreenSeams® parcels
  - At least 25% of the green infrastructure retention capacity requirement must be met through implementation of rain gardens, permeable pavement, bioswales, etc.
- Any green infrastructure practices/control measures that are put in place must be maintained

Milwaukee Metropolitan Sewerage District

- MMSD issued two requests for proposals from entities in the service area.
- The District reviewed proposals and selected projects to be supported
- Total gallons excluding GreenSeams® parcel acquisitions: 3,865,000
- Total gallons including parcel GreenSeams® acquisitions: 10,020,000
- Includes 8 Green Roofs projects
- Includes 13 projects for Rain Gardens, Permeable Pavements, Bioswales, etc.

Milwaukee Metropolitan Sewerage District

Some of MMSD's Green Infrastructure Partners (2013)

- Six Points Farmers Market
- Bradley Road Median
- All Peoples Church
- St. Ann Inter-Generational Center
- UWM Sandburg Commons Gardens
- City DPW Yards

Detroit Water and Sewerage Department 2013 NPDES Permit

Rouge District

- The permittee shall develop and implement a Green Infrastructure Plan for this area.
- The Plan shall describe a process for locating, designing, constructing, operating, and evaluating GI in these sewersheds. GI implementation shall be planned to capture wet weather flows that would otherwise flow into the sewer system and contribute to CSOs.

Detroit Permit

Elements of the Rouge District GI Plan

- Disconnection of downspouts
- Provisions covering demolition and removal of vacant structures
  - Where demolition is planned and implemented at sites that will be re-purposed for GI, the demolition specifications shall ensure that basements and other impervious surfaces at the sites are removed, that the site is raked to remove large rocks and construction debris, and that engineered soils consisting of an appropriate mix of topsoil, compost, and sand is applied following the demolition to support plant growth and promote infiltration

Detroit Permit

Elements of the Rouge District GI Plan

- Provisions for installation of bioswales along roadways and parking lots to intercept runoff and reduce storm water inputs to the combined sewer system from impervious surfaces
- Provisions for installation of rain barrels and rain gardens at commercial and residential properties to capture and hold stormwater runoff
- Provisions for tree planting for uptake and evapotranspiration

Detroit Permit

Elements of the Rouge District GI Plan

- Prioritization criteria for sites where green infrastructure practices will be implemented -- locations and designs that will provide the greatest benefits in terms keeping flows out of the sewer system and helping to reduce CSOs
  - Additional prioritization criteria could include locations that could help reduce localized flooding or basement back-ups
- Processes for public outreach and public participation in selecting sites and implementing GI practices

Detroit Permit

Elements of the Rouge District GI Plan

- Procedures/methods for tracking green infrastructure implementation and measuring effects
- Provisions for ensuring appropriate maintenance of sites where green infrastructure has been implemented, including roles and schedules for maintenance
- Provisions for ensuring storm water management (runoff reduction) benefits associated with GI implementation will be preserved over time

Detroit Permit

- GI Plan approved in 2013
- DWSD will implement GI in the Rouge District in accordance with the plan
- The investment in GI in these sewersheds will be an average of 3 million dollars per fiscal year for the ten-year period ending 2019 (for a total of $30 million), and an average of 2 million dollars per year for the following 10 years (for a total of $20 million)

Detroit Permit

East Side

- This near east-side area of Detroit is another area of focus in the permit
- Because of the potential for some larger-scale green projects due to a relatively large amount of vacant land in the area, it may prove to be possible to eliminate or reduce the size of some previously envisioned CSO treatment facilities for this area using the combination of GI implementation along with possible sewer separation and other engineering solutions

Detroit Permit

East Side – This Permit Cycle

- Study the potential for GI implementation and prepare a conceptual engineering plan for providing elimination or adequate treatment of CSOs at nearby outfalls
- Based on the recommendations of this plan once approved, future CSO Control requirements and GI elements for these outfalls will be established in subsequent NPDES permits

Green Infrastructure in Enforcement Actions

- Increasingly common in CSO Enforcement Cases:
  - Cleveland
  - St. Louis
  - Chicago
  - Washington, D.C.
  - Seattle
  - Buffalo

Metropolitan Water Reclamation District of Greater Chicago

- **Deep tunnel project underway. Completion scheduled in the Consent Decree.**
  - **The backbone of the CSO control program**
  - **In the next ~ four years MWRD will more than quadruple its current CSO storage capacity**

- **Green infrastructure also included in the CD**
  - **“The Icing on the TARP cake”**

MWRD – Green Infrastructure

Green Infrastructure Plan

- Establishing Partnerships and Collaboration with Other Stakeholders
- Public Participation
- Geographic Coverage/Decision Criteria
- Preservation of Constructed Green Infrastructure Projects

MWRD – Green Infrastructure

Geographic Coverage/Decision Criteria (prioritization scheme)

(1) Green Infrastructure control measures will help reduce flooding and basement backups;

(2) Land ownership will readily accommodate permanent GI control measures and maintenance, such as areas where vacant parcels can be retrofitted into "stormwater parks," which would store and infiltrate or reuse rainfall and runoff and also be an amenity for local residents; and

(3) Green Infrastructure control measures can improve socio-economic conditions in the service area, with the highest priority given to neighborhoods where the need for improvement is greatest.

MWRD – Green Infrastructure

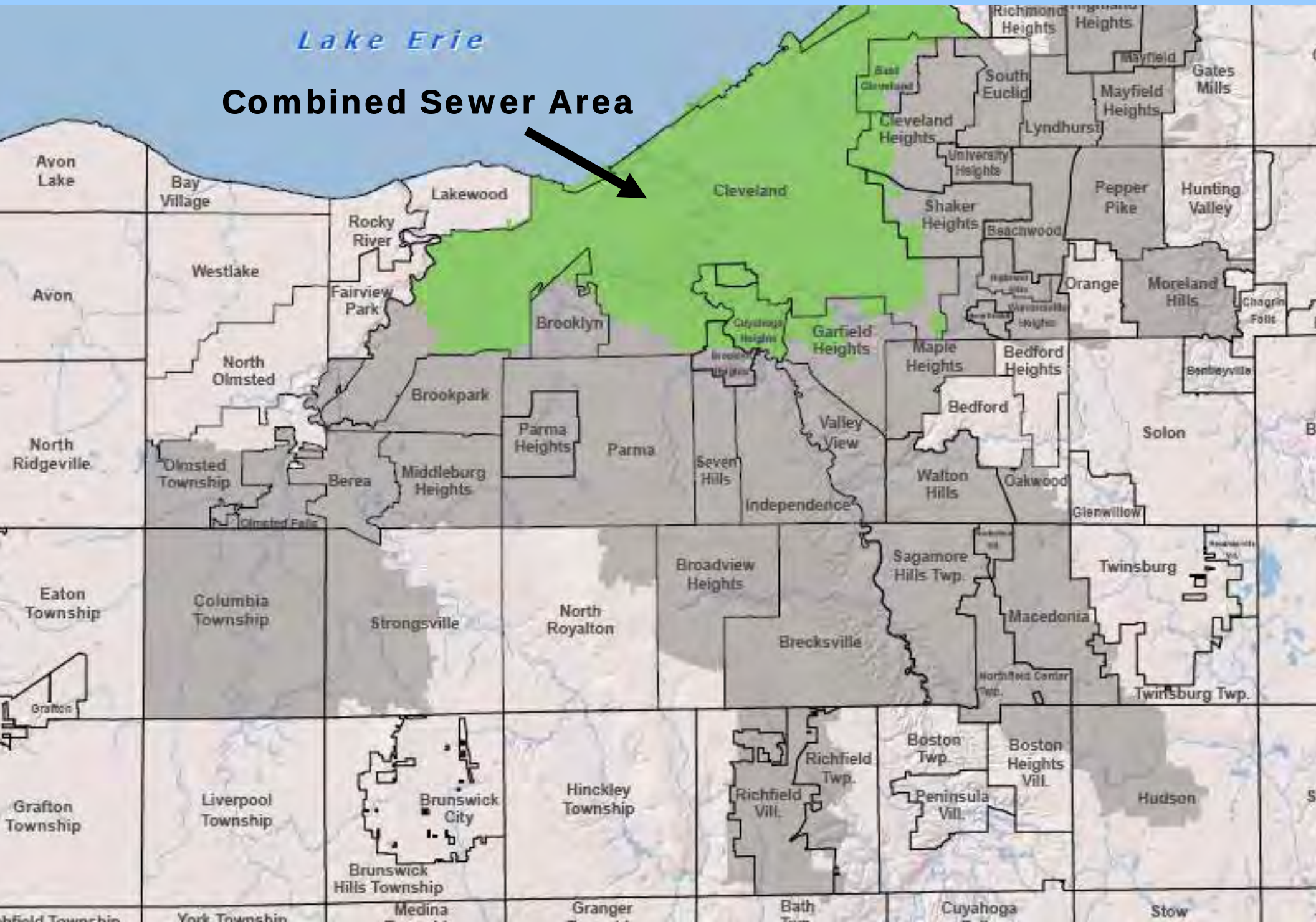
MWRD, by itself or in collaboration with other stakeholders, will complete Green Infrastructure projects within its service area that are identified in accordance with the Plan

MWRD – Green Infrastructure

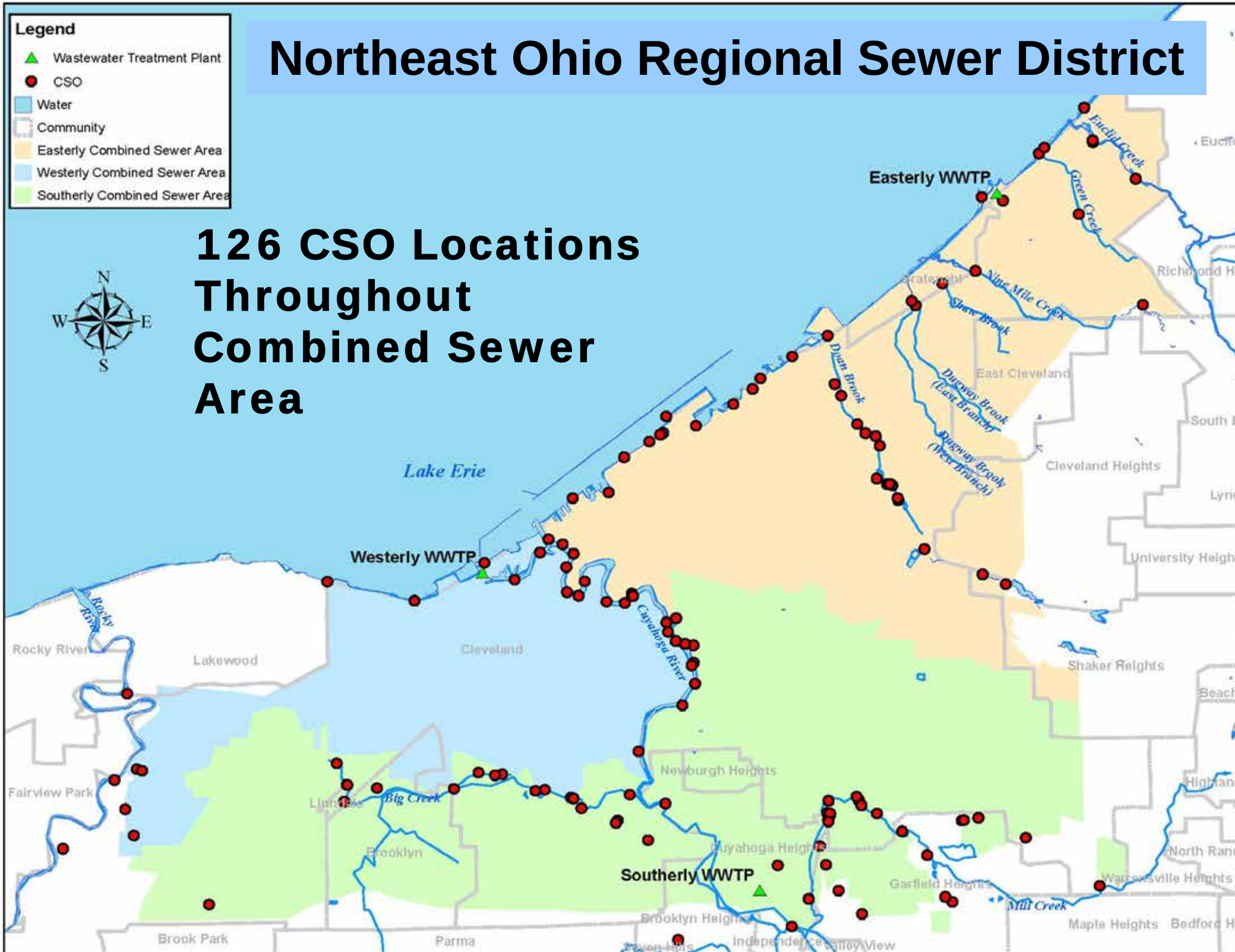
Date	Implementation Milestone/Requirement
5 years after the Effective Date of the Consent Decree	2,000,000 gallons of Design Retention Capacity
10 years	5,000,000 gallons (cumulative)
15 years	10,000,000 gallons (cumulative)

"Within three years after the Effective Date of the Consent Decree, MWRD shall develop and maintain an inventory of completed Green Infrastructure projects, including project locations, collaborating partners, type and size/scope of Green Infrastructure projects, the entity responsible for project maintenance, and Design Retention Capacity."

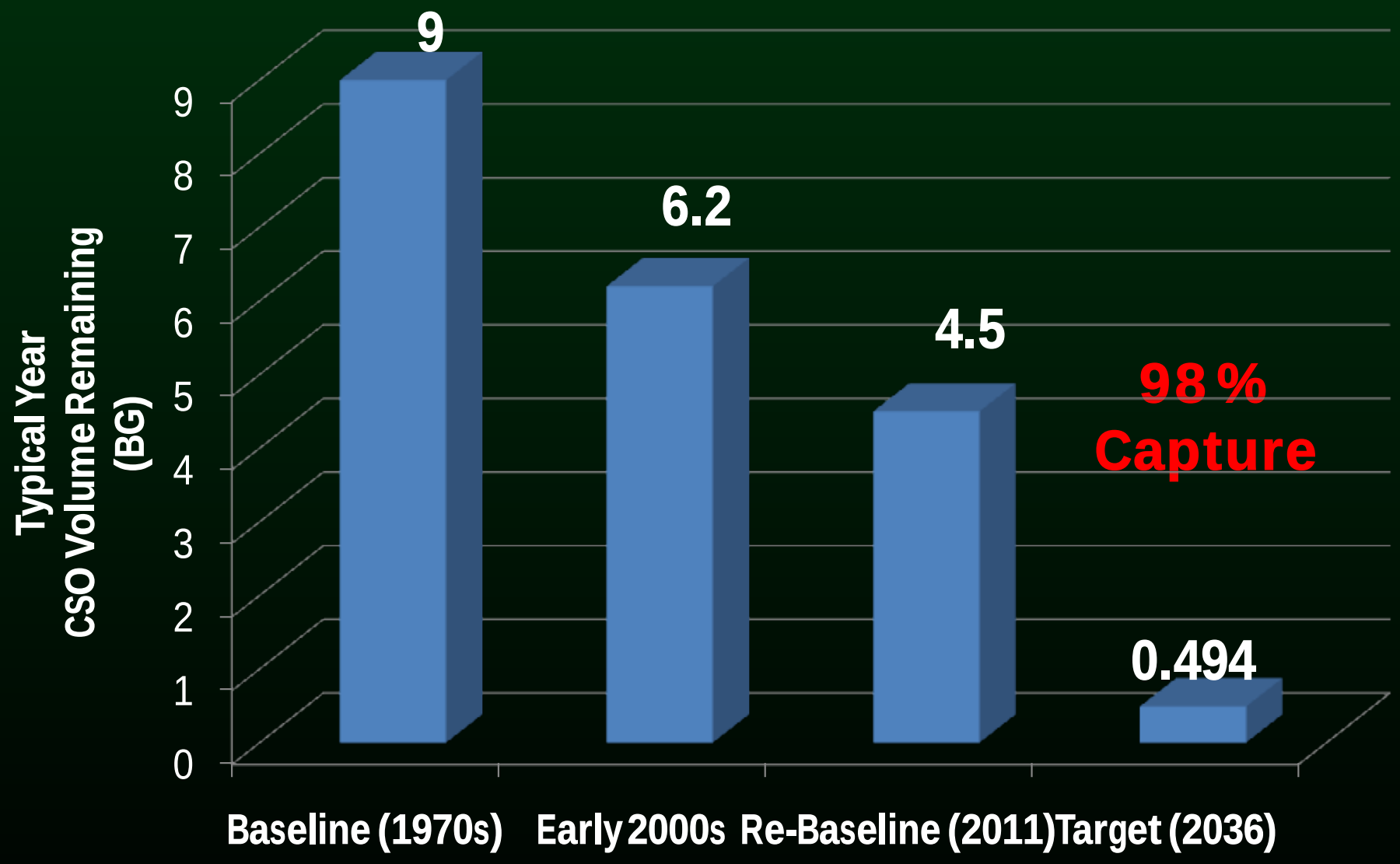
Northeast Ohio Regional Sewer District



Northeast Ohio Regional Sewer District



EPA Requires Northeast Ohio's CSO Problem Reduced in 25 Years

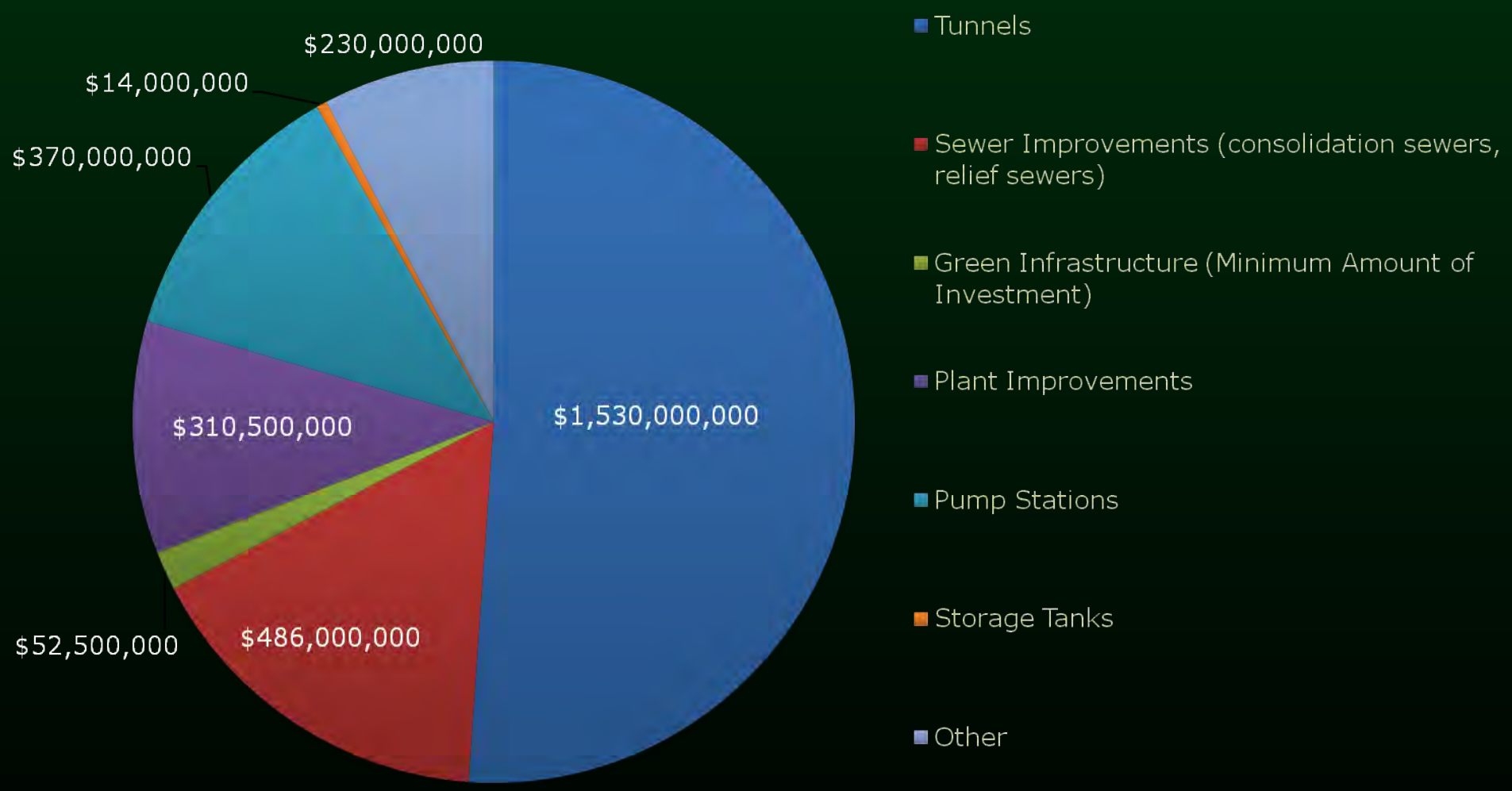


Your Sewer District Keeping our Great Lake great.

#ProjectCleanLake

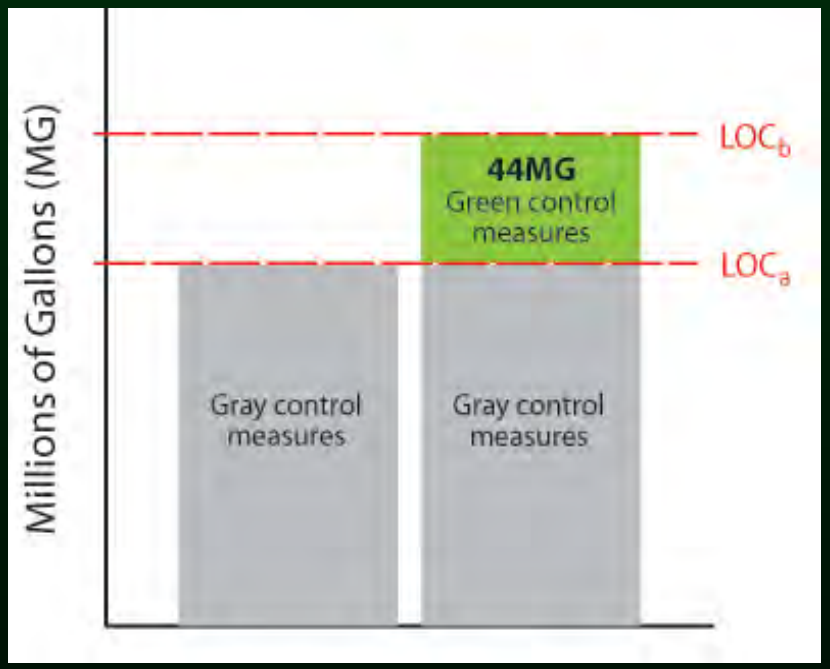
CSO Consent Decree

$3B Capital Investment in CSO Control Measures over 25 Years

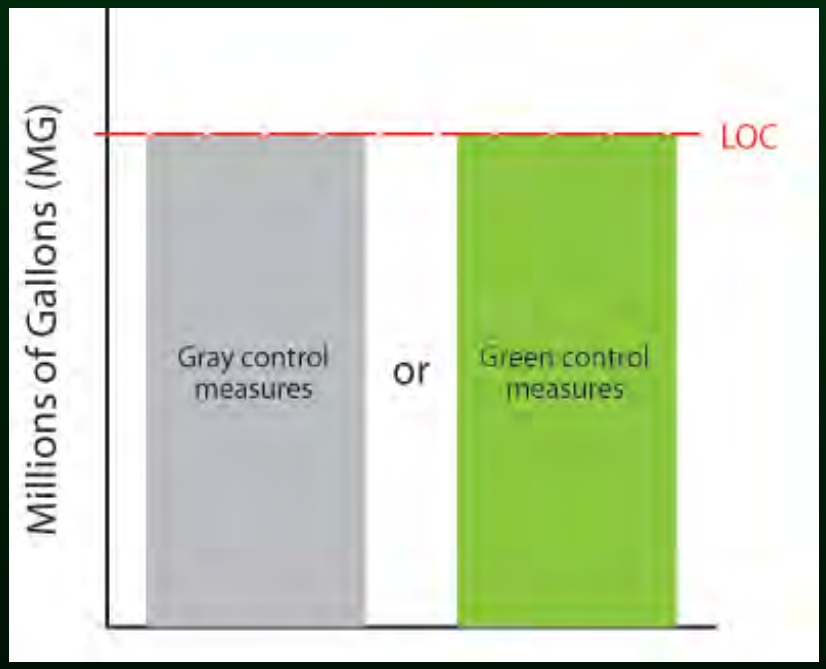


CSO Consent Decree includes

Two Components regarding Green Infrastructure

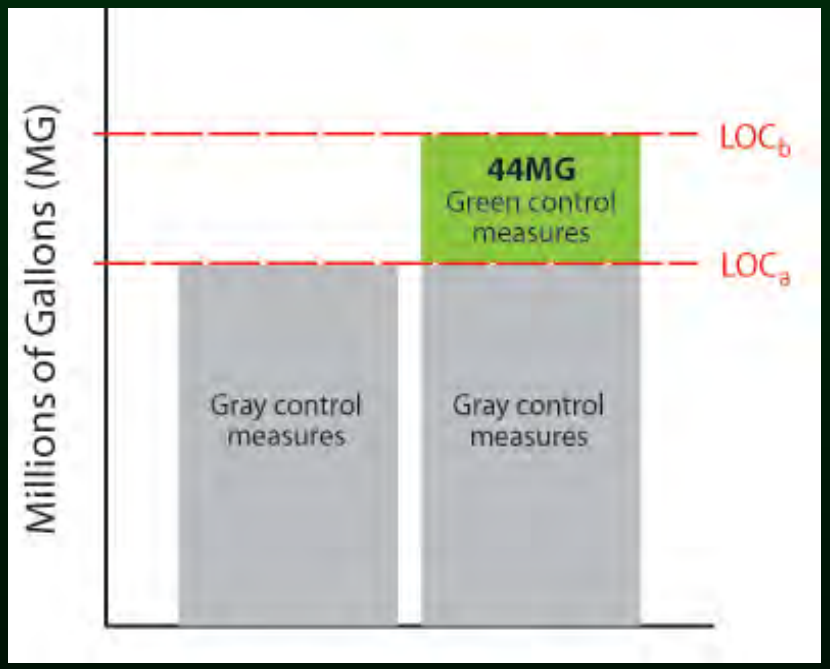


Appendix 3: "Gray plus Green"
(District submitted Green Infrastructure Plan December 2011)



Appendix 4: "Gray vs. Green"
(Opportunity to "right-size" gray using green)

NEORSD - Required Green Infrastructure Implementation



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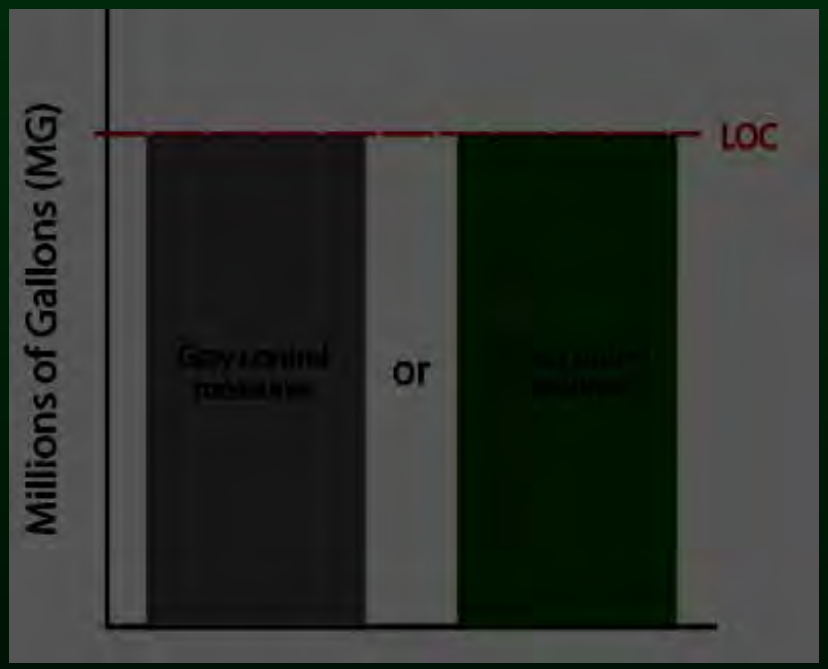


Appendix 4: "Gray vs. Green"
(Opportunity to "right-size" gray using green)

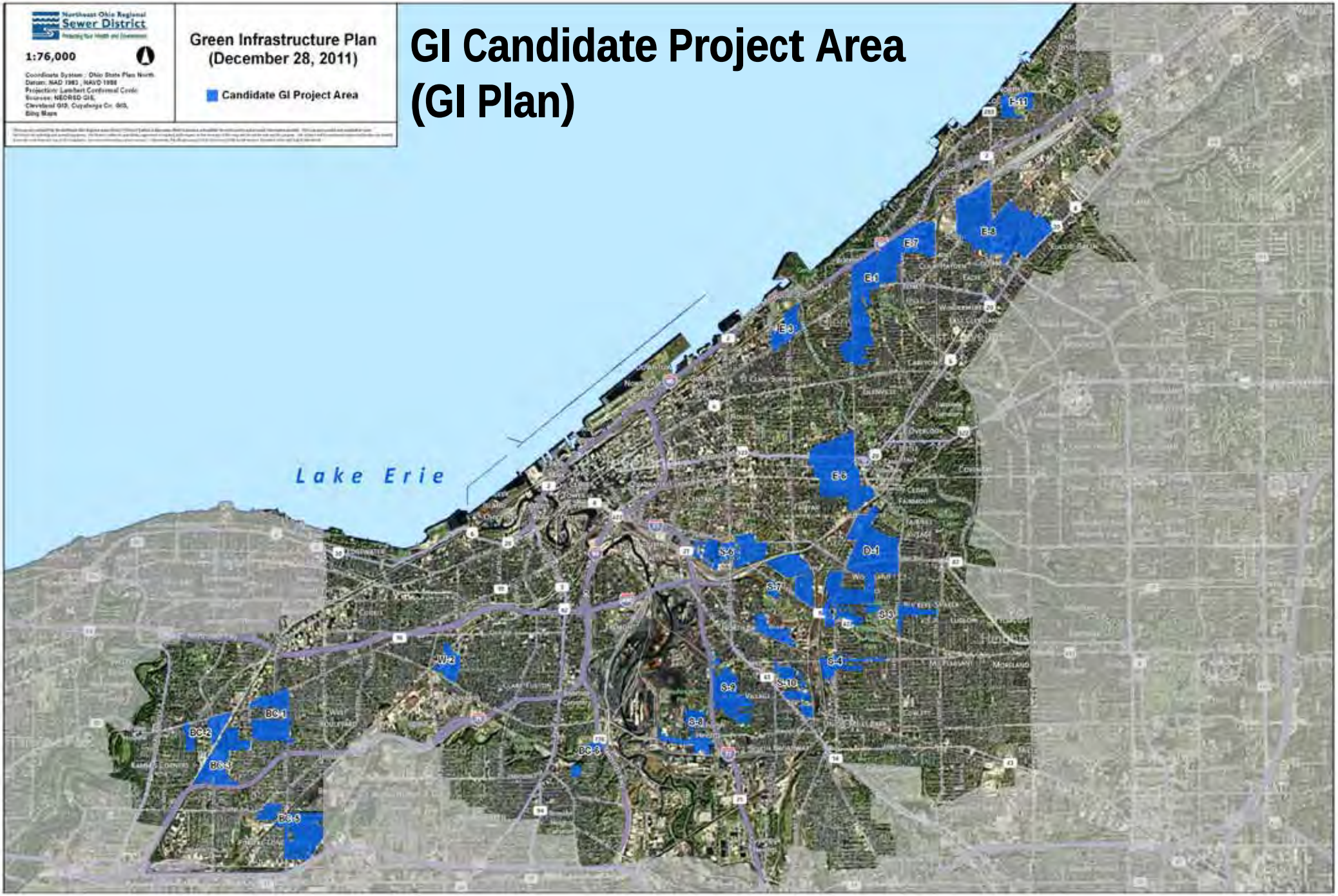
Appendix 3 Green Infrastructure

44 Million Gallons in 8 Years with Green Infrastructure

NEORSD - Required Green Infrastructure Implementation

- Green Infrastructure Plan / Index
  - 20 candidate GI project areas identified
- Development
  - GI Advanced Facilities Plan: 14 GI control measures confirmed
  - Reflected in GI PCMP
- Implementation
  - Capital Plan: 10 Capital Plan projects established

GI Candidate Project Area (GI Plan)



PROJECT CLEAN LAKE

GREAT LAKE • GREAT FUTURE

NEORSD: CSO CONTROL CONSENT DECREE

Some of the Selected GI Projects

Your Sewer District Keeping our Great Lake great.

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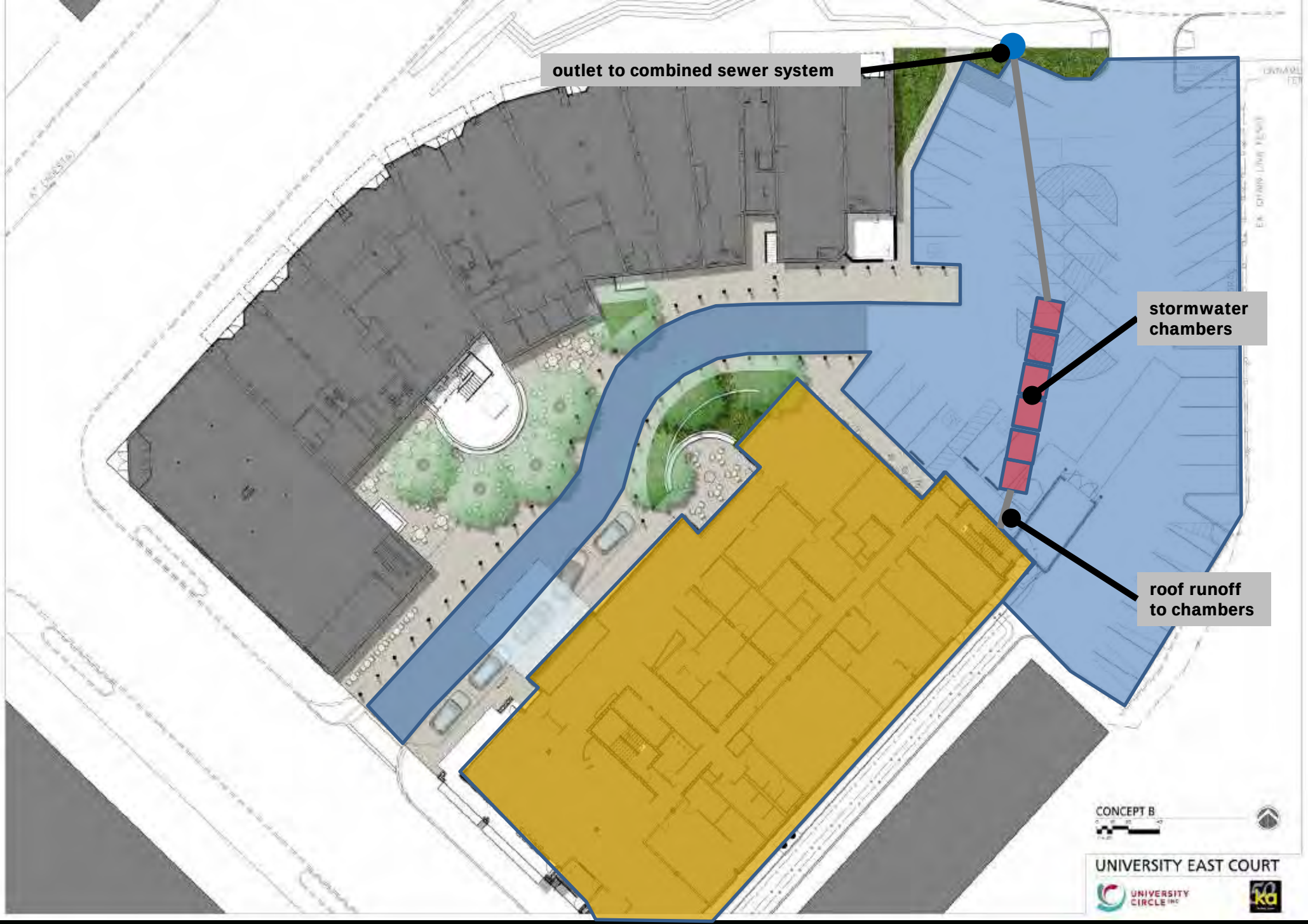

outlet to combined sewer system
stormwater chambers
roof runoff to chambers
CONCEPT B
UNIVERSITY EAST COURT
UNIVERSITY CIRCLE INC

East 75th Street Bioretention Features

N

0 20 40
Feet

Legend

Existing Combined Sewer

Project Area Boundary

NORTHEAST OHIO REGIONAL SEWER DISTRICT
GREEN INFRASTRUCTURE AMBASSADOR PROJECTS
SLAVIC VILLAGE EAST 75TH STREET BIORETENTION FEATURES

HUMAN NATURE

STRAND ASSOCIATES

GREEN INFRASTRUCTURE DESIGN • **SEPTEMBER 2013** • PRELIMINARY DRAFT FOR DISCUSSION PURPOSES ONLY

East 75th Street Bioretention Features

N

0 20 40
Feet

Legend

Existing Combined Sewer

NORTHEAST OHIO REGIONAL SEWER DISTRICT
GREEN INFRASTRUCTURE AMBASSADOR PROJECTS
SLAVIC VILLAGE EAST 75TH STREET BIORETENTION FEATURES

HUMAN NATURE

STRAND ASSOCIATES

East 75th Street Bioretention Feature South (approximately three years after construction)

East 75th Street Bioretention Feature North (before construction)

East 75th Street Bioretention Feature North (approximately three years after construction)

DATA SOURCES: NEORSD

N

0 100 200
Feet

Legend

SWO Sewer (Kingsbury Run Branch Culvert)

Proposed Storm Sewer

NORTHEAST OHIO REGIONAL SEWER DISTRICT

EARLY ACTION PROJECTS

URBAN AGRICULTURE EAP CONCEPT

HUMAN NATURE

STRAND ASSOCIATES

GREEN INFRASTRUCTURE DESIGN • **JUNE 2013** • PRELIMINARY DRAFT FOR DISCUSSION PURPOSES ONLY

EXISTING CONDITIONS

N

0 160 320
Feet

Legend

- Combined Sewer
- Sanitary Sewer
- Storm Sewer
- SWO Sewer
- Proposed Storm Sewer
- CSO

NORTHEAST OHIO REGIONAL SEWER DISTRICT

CANDIDATE PROJECT AREAS

FAIRHILL/MLK EAP CONCEPT

GREEN INFRASTRUCTURE DESIGN • **JUNE 2013** • PRELIMINARY DRAFT FOR DISCUSSION PURPOSES ONLY

Your Sewer District **Keeping our Great Lake great.**

#ProjectCleanLake

HUMAN NATURE, INC.

What is a TMDL?

A TMDL is the State's formal process to clean up polluted waters

Total
Maximum
Daily
Load

Polluted

Water quality standards not met

Study

- Identifies sources of pollution
- Calculates amounts from each source
- Sets maximum pollutant load
- Estimates necessary pollutant reductions to meet water quality standards

Implementation Plan

- Identifies permit controls or best management practices needed to make necessary pollutant reductions

Implementation

Monitoring

Clean

Water quality standards met

TMDLs and Stormwater Permits

TMDL Allocation

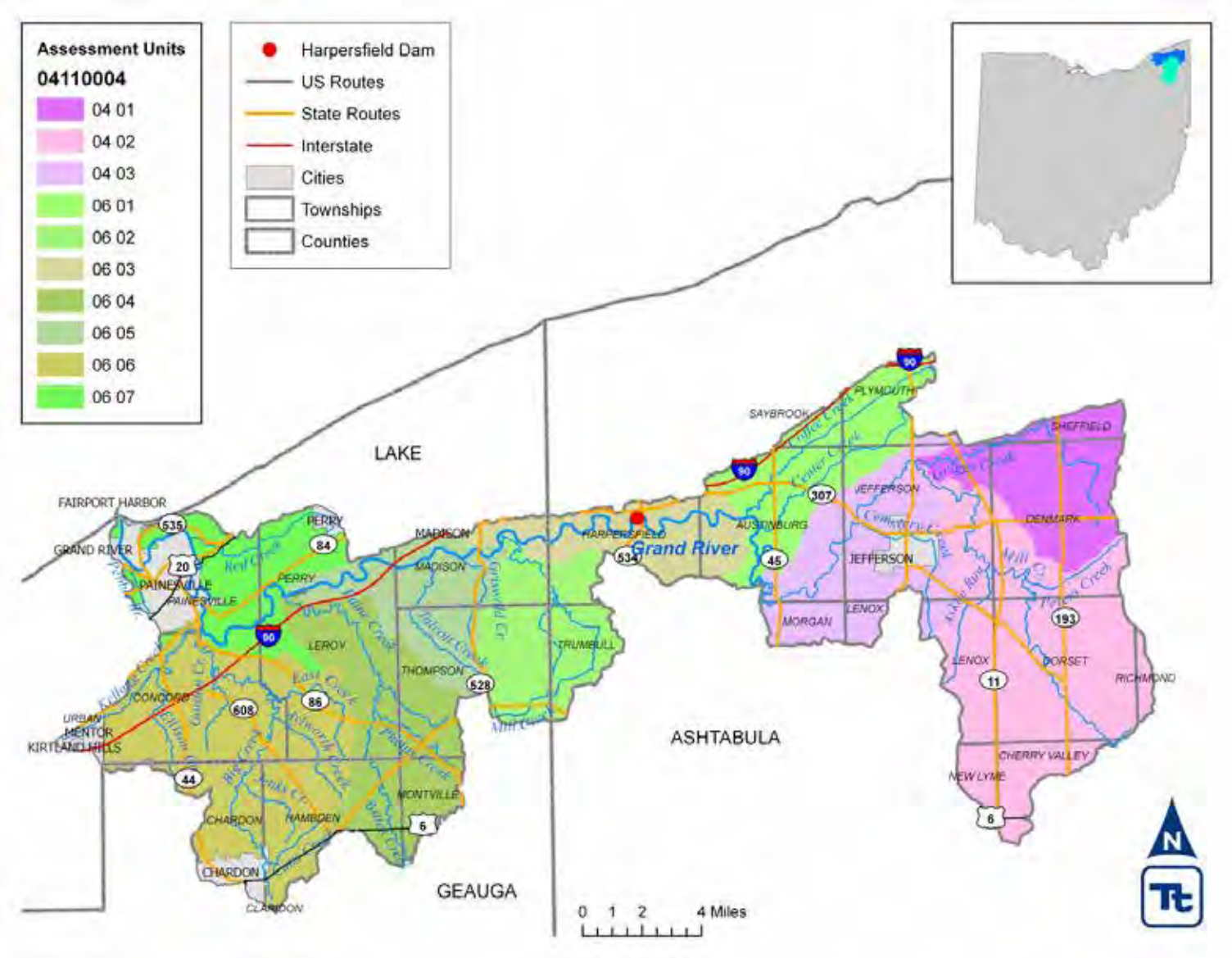
- NPDES Stormwater must have WLA
- Non-NPDES Stormwater and nonpoint sources addressed as LA
- Allocation for NPDES Stormwater may be expressed as an “categorical” or “aggregated” wasteload allocation or as an individual allocation
- Individual allocations are preferred – facilitates implementation

NPDES Permits

- NPDES permits must be consistent with assumptions and requirements of WLA in a TMDL
- Discharge requirements , reflecting the TMDL WLA, may be expressed as BMPs
- Can also be expressed in the permit as a numeric effluent limit
- Permit must specify the monitoring necessary to determine compliance with effluent requirements.

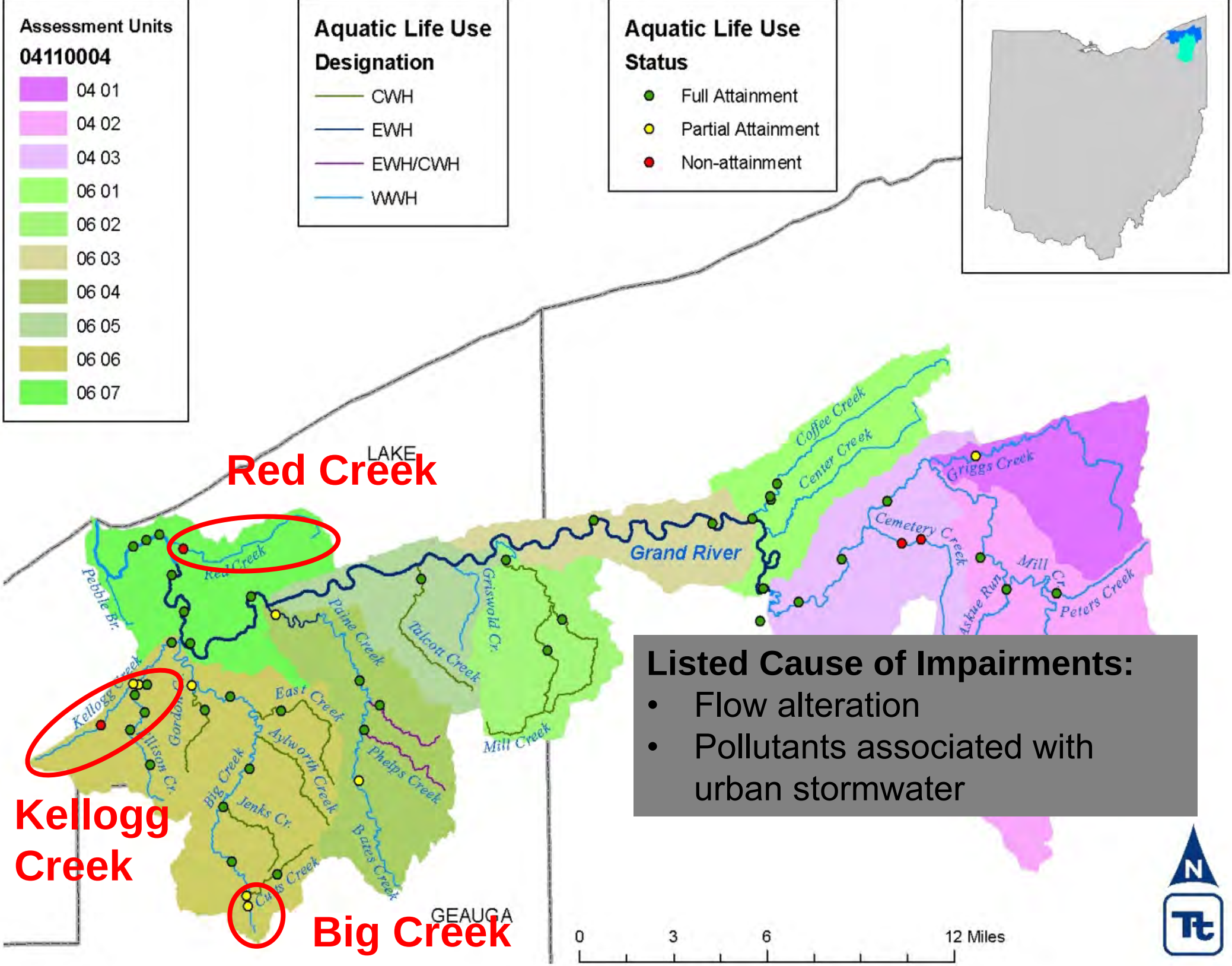
TMDLs May Drive Stormwater Controls

Example-The lower Grand River in Ohio



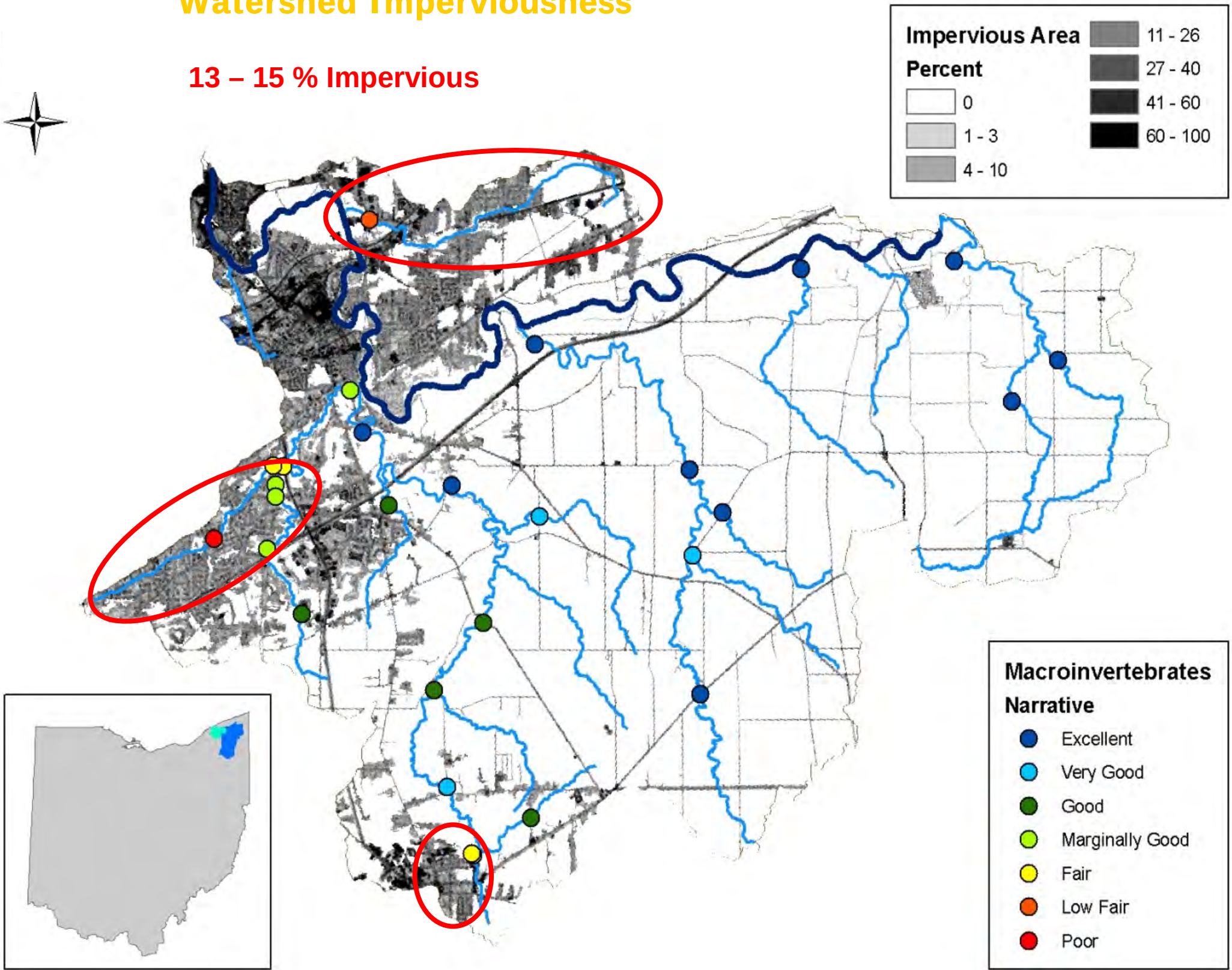
303(d) Listing for the lower Grand River

Segment	Name	Area (mi^2)	Causes	Probable Sources
04 03	Town of Jefferson – Mill Creek	28.17	Flow alteration Organic enrichment / dissolved oxygen Unknown toxicity Bacteria	Urban runoff, storm sewers Sanitary sewer overflows (collection system failures)
06 01	Coffee Creek – Grand River	22.01	Bacteria	Failing septic systems, anthropogenic sources
06 02	Mill Creek	20.99	Bacteria	
06 06	Big Creek	50.42	Direct habitat alteration Unknown toxicity Natural limits Bacteria	Urban runoff, storm sewers Hydromodification – development Natural
06 07	Red Creek – Grand River	26.30	Flow alteration Unknown toxicity Bacteria	Urban runoff, storm sewers


Assessment Units
04110004
04 01
04 02
04 03
06 01
06 02
06 03
06 04
06 05
06 06
06 07
Aquatic Life Use Designation
CWH
EWH
EWH/CWH
WWH
Aquatic Life Use Status
Full Attainment
Partial Attainment
Non-attainment
Red Creek
LAKE
Red Creek
Pebble Br.
Kellogg Creek
Kellogg Creek
Gordon Cr.
Allison Cr.
Big Creek
Jenks Cr.
Curts Creek
East Creek
Aylworth Creek
Paine Creek
Talcott Creek
Griswold Cr.
Mill Creek
Phelps Creek
Bates Creek
Grand River
Coffee Creek
Center Creek
Griggs Creek
Cemetery Creek
Askue Run
Mill Cr.
Peters Creek
GEAUGA
Big Creek
0
3
6
12 Miles
N
Listed Cause of Impairments:
• Flow alteration
• Pollutants associated with urban stormwater

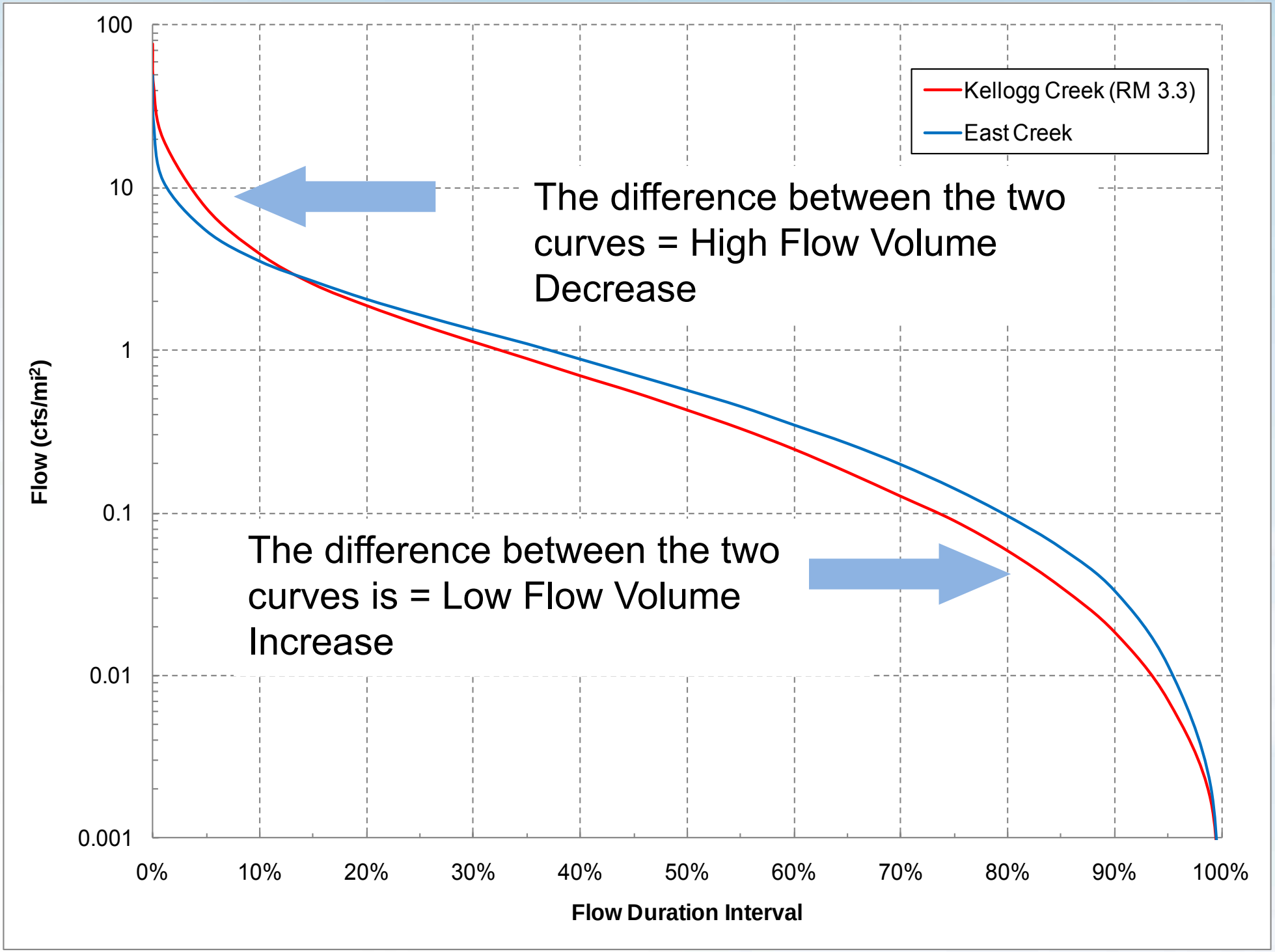
Watershed Imperviousness

13 – 15 % Impervious



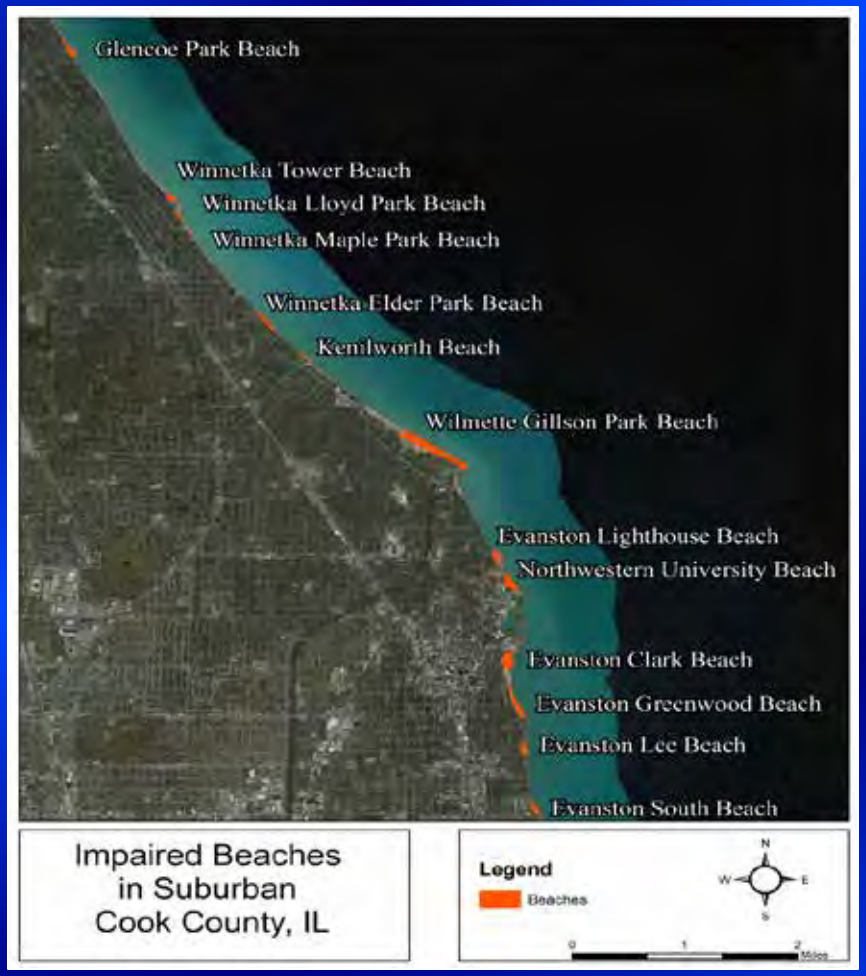
Setting TMDL Targets

- Impaired streams are too flashy. What characteristics would support healthy biological communities?
- Attainment (reference) stream approach
  - Evaluated 11 nearby streams attaining ALU
  - Identified a suitable reference stream for each impaired stream
    - Use relative, not absolute flow value targets
    - Reference streams are geophysically and regionally relevant


100
10
1
0.1
0.01
0.001
Flow (cfs/mi²)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Flow Duration Interval
Kellogg Creek (RM 3.3)
East Creek
The difference between the two curves = High Flow Volume Decrease
The difference between the two curves is = Low Flow Volume Increase

TMDLs May Drive Stormwater Controls

Example-Lake Michigan Beaches TMDL

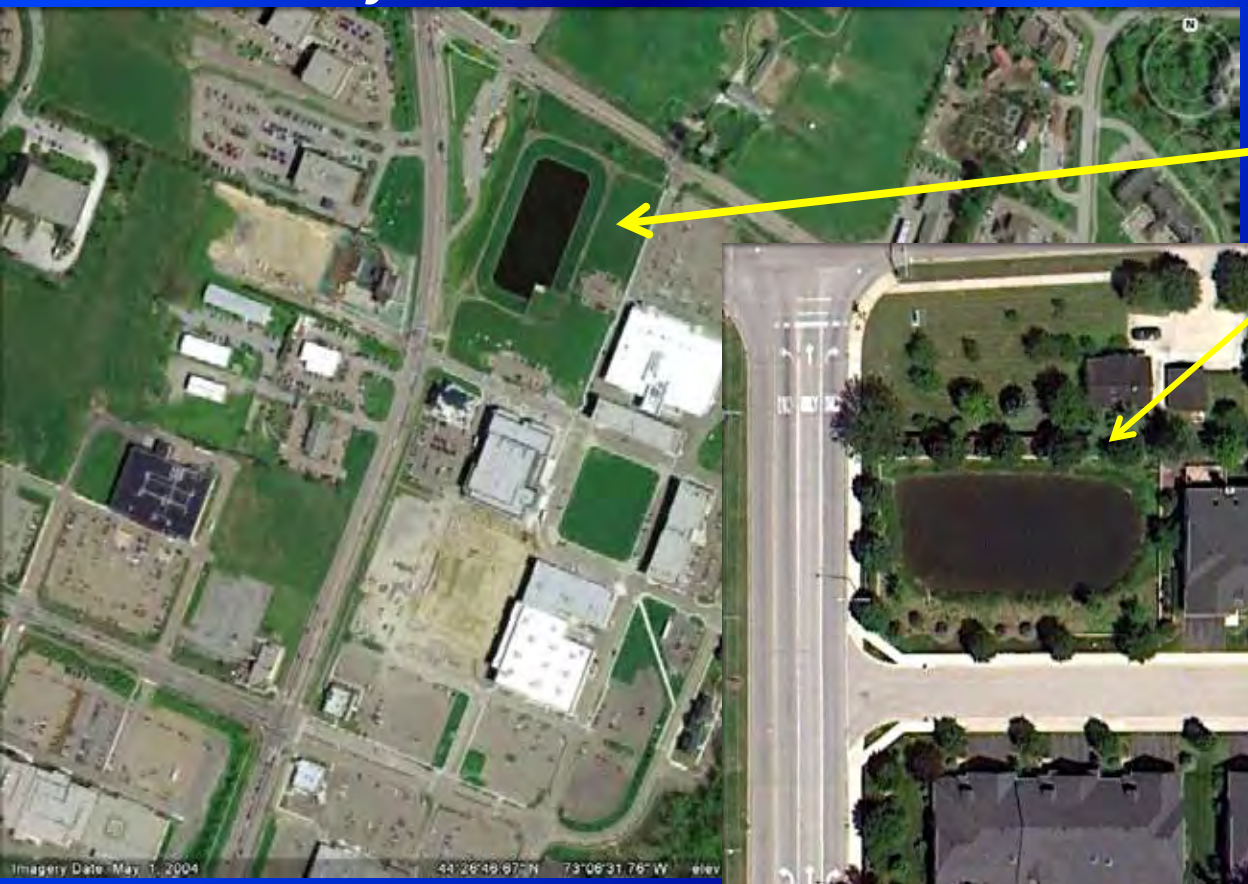


The TMDL establishes the following E. coli wasteload allocations (WLAs) for communities for stormwater discharges to Lake Michigan:

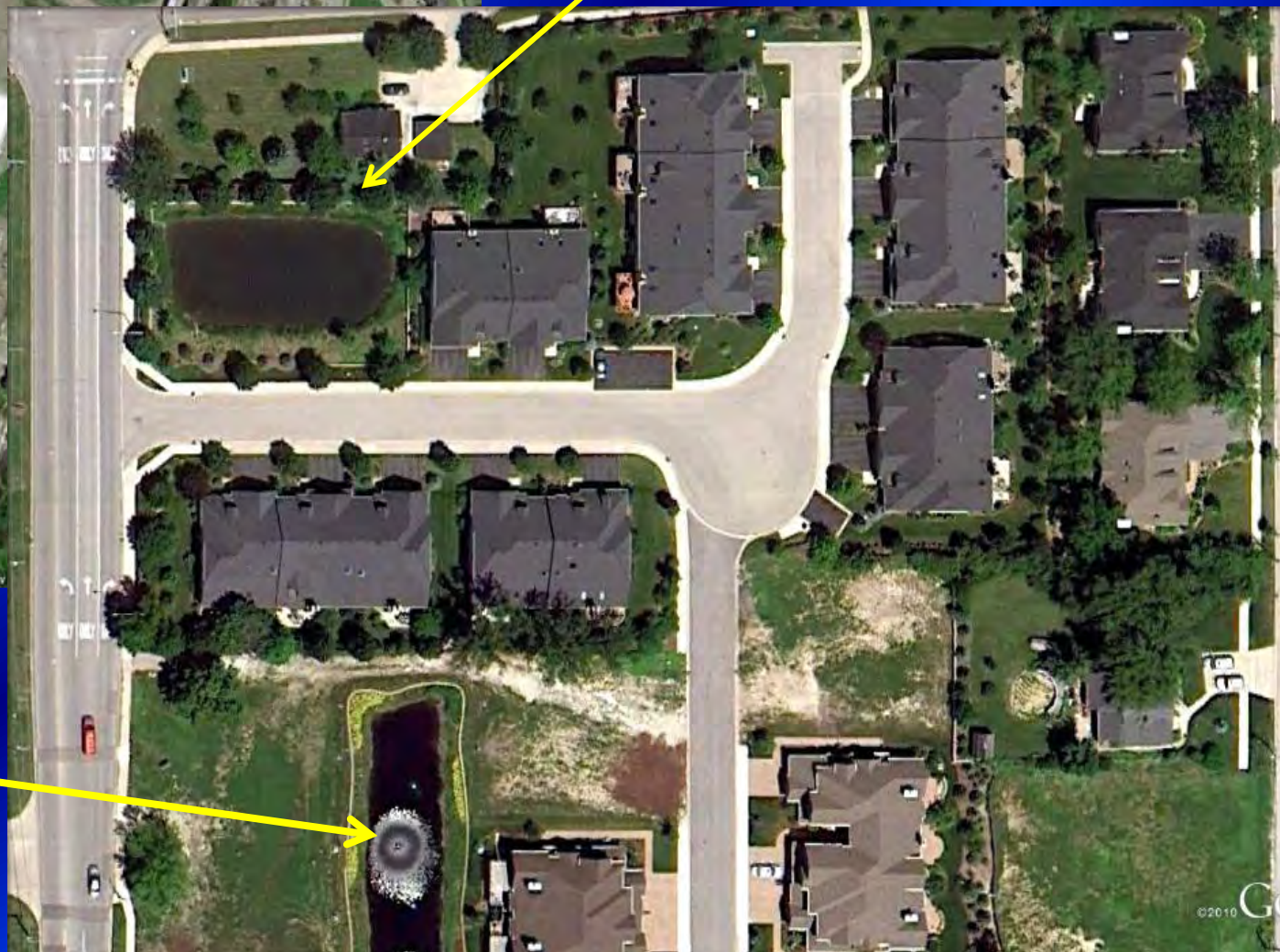
Community	Permit No.	WLA (cfu/100 mL)
Evanston	ILR400335	126
Glencoe	ILR400198	126
Wilmette	ILR400473	126
Winnetka	ILR400476	126
Kenilworth	ILR400214	126

Codes Put Stormwater in Jail

Slide Courtesy of JuliBeth Hinds



Stormwater Jail



Look! A fountain!

Menomonee Watershed Codes & Ordinances

Kate Morgan	1000 Friends of WI
Juli Beth Hinds, AICP	Birchline Planning LLC
Tim Detzer, PE	Milwaukee County
Steve Keith	Milwaukee County

And thank you to the project partners –

The Fund for Lake Michigan, Milwaukee Metropolitan Sewerage District, 1000 Friends of WI, Milwaukee County Environmental Services, Southeastern Wisconsin Watersheds Trust, and the 13 municipalities participating in this work

Detailed Code Audits

Purposes & Tasks

- Update MMSD's 2005 audit of codes & ordinances for barriers to Green Infrastructure
- Understand barriers in more detail, and in context
- Evaluate regional land use and watershed issues that may inform code changes and other pollutant reduction strategies
- Develop prioritized recommendations, tailored to each municipality's codes, issues, and opportunities
- Follow up on recommendations

Participating Municipalities

MENOMONEE WATERSHED:

Butler w Brookfield w Elm Grove
Germantown w Greenfield
Menomonee Falls w Mequon
Milwaukeew Wauwatosa
West Milwaukee

KINNICKINNICK WATERSHED:

Cudahy w St Francis w West Allis

+ Audit Results: Green Infrastructure

Positives

Code-Related

- Updates/changes from 2005 generally were driven by State requirements:
  - Erosion control
  - Post-construction SW management (DNR & MMSD Chapter 13)
- **Communities are actively using pre-application conference or sketch plan**
- **Flexible site design is almost universal, at least in PUD**
- *Some* changes to reduce parking surface area, include alternative street section options, allow bioretention

NOT Code-Related

- Strong interest & knowledge (even if it often involved "we heard permeable asphalt failed at {insert location}").
- Great willingness & opportunity to look at landscaping as opportunity zone for green infrastructure and improving land cover (trees, natives, turf amendment)

Example of Good Code Language

City of Milwaukee

295-405(4) 4. STORM WATER TREATMENT. Any landscaping installed pursuant to this section or any other provision of this chapter, including but not limited to required landscaping for motor vehicle display areas, parking lots, storage yards, outdoor equipment and residential buffers, may be used for storm water treatment purposes.

ALSO 295-405(2) INTERIOR landscaping includes waiver provision for stormwater: (d) d. Waiver of Tree and Shrub Requirements. The tree and shrub planting and preservation requirements of par. a may be waived by the commissioner if interior parking lot landscaping is to be used for bioretention, bioswales, infiltration basins or rain gardens and the commissioner approves an alternative landscaping beautification plan for the parking lot.

+ Examples:

Codes:
Various Issues

- Sec. (XXX) off-site parking must be within 150' of the principal use
- Sec. (XXX). – Mowing. **It shall be the duty of every person or organization to mow or cause to be mowed upon property so owned or occupied all grasses exceeding six inches in height.**
- Sec. (XXX) **All open spaces** or areas containing a dwelling unit for which an occupancy permit has been issued **shall be put into a lawn (except for such areas set aside for trees, shrubbery and gardens),** the area of the lot from the building line to the street right-of-way within 2 years after an occupancy permit has been issued, and the balance of the lot 3 years after occupancy permit has been issued.

Policy:
Assume the Detention Basin

- ☐ **Drainage Basin Data.**
  - Basin area
  - Impervious area
  - Soil types (source reference)
  - Curve number calculations
  - Time of concentration calculations
- ☐ **Proposed Conditions Hydrograph.**
- ☐ **Proposed Conditions with Detention Hydrograph.**
- ☐ **Critical Duration Analysis (if applicable).**
- ☐ **Detention Basin Design.**
  - Elevation versus storage relations for each detention basin
  - Computer model analysis of hydrograph routing through the pond for the 2- and 100-year event or calculations
  - Peak outflow versus required unit release rate or proportion of runoff volume during critical time period shown in table or hydrograph plot
- ☐ **Outlet Design.**
  - Drawing or sketch
  - Rating curve
  - Calculations
- ☐ **Computer Model Input and Output or Hydrograph and Routing Calculations.**
- ☐ **LID Quickscreen pages as appropriate to document use of Low Impact Development onsite.**
- ☐ **Maintenance Plan and Responsible Party Designation.**
  - Maintenance plan
  - Identification of responsible party
  - Funding source
  - Signed letter

Additional Items Required when the Volumetric Design Procedure is Used:

- ☐ **Existing Conditions Hydrograph.**
- ☐ **Flood Volume Calculations.**

WinSLAMM Model Results

+

If sites were redeveloped or projects completed AFTER a recommended code change, what would be the benefits for water quality and compliance?

1) Chose an important code recommendation OR municipal GI initiative in each community

2) Selected a site in the same municipality where application of the recommended code change or GI practice could be modeled

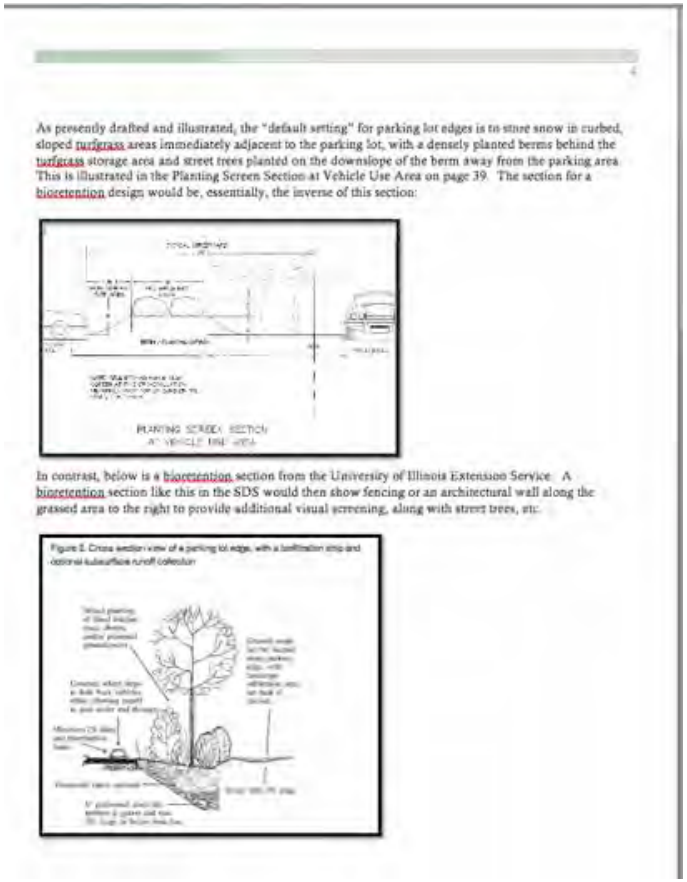
3) Most sites were candidate retrofit areas identified in Watershed Restoration Plan

4) *Assume* funding for a municipal project, or substantial redevelopment of the site!

5) Milwaukee County ran WinSLAMM model to look at volume and TSS load change from existing conditions

Brookfield: Using bioretention in landscaped road frontage areas

Code Change: **Incorporate bioretention into landscaping instead of berms & evergreens**



As presently drafted and illustrated, the "default setting" for parking lot edges is to store snow in curbed, sloped turfgrass areas immediately adjacent to the parking lot, with a densely planted berms behind the turfgrass storage area and street trees planted on the downslope of the berm away from the parking area. This is illustrated in the Planting Screen Section at Vehicle Use Area on page 39. The section for a bioretention design would be, essentially, the inverse of this section:

In contrast, below is a bioretention section from the University of Illinois Extension Service. A bioretention section like this in the SDS would then show fencing or an architectural wall along the grassed area to the right to provide additional visual screening, along with street trees, etc.

16700 West Bluemound Road

- **Total drainage area: 324,172**
- **Bioretention area: 43,097 SF**
- **% Runoff Reduction: 72.8%**
- **% TSS Reduction: 79.3%**

Butler: Reducing total impervious area associated with parking

Code Change: Reduce minimum parking ratio and
Set maximum # of drive-through lanes

VILLAGE OF BUTLER
Zoning Code Section 13-1-92(k)
Option for changing parking ratios and adding shared parking provisions

(k) The Following Guide Specifies the Minimum Number of Parking Spaces Required

The reference herein to "the work shift with the largest number of employees" means the maximum number of full-time or part-time employees present at the facility at any one (1) time. For example, the largest work shift may be a particular day of the week, or a lunch or dinner period in the case of a restaurant. The reference herein to "maximum capacity" means the maximum number of persons which may be accommodated by the use as determined by its design or by applicable building code regulations, whichever is greater. In the case of structures or uses not specified herein, the number of spaces specified for a use which is similar shall apply. In developments involving the establishment of two (2) or more uses on one (1) lot or parcel, the number of spaces required for each use shall determine the total number of spaces required.

[PLEASE NOTE THAT 'EMPLOYEE MAX' BELOW IS AN ABBREVIATION FOR 'EMPLOYEES AT MAXIMUM SHIFT']

(1) Residential uses.

Use	Required Parking	Notes
Single-family and two-family dwellings	2.0 spaces per dwelling unit	*Rec. keeping current standard*
Multi-family dwellings	2.0 spaces per dwelling unit	ADD NOTE: For buildings with more than 8 units where all spaces are in common (i.e. not reserved) requirement is reduced to 1.2 per DU plus 1 per every 4 units.
Housing for the elderly	0.75 spaces per dwelling unit	*Rec. keeping current standard*

(2) Retail sales and customer service uses; places of entertainment.

Use	Required Parking	Notes
General retail sales and	1 per 200 SF Gross Floor Area	*Current standard 1/150 customer*

12701 W. Hampton:

- **Remove 2 drive-through lanes**
- **Park at 5.5 spaces/1000 SF = 44 spaces instead of 64**
- **Drainage area 33,000 SF; 5700 SF bioretention**
- **% Runoff Reduction: 48.0%%**
- **% TSS Reduction: 60.4%**

+ Greenfield: Reducing total surface parking area

Code Change: Enable use of shared parking; remove requirement for curb around parking lot islands

D. *Off-street parking requirements for mixed or combined uses located within the same building or on the same lot or parcel.* As a matter of policy the City of Greenfield finds that coordination of parking among mixed or combined uses is desirable to reduce the amount of paved surface on a site. Combinations of any of the uses set forth in Table 21.06.0203 shall may provide the total number of off-street parking stalls and/or queuing space required for each individual use, or may submit for Plan Commission approval a Shared Parking Analysis and Plan in accordance with the following:

1. A Shared Parking Plan shall be submitted with site plan showing a complete and accurate description of the proposed uses, the floor area dedicated to each use, and the distance from each use to the proposed parking area. Uses participating in the shared parking plan must be located with one-quarter (1/4) mile of the parking area.

2. A Shared Parking Analysis shall be presented showing the parking demand for each individual use by time period, in the form of a matrix. The time periods shall include a weekday morning,

E. *Concrete curb required for all off-street parking areas.* Concrete curb meeting City specifications shall be required for all off-street parking areas serving more than five (5) vehicles in all nonresidential zoning districts and in the MFR-1, MFR-2, MFR-3, and PUD Districts. This requirement shall also apply to the expansion of any existing off-street parking lot where the number of off-street parking spaces is increased by ten (10) spaces or more. Breaks, depressions or other inlets for stormwater flows are permitted where a landscaped area has been designed to function as a vegetated stormwater control measure, in conjunction with an approved Stormwater Management Plan.

Site: 7401 W. Barnard St. & S. 76th St.

- Modeled reduction in imperviousness alone, and reduction + bioretention
- **Impervious area decrease alone:**
  - **% Runoff Reduction: 18%**
  - **% TSS Reduction: 16%**
- **.4 ac bioretention alone:**
  - **% Runoff Reduction: 55%**
  - **% TSS Reduction: 66%**

+ West Milwaukee: Permeable Alleyway

Code Change: **Allow use of permeable surfacing in driveways and alleys**

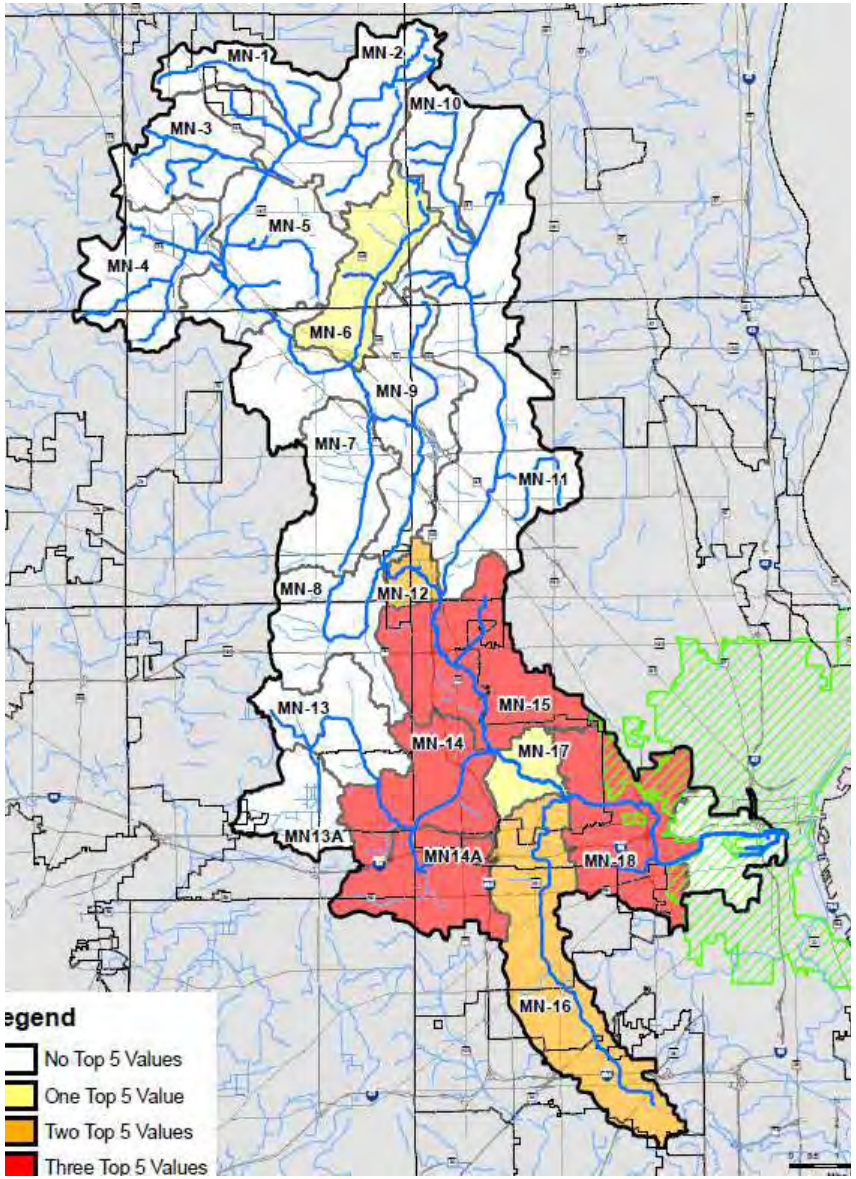
(3) *Surfacing*. All driveways shall be surfaced ~~with an asphaltic or portland cement pavement~~ in accordance with Village standards and specifications so as to provide a durable and dustfree surface, and shall be so graded and drained as to dispose of all surface water. Permeable surfacing may be used upon review and approval by the Village Engineer.

Site: Alley near City Hall

- **Drainage area: 25,000 SF**
- **Paver area: 5600 SF**
- **Change alley to permeable surface:**
  - **% Runoff Reduction: 63%**
  - **% TSS Reduction: 63%**

Learned Conclusions

- Implementing code changes can (at least hypothetically!) make a difference in volume and TSS loading if sites are "tweaked"
- **Important potential tool for looking how to deal with TMDL allocations and hotspots
- Many, many, many little things in the codes could improve water quality outcomes
- MAINTENANCE, maintenance, maintenance and maintenance are critically important

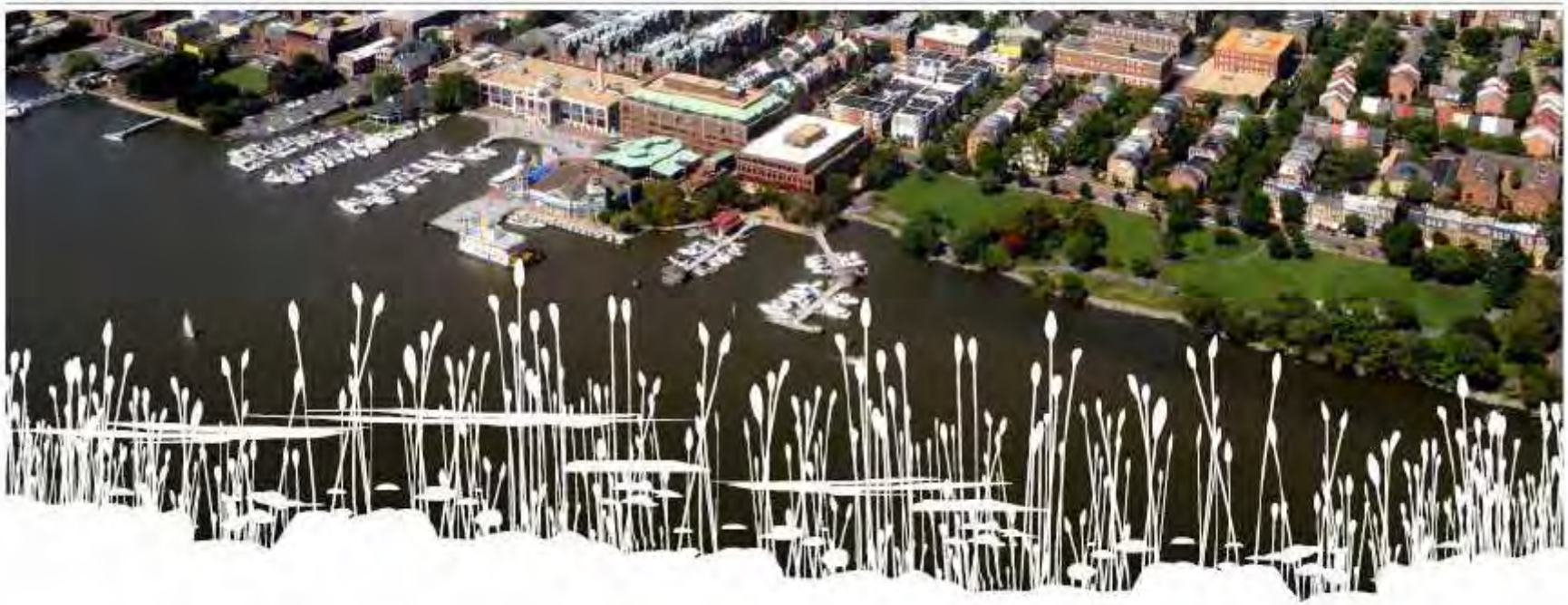


EPA
United States
Environmental Protection
Agency

EPA 231B09001 | October 2009 | http://www.epa.gov

WATERQUALITY SCORECARD

Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales



http://epa.gov/smartgrowth/water_scorecard.htm

Slide Courtesy of Center for Neighborhood Technology

"We are ahead of the Pope."

-- Fr. Jim Barrett

www.epa.gov/greeninfrastructure