

Transforming Wet Weather Challenges into Community Opportunities

Tony Parrott, Director

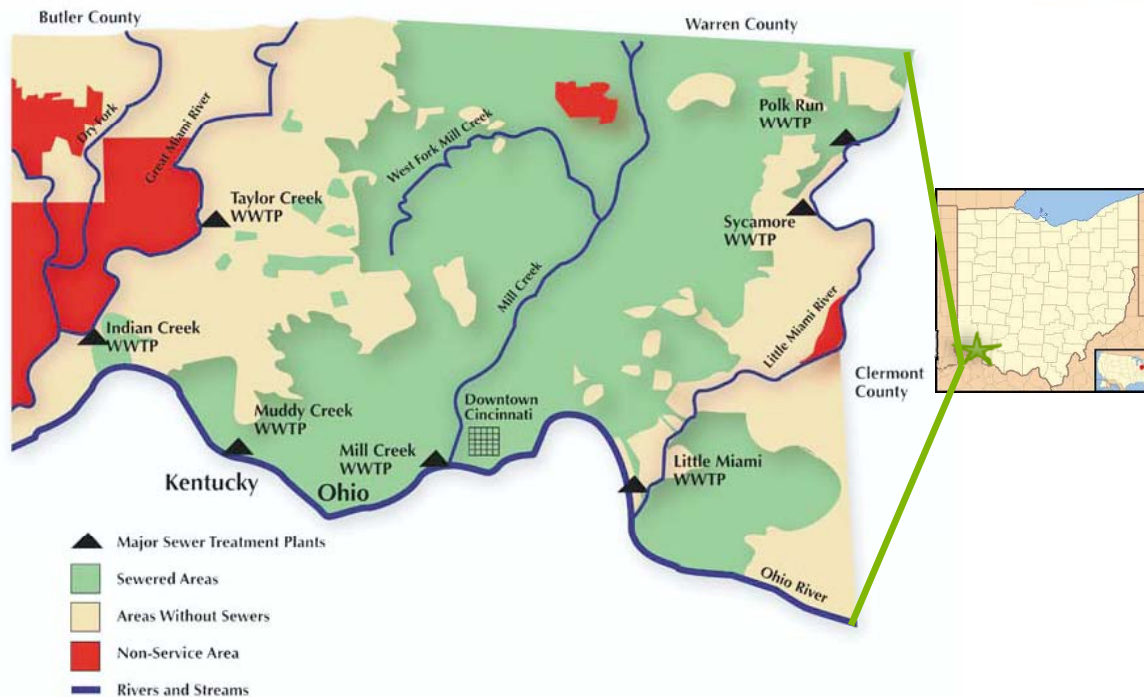
Metropolitan Sewer District of Greater Cincinnati

Terry Cole

Jacobs Engineering Group

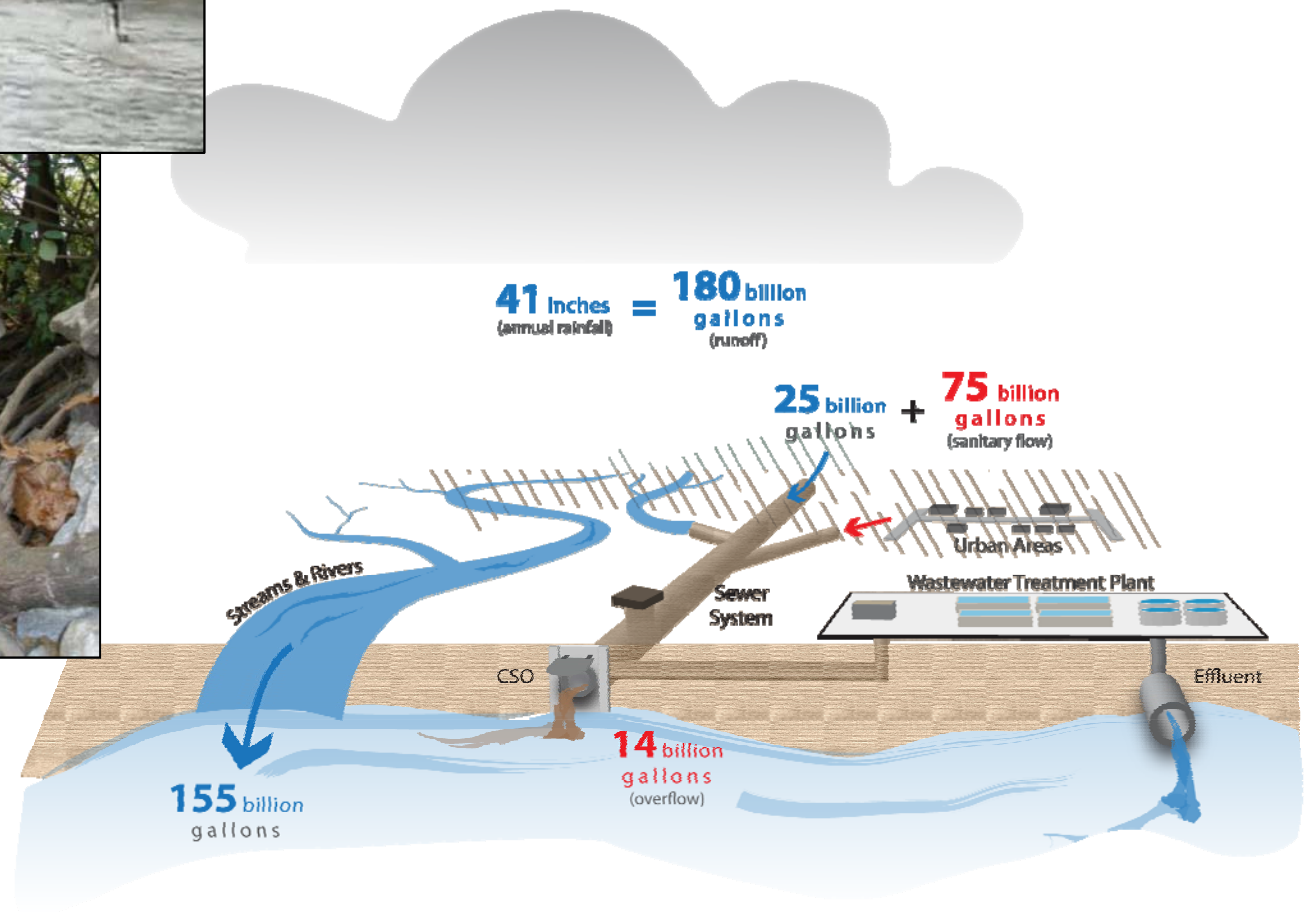


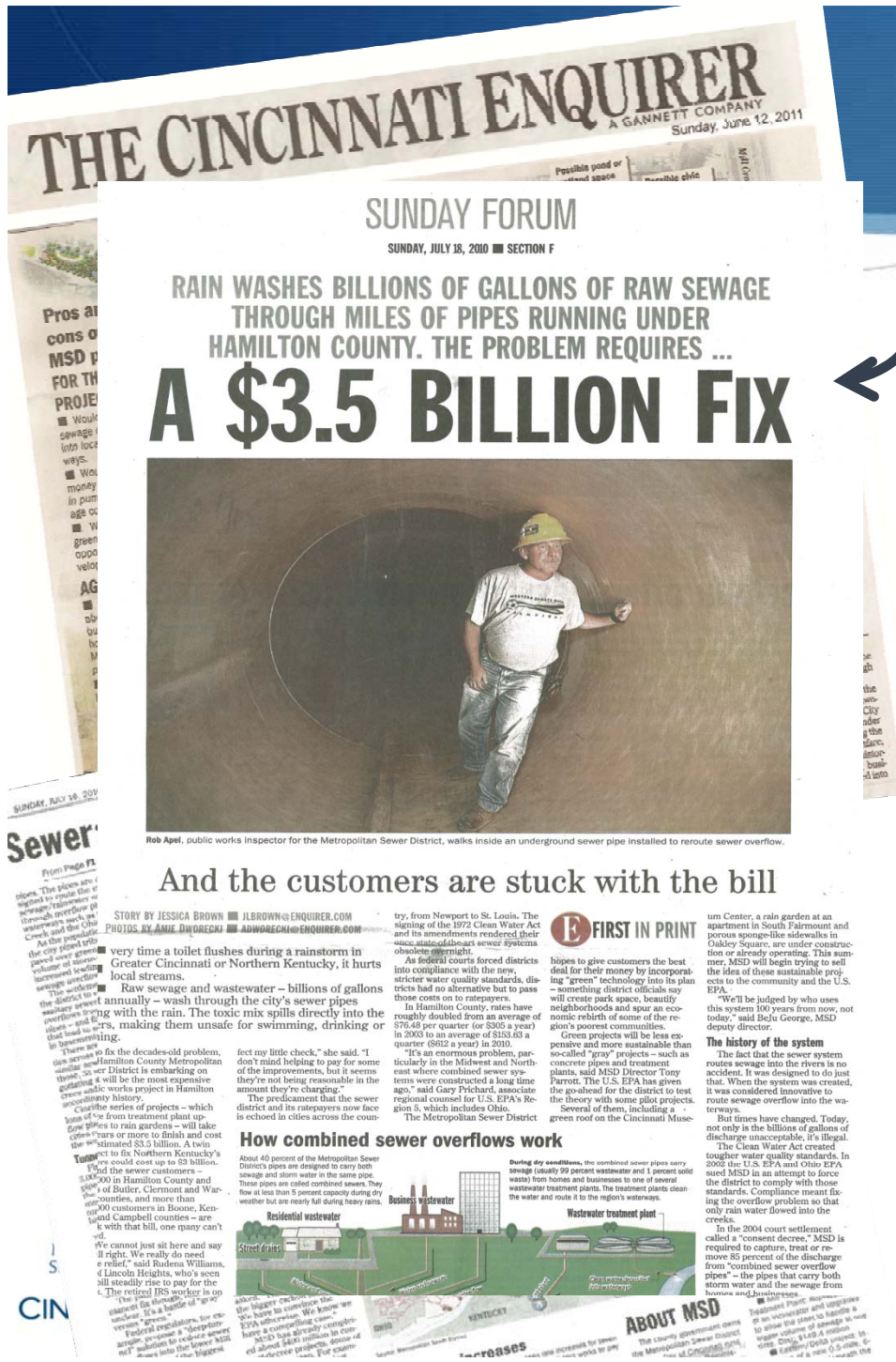
MSD's Cincinnati and Hamilton County service area



- Publicly Owned/Operated Wastewater Utility Serving Southwest Ohio (Hamilton County)
- Serves a Population of about 855,000
 - 230,000 Residential and 250 Industrial Users
 - Operates 7 Wastewater Treatment Plants; treating 70 Billion Gallons/yr

MSD's wet weather challenges





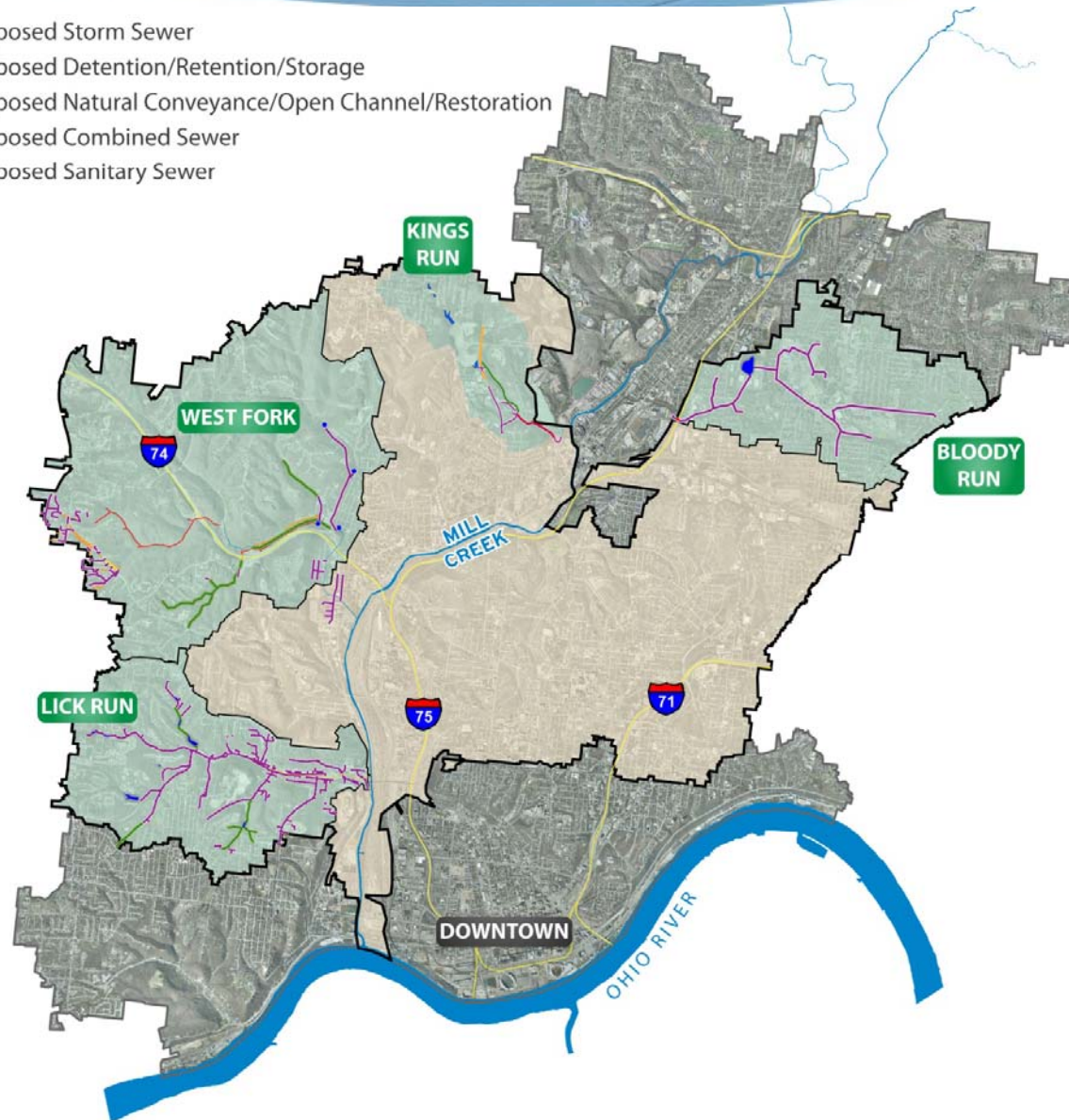
7/18/10
Cincinnati
Enquirer



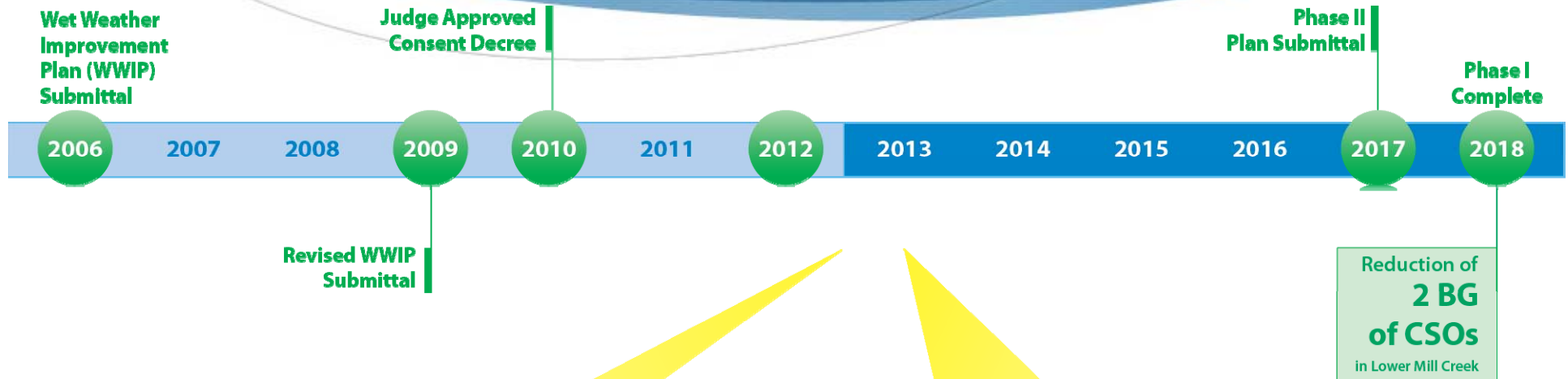
March 1, 2010 Broadcast
"Sewer Rate Hikes Expected
for MSD Customers"

Lower Mill Creek Watershed

- Proposed Storm Sewer
- Proposed Detention/Retention/Storage
- Proposed Natural Conveyance/Open Channel/Restoration
- Proposed Combined Sewer
- Proposed Sanitary Sewer



CSO Control Mandates: Lower Mill Creek



**DEFAULT
SOLUTION**

**ALTERNATIVE
SOLUTION**

March 2012
Submit preliminary findings
to the Hamilton County Board
of County Commissioners

**LOWER MILL CREEK
PARTIAL REMEDY**

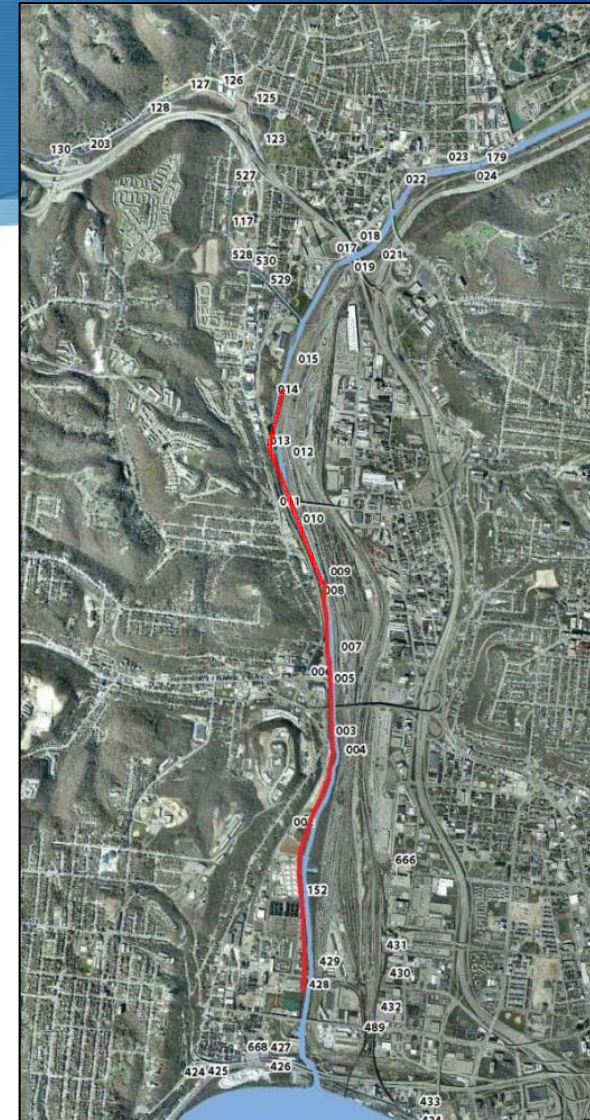
December 2012
Submit preferred plan for
reduction of 2 billion gallons of CSOs
in the Lower Mill Creek by 2018

Phase 1 – Grey Alternative

Phase 1 Highlights

- 25-ft deep tunnel from WWTP to CSO 14 (I-74 & I-75 exchange)
- Tunnel Pump Station & EHRT
- Consolidation Sewers

PHASE 1	GREY
Tunnel (ft)	15,300
Vertical Length of Drop Shafts (ft)	1,500
Consolidation Sewers (ft)	10,400
Tunnel Pump Station & EHRT (mgd)	84
Real Time Control Facilities (CSOs)	5,125, 482, 485/487
West Fork Channel Grate Modifications	YES

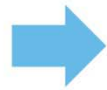


BUT...what if a sewer project was more than a sewer project?

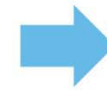
What if it could be...

- ◆ ... a catalyst for community transformation?
- ◆ ... a regional model for a new watershed-based approach to community planning?
- ◆ ...a national model for green infrastructure planning/design?
- ◆ ... a way to involve the community and many public and private partners?
- ◆ ... a network of community assets that attracted new interest and investment?
- ◆ ... a footprint for open spaces, enhanced streetscapes and opportunities for green buildings?
- ◆ ... a model for a sustainable 21st century community?

Current Conditions
in the Community



Leverage
MSD's Investment



Community's Vision
for the Future

THE CINCINNATI ENQUIRER

Property value at a substantial decline



Expand & improve
parks and greenspaces

Opportunities for
improved mixed use and
affordable housing

Improve traffic flow,
pedestrian accessibility
and safety

Incentives for
business retention
or redevelopment

MSD

Metropolitan Sewer District

Investment to reduce sewer overflows
and meet federal mandates

economics
sustainability
infill
jobs
bike trails
smart growth
safety
recreational
opportunities
community
gardens
better
education
quality place
community assets



MSD business strategies aligned with Best Practices for integration

☑ Leverage MSD Investments while meeting the core Consent Decree requirements of CSO reduction, cost effectively

☑ Understand current conditions

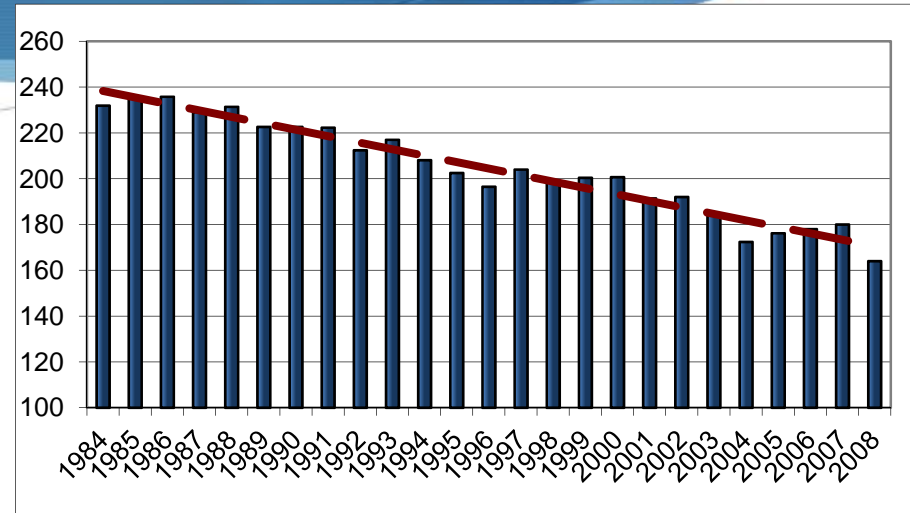
- Economy
- Natural Resources
- Infrastructure
- Demographics

“Local disadvantages ... and adverse conditions ...force innovation and ... development of new methods... this innovation often leads to a comparative advantage.”

M. Porter/Harvard Business School

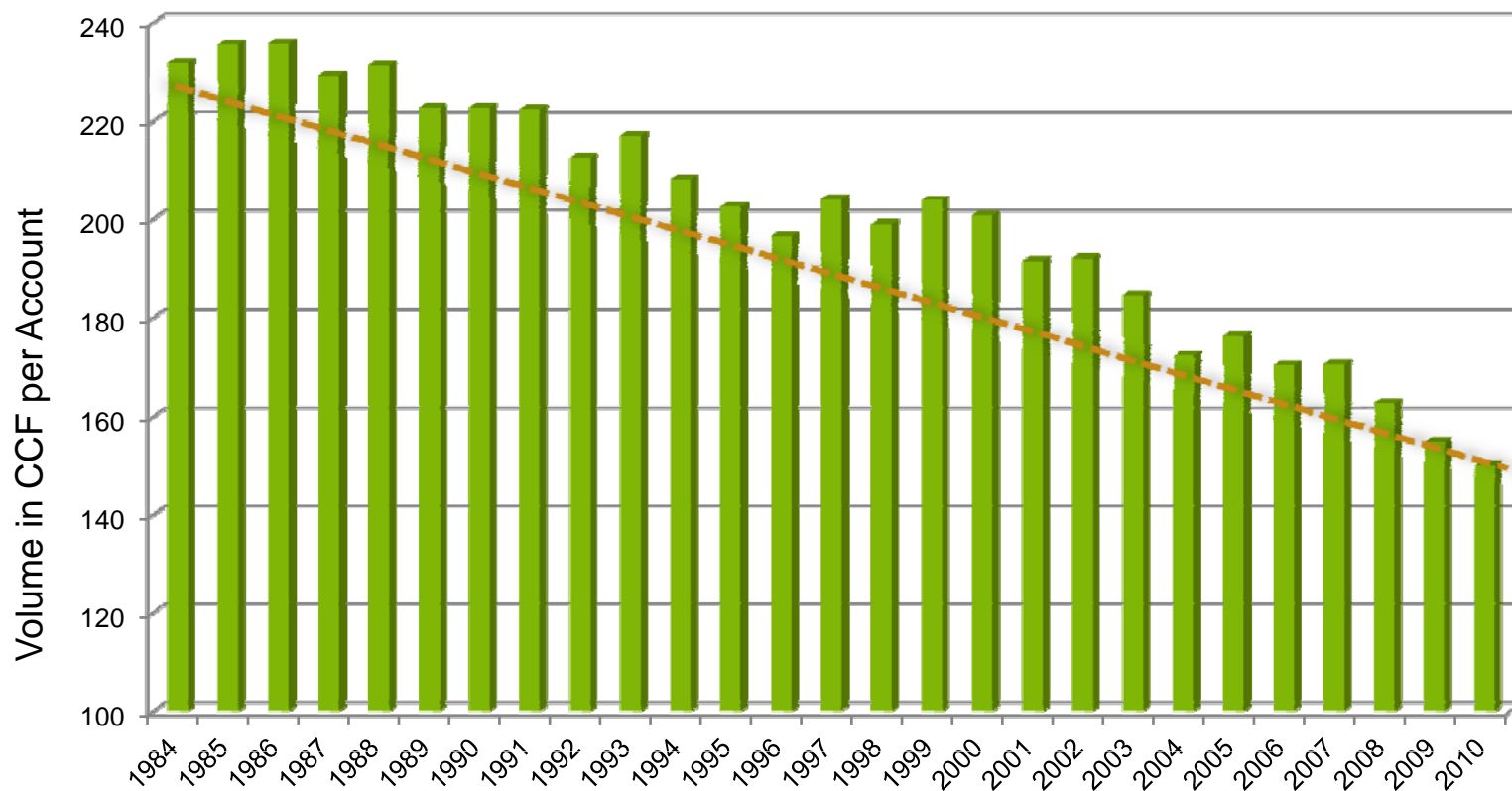
Current Utility Conditions

- Decline in # of Account
- Increasing Energy costs
- Positive or Negative environmental externalities from utility operations – TRIPLE BOTTOM LINE APPROACH

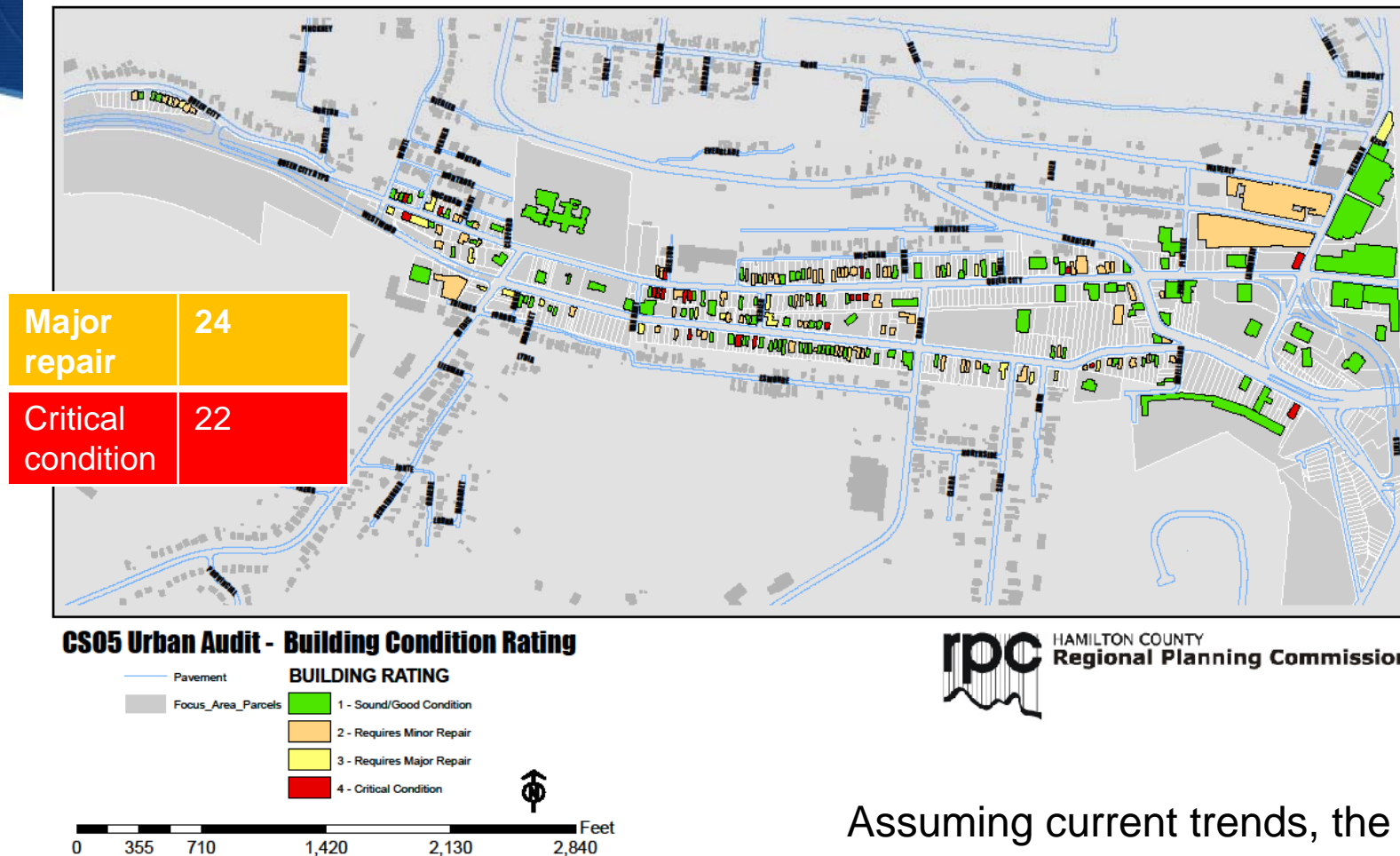


Declining Usage per Account Poses Major Risk for MSD

Fewer high usage industries places larger burden on residential users

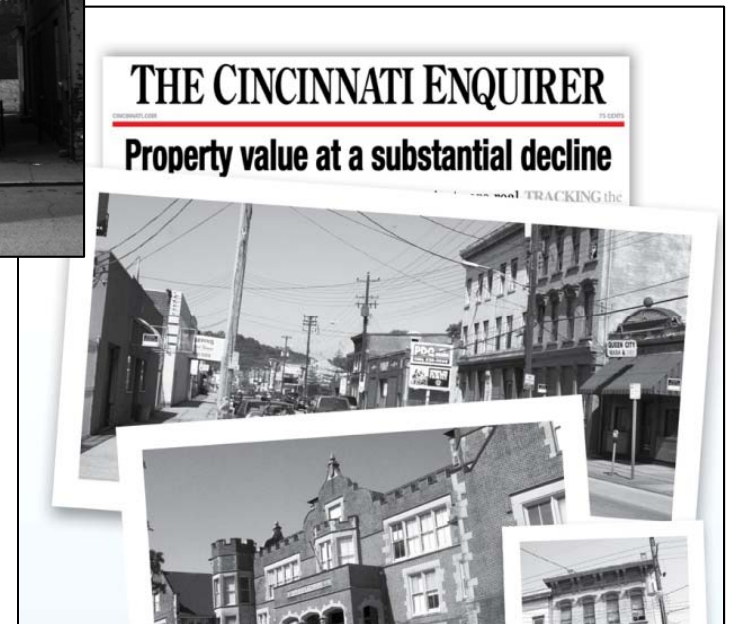


Economic realities



Assuming current trends, the rate of household decline equates to a loss of 200 households within 1 mile, resulting in a **loss** of more than **\$5.7 million** (in 2008 dollars)

Declining population and households have resulted in physical decline, foreclosure, and vacancy



Some See Challenges...



...We see Opportunities

Water resources management

policy

land use

watershed
management

💧 Integrated Approach to Infrastructure Needs

transportation

economic
development

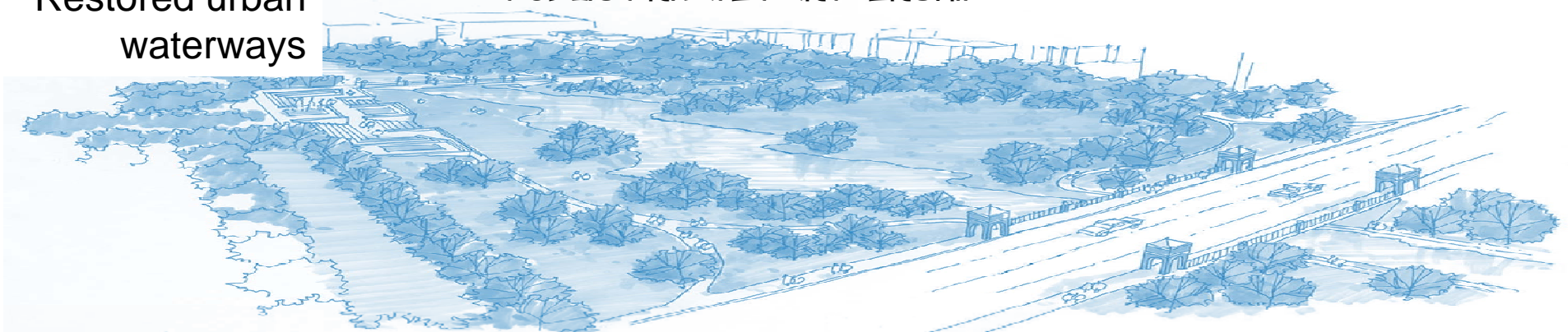
community
revitalization

**COMMUNITY
ENGAGEMENT**

Parks & Greenways

Restored urban
waterways

PUBLIC PRIVATE PARTNERSHIP

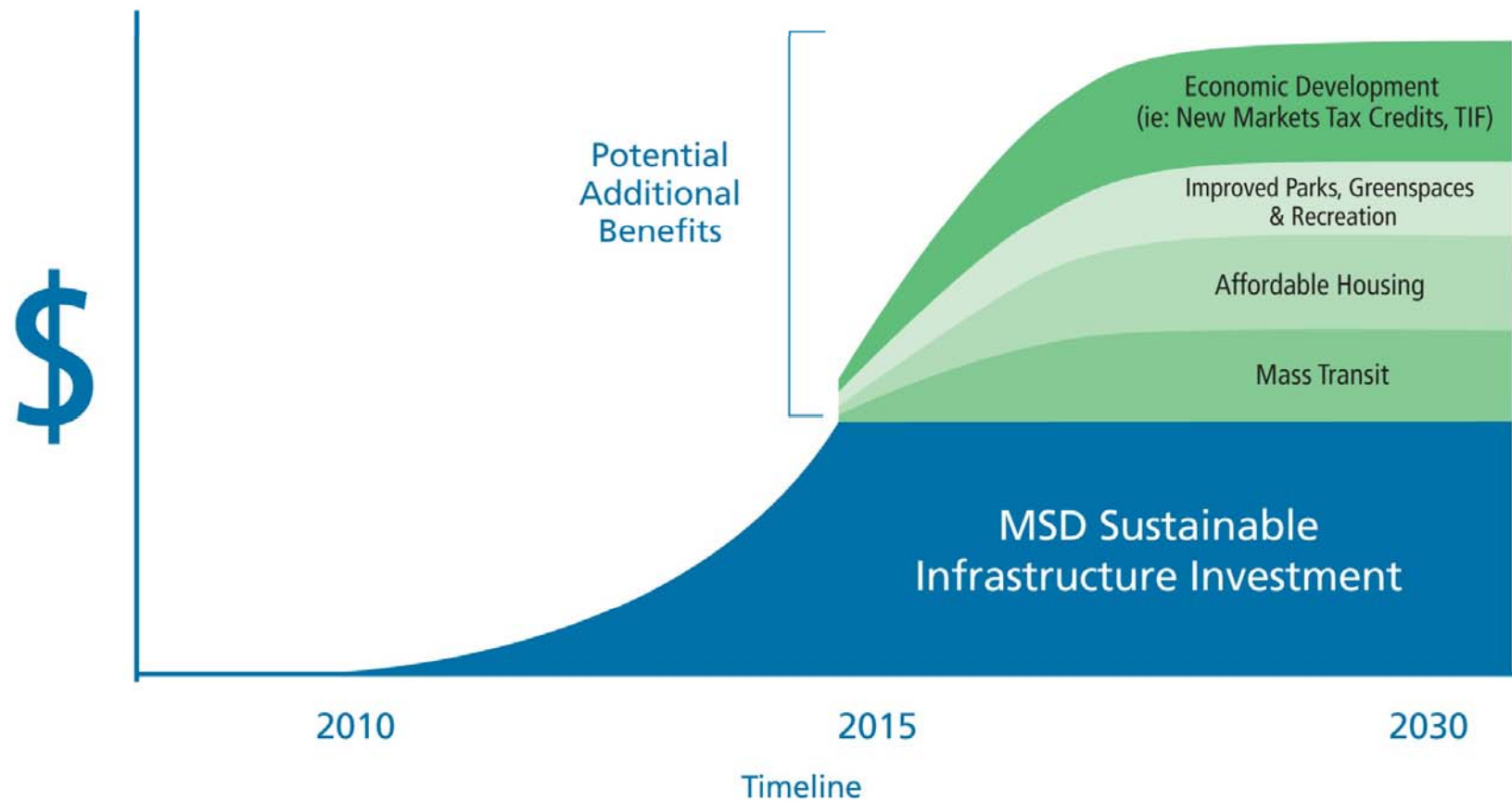


USEPA Integrated Wastewater Planning Framework encourages innovation

*Use the flexibility of EPA's existing regulations and policies and encourage municipalities to evaluate **how best to meet all of their CWA requirements** and within their financial capability . Elements include:*

- ◆ Water quality, human health and regulatory issues
- ◆ Measuring success
- ◆ Community stakeholders in the planning and selection
- ◆ Existing wastewater and stormwater systems' current performance
- ◆ Identifying, evaluating, and selecting alternatives and proposing implementation schedules

Additional Benefits and Value

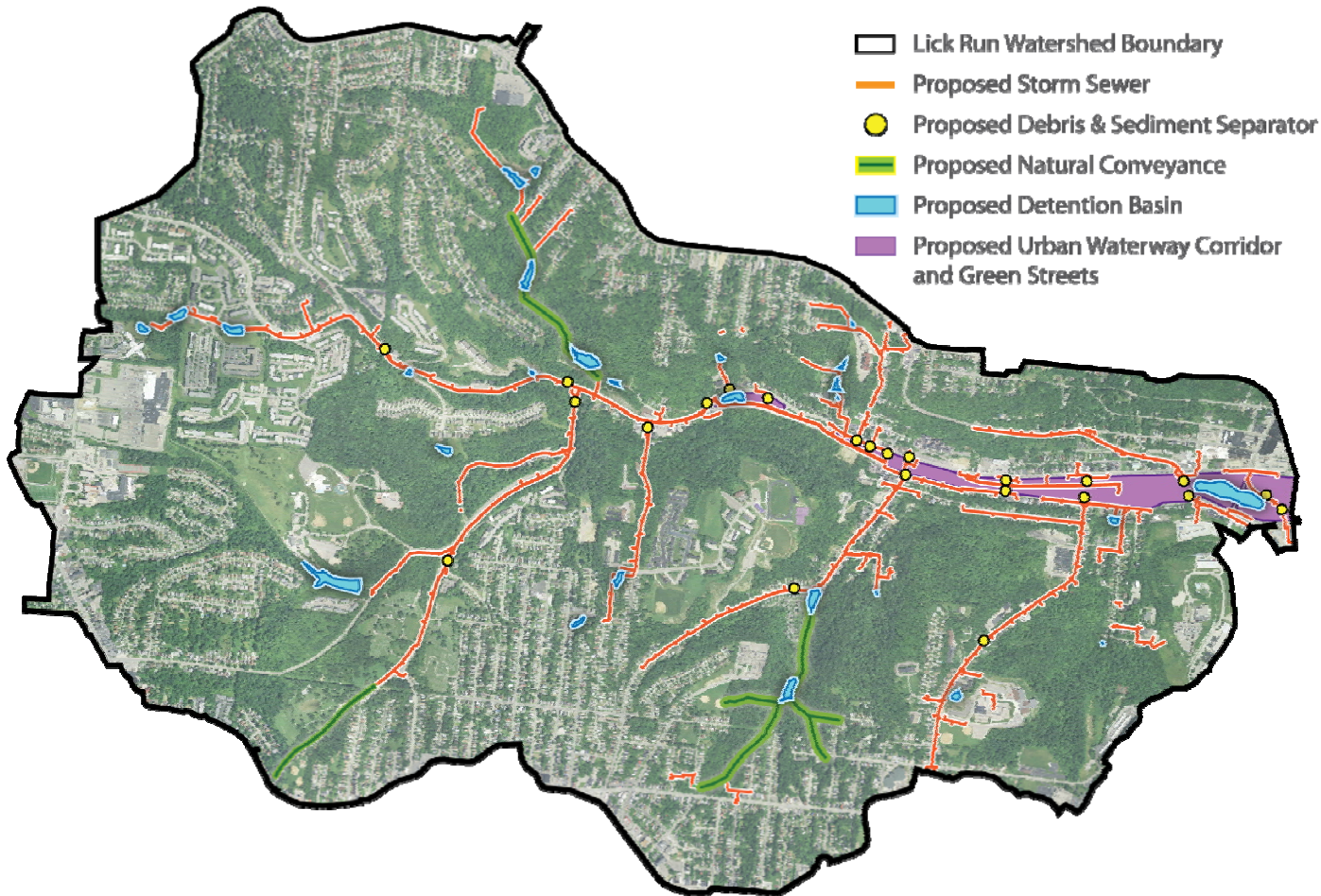


Integrated Watershed-Based Planning

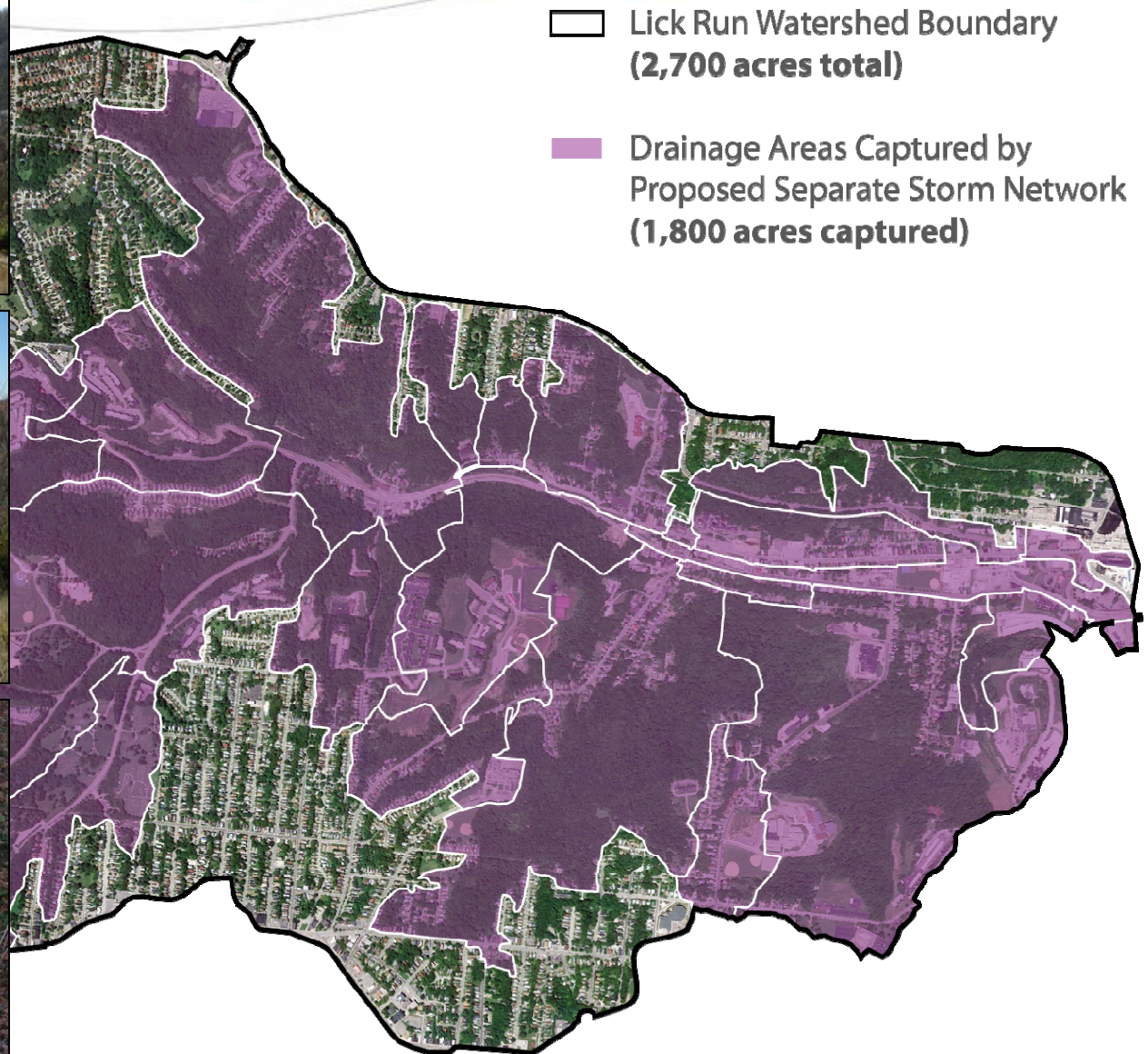
- Using community feedback to synthesize strengths into a refined concept for the proposed urban waterway
- Define near-term opportunities through leveraged investments and public partnerships
- Identify long-term watershed opportunities through public and private partnerships



Phase 1 - Strategic Storm Separation



Opportunity for an Urban Waterway Corridor



Existing Conditions – Lick Run Watershed

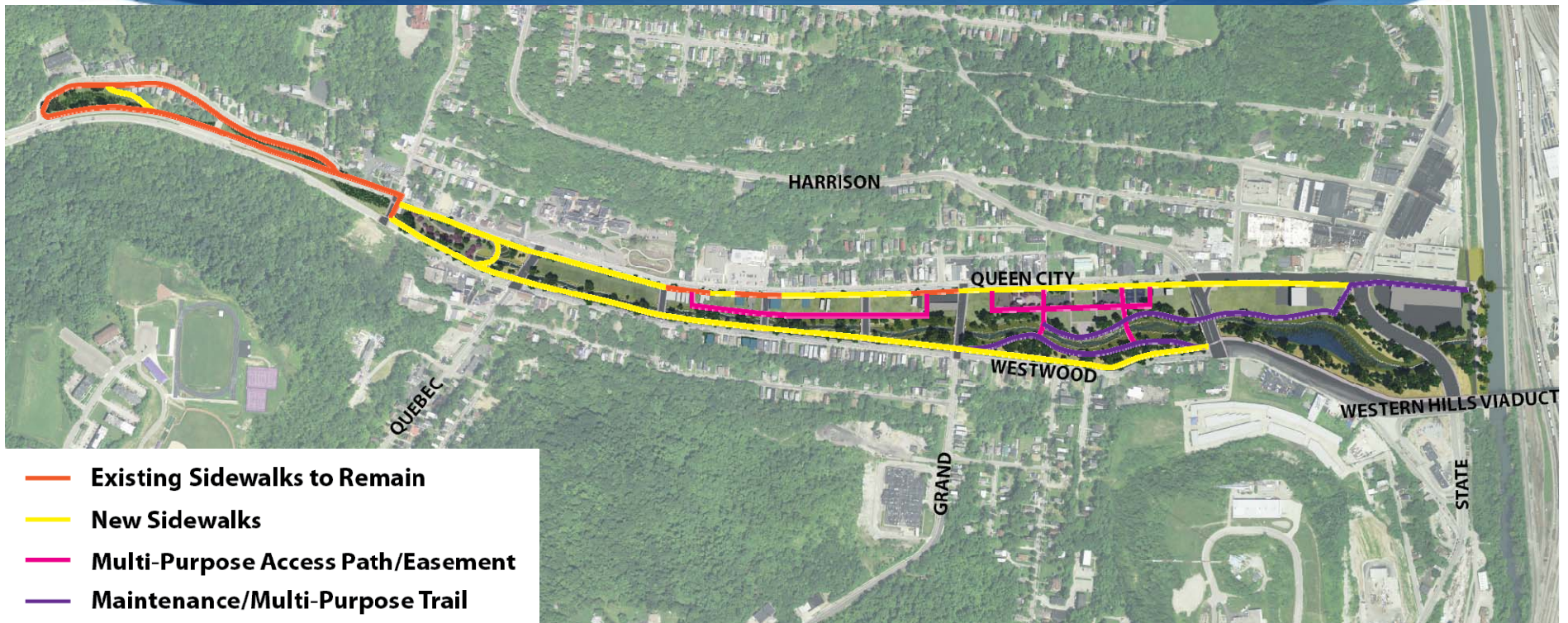


Urban Waterway Alignment & Water Quality Features



The Base Project

Maintenance Access, Sidewalks & Trails



The Base Project

Leveraging Benefits of Innovative Water Solutions



Phase 1 – Benefits Comparison

Phase 1 Benefit	Grey Alternative	Sustainable/Hybrid Alternative
Phase 1 achieves > 2 billion gallons CSO reduction	✓	✓
Fewer assumptions in modeled results	✓	
Higher volume flow treated at WWTP or EHRT	✓	
More operational flexibility for interceptor maintenance	✓	
Accommodates multiple solutions for Carthage & SSO 700	✓	✓
Surface improvements and increased public acceptance		✓
Opportunity to leverage private/public funding		✓
Construction jobs available for local workforce & SBEs		✓
Less purchased energy		✓
Flexibility for future long-term decision making		✓
Water quality improvements	✓	✓
Brownfield remediation		✓
Repurposing of land		✓
Reduction in wet weather volume to WWTP		✓
Right-size Phase 2 infrastructure		✓

Phase 1 – Risk Comparison

Phase 1 Risk	Grey Alternative	Sustainable/ Hybrid Alternative
Long-term solution not adaptable	X	
Complex construction methods	X	
Limited local construction participation	X	
Higher energy demand & cost	X	
Larger carbon footprint	X	
Additional assumptions for modeling		X
Potential future stormwater regulations	X	X
Future NPDES regulations	X	X
Potential large variance with cost for tunnel construction	X	

Phase 1 – Cost Summary

PHASE 1	Grey Alternative	Sustainable/Hybrid Alternative
Lick Run Watershed	\$ -	\$ 195,449,000
West Fork Watershed	\$ -	\$ 73,503,000
Bloody Run Watershed	\$ -	\$ 3,421,000
Kings Run Watershed	\$ -	\$ 34,423,000
CSO 488 Storage	\$ -	\$ 10,651,000
Tunnel	\$ 312,671,000	\$ -
Consolidation Sewers	\$ 88,927,000	\$ -
Tunnel Pump Station & EHRT	\$ 135,811,000	\$ -
Total	\$ 537,409,000	\$ 317,447,000

Lower Mill Creek Final Remedy (LMCFR) Alternative/Options

If Grey Alternative is pursued in Phase 1 → Phase 2 = Extended Tunnel Option

If Sustainable Hybrid Alternative is pursued in Phase 1 → Phase 2 = Source Control Option

OR

→ Phase 2 = Tunnel Option

LMCFR Cost Summary

PHASE 1		Grey	Sustainable/Hybrid	
Sub-Total \$		534,677,000	\$ 317,447,000	
PHASE 2	Grey Alternative	Sustainable Option	Hybrid Option	
Denham Watershed	\$ -	\$ 58,181,000	\$ -	
Ludlow Run Watershed	\$ -	\$ 33,727,000	\$ -	
Bloody Run Watershed	\$ -	\$ 83,526,000	\$ 58,305,000	
Upper Watersheds Part Seps	\$ 74,768,000	\$ 29,345,000	\$ 45,104,000	
EHRT & Storage Facilities	\$ 186,568,000	\$ 25,813,000	\$ 25,813,000	
Carthage EHRT	\$ 65,979,000	\$ 65,979,000	\$ 65,979,000	
Regulator Improvements	\$ 15,918,000	\$ 15,918,000	\$ 15,918,000	
Tunnel Pump Station & EHRT	\$ -	\$ -	\$ 135,811,000	
Tunnel	\$ 218,130,000	\$ -	\$ 414,584,000	
Consolidation Sewers	\$ 83,123,000	\$ -	\$ 165,718,000	
Total	\$ 644,486,000	\$ 312,489,000	\$ 927,232,000	
TOTAL LMCFR	\$ 1,181,895,000	\$ 629,936,000	\$ 1,244,679,000	

LMCFR – Volumetric Control

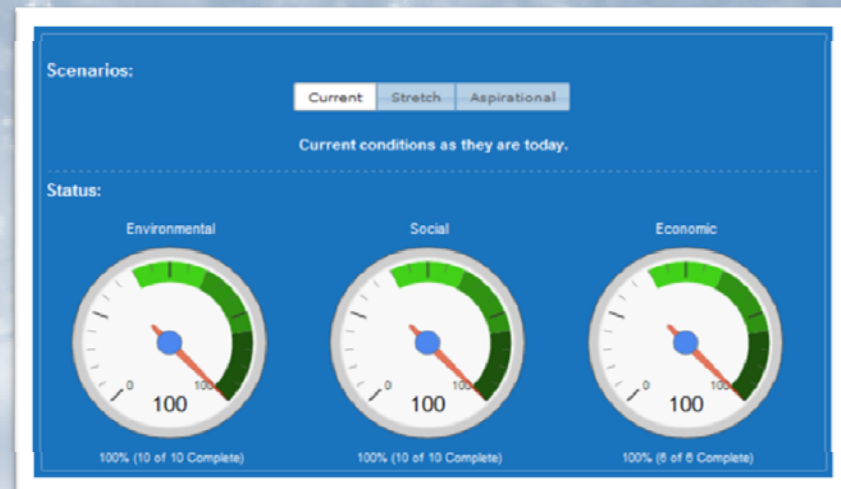
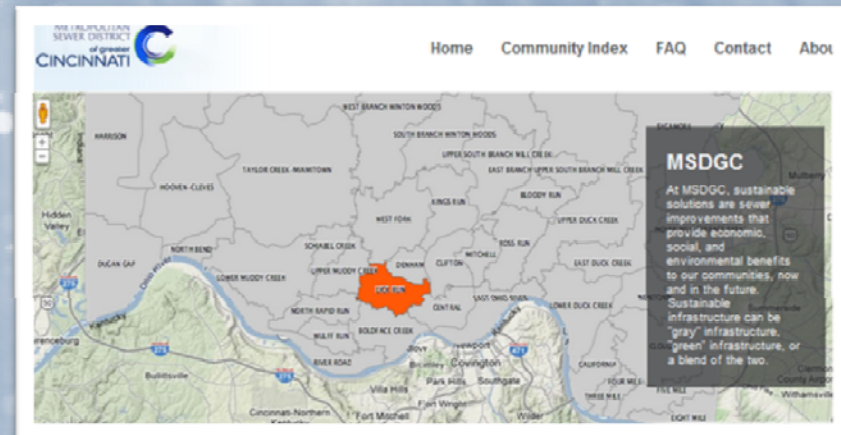
Performance Metrics	Original WWIP Model	Updated Baseline Model 3.2	LMCFR Grey Alternative	Phase 2 Sustainable Alternative	Phase 2 Hybrid Alternative
Combined System Inflow (MG)	13,602	10,148	8,158	6,200	7,019
Stormwater Separated (MG)	0	0	1,990	3,948	3,129
Overflow Mitigated (MG)	0	0	3,902	3,005	4,051
Flows Treated at EHRT (MG)	0	0	268	231	263
Flows Treated at WWTP (MG)	5,349	5,071	7,063	4,129	5,993
Remaining Overflow (MG)	8,253	5,077	1,175	2,072	1,026
Watershed % Control	39%	50%	88%	80%	90%
Number of CSOs Eliminated	0	4	6	9	9
Number of CSOs > 85% Control	37	28	97	75	97
Number of CSOs < 85% Control	62	69	0	22	0
No. of CSOs >100 MG overflow	28	11	2	6	2

**Options to be determined as part of Phase 2 scheduling*

Sustainability LENS

Key Features:

- ◆ Linked to **Google Maps** using **CAGIS GIS** data layers
- ◆ Development of Planning **Scenarios**
- ◆ Development of **Key Performance Indicators** to achieve community goals
- ◆ Provides planning **analysis of alternatives** for further detailed evaluation
- ◆ Relative **cost comparisons** of alternatives
- ◆ Easy and **rapid evaluations** for quick decision making
- ◆ **Bench marking** of communities (next version)



Input Community Performance Related to Performance Indicators

Community: Lickrun Watershed

ENVIRONMENTAL



NATURAL SYSTEMS



WATER QUALITY &
QUANTITY



REDUCE GHG EMISSIONS



REDUCE WASTE
STREAMS

SOCIAL

ECONOMIC



VIEW SUSTAINABLE
COMMUNITY REPORTS



Environmental Stewardship

Development of a competitive and diversified economy capable of meeting the needs of, and securing a high standard of living for, all its people for the present and for the future.

CSO Compliance

PI: Stormwater runoff reduction using Green Infrastructure in typical year event

PI: CSO flow reduced or controlled in typical year event

Values

Comments

Target Value: 800

Units: Million gallons CSO/typical year from the watershed

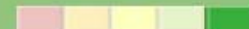
CSO Planning Toolkit



Current: 1000 125 %



Stretch: 268 34 %



Aspirational: 250 34 %



Save

Progress towards Clean Water Act standards

Compute Output



Reporting of Sustainable Community Index

- Allows reports to compare three scenarios
- Provides strengths and weakness of each scenario
- Provides relative cost comparison of scenarios



Cincinnati MSD

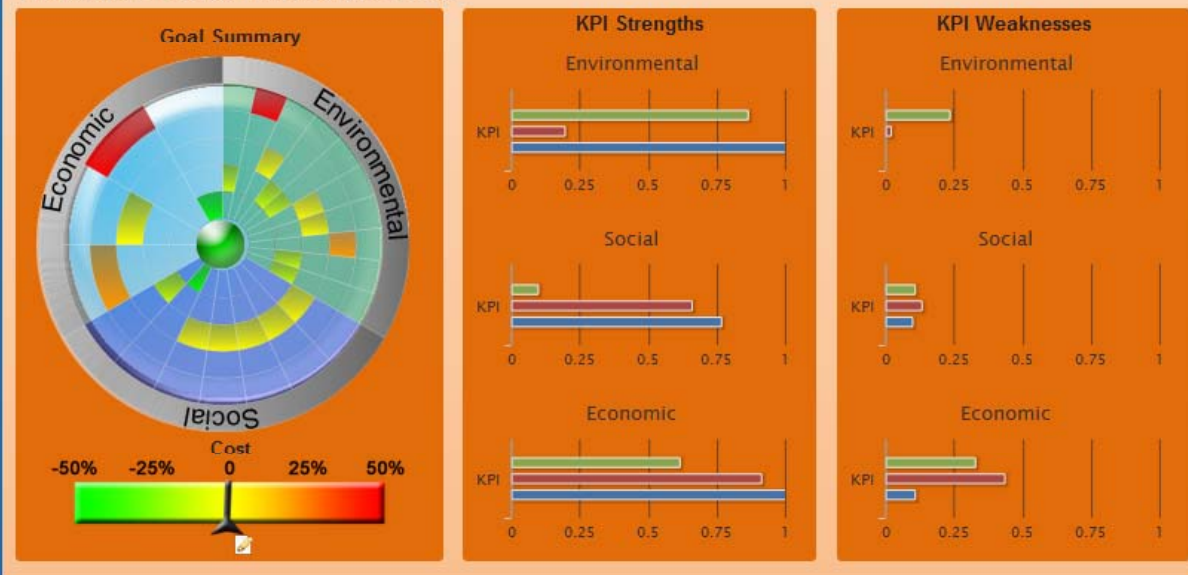
Cincinnati MSD Sustainable Community Index is being developed to include:

- Integration of state and federal water quality standards,
- To maintain or enhance Community ecology through a technology based solutions.
- Use Sustainable Community Index to promote use of integrated resource management and activities to improve the environment, promote economic growth, and to enhance quality of life.
- Help identify solutions and developing management strategies to achieve desired goals

Lick Run Sustainable Community Summary

Summary Details Benchmarks

Current: Current conditions as they are today.



3 Keys to MSD's Innovative Community Engagement

MSD views community engagement equally as essential as the technical elements in making this effort a success



3 Keys to MSD's Innovative Community Engagement

MSD recognizes the need to commit the resources necessary for meaningful community engagement.



3 Keys to MSD's Innovative Community Engagement

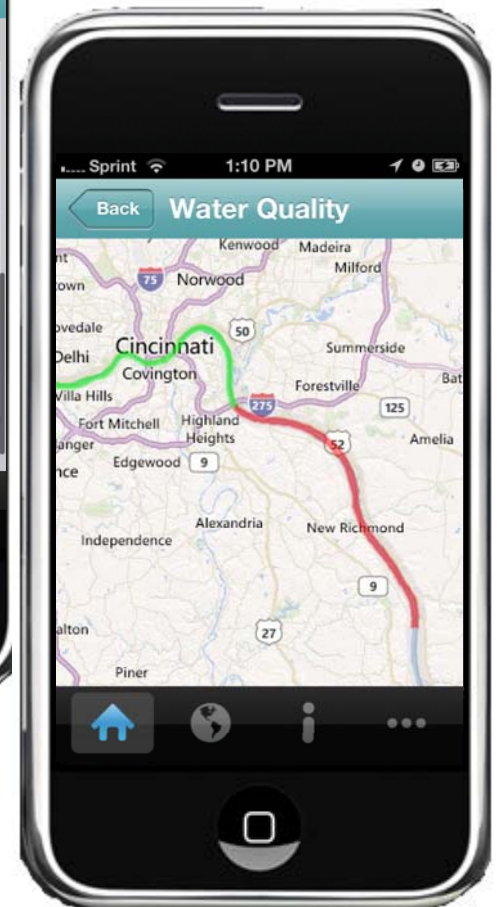
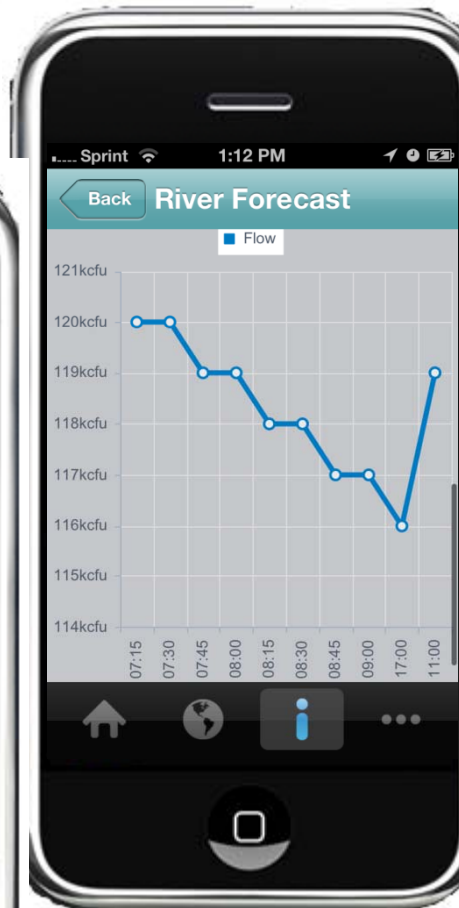
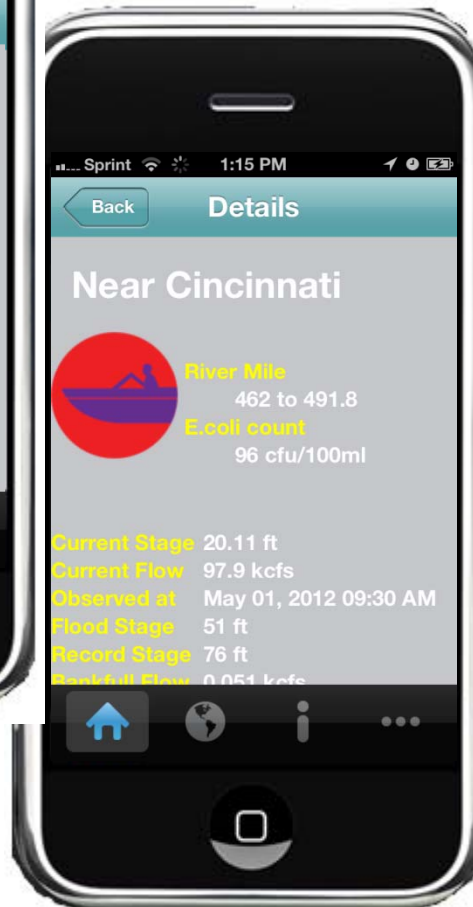
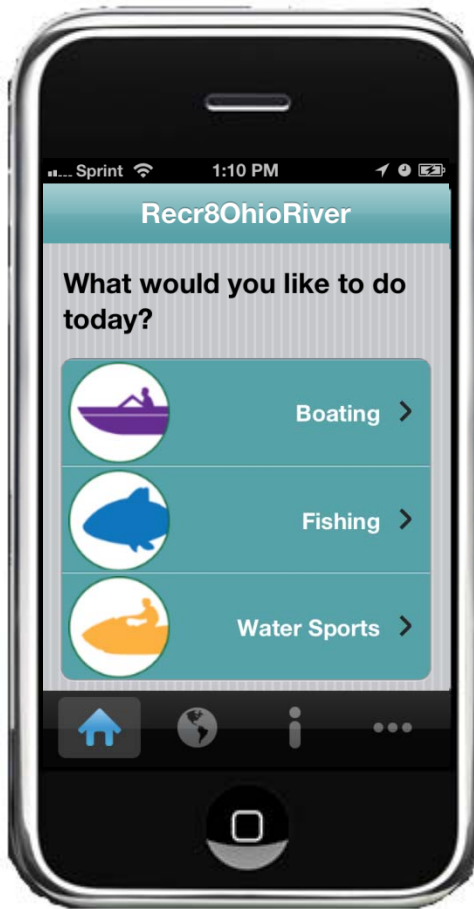
MSD gets that everything is local.



PROJECT GROUNDWORK
your pipeline to clean water



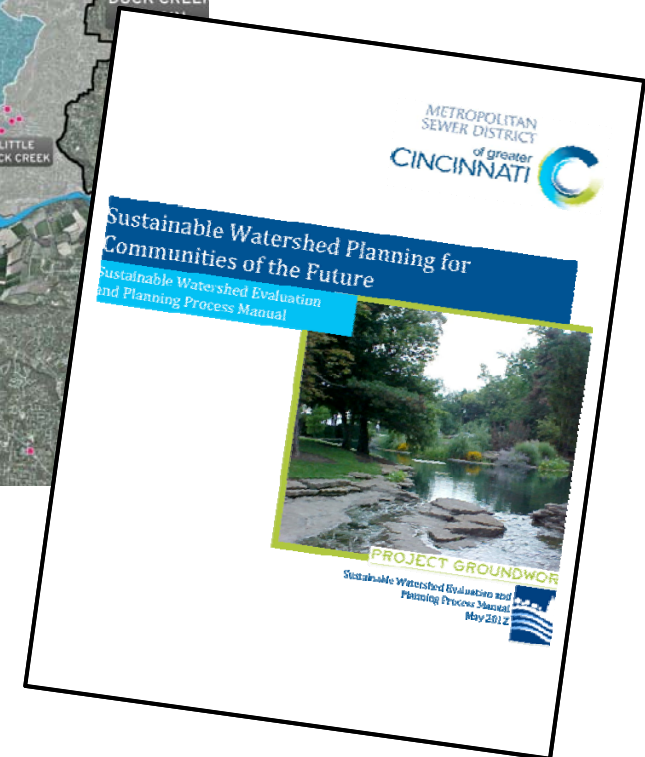
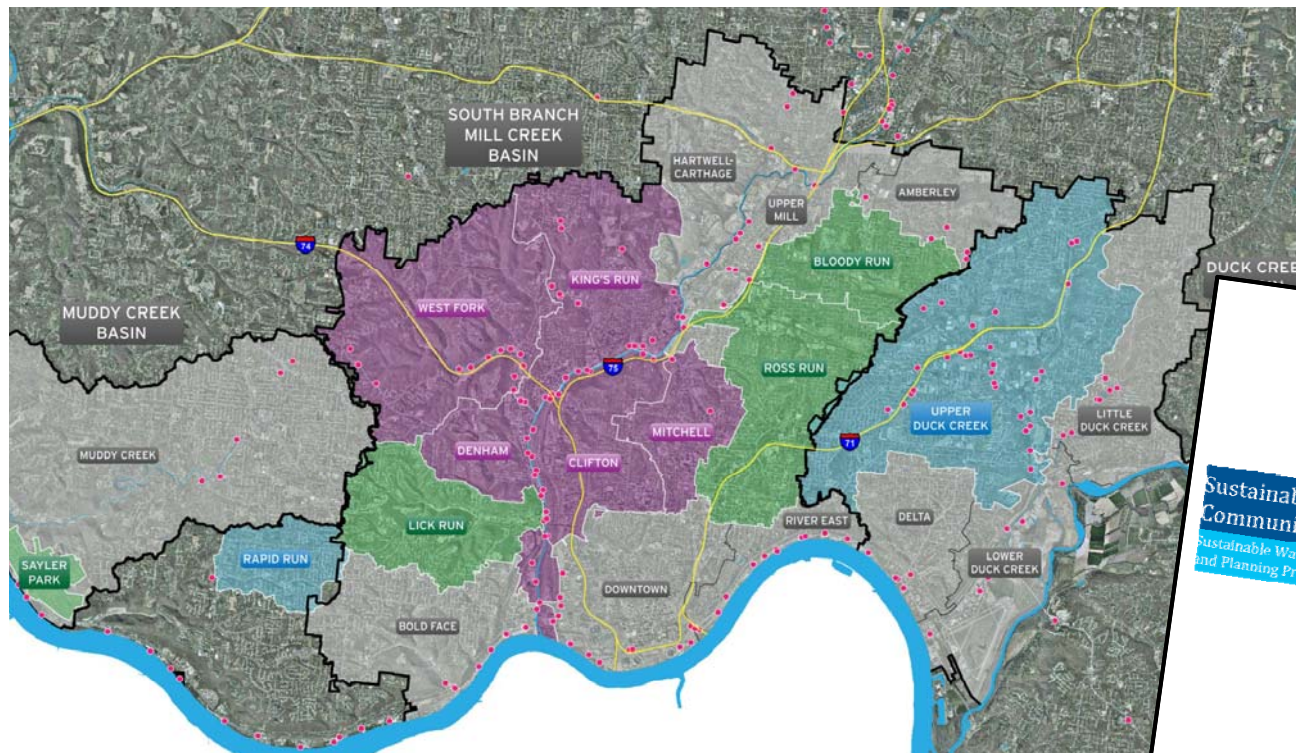
“Recr8OhioRiver” smartphone app



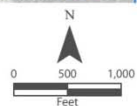
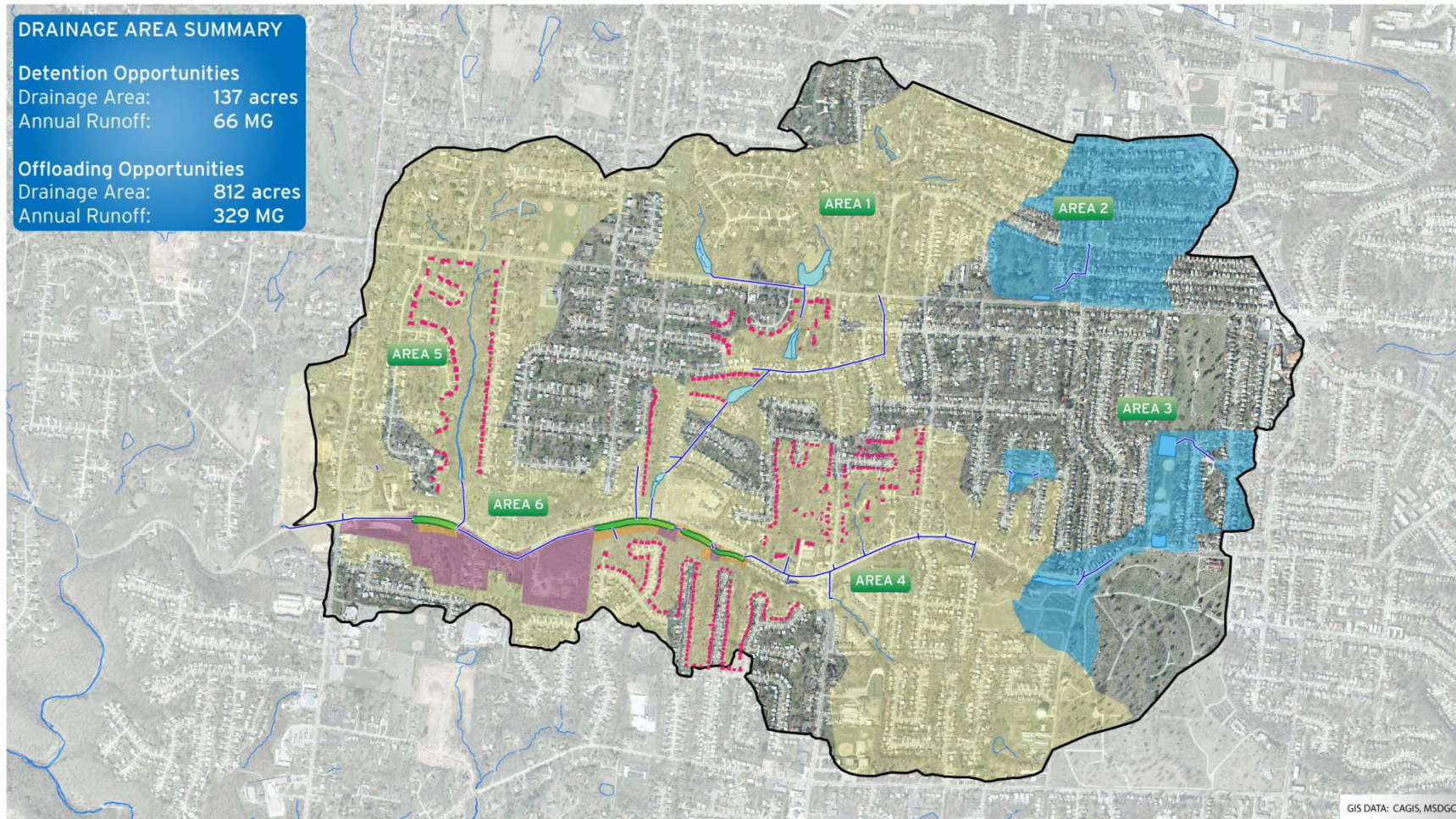
Questions?



MSD Sustainable Watershed Evaluation Planning



Sustainable Infrastructure CSO Reduction Solution



Legend

- Existing Stream
- Proposed Storm Sewer
- FEMA Grant Properties
- Impacted Properties
- Detention/Water Quality Feature
- Downspout Disconnection
- Potential Conveyance Features
- Detention Drainage Area
- Offloading Drainage Area

METROPOLITAN SEWER DISTRICT OF GREATER CINCINNATI
RAPID RUN FEASIBILITY STUDY

OPPORTUNITY SUMMARY

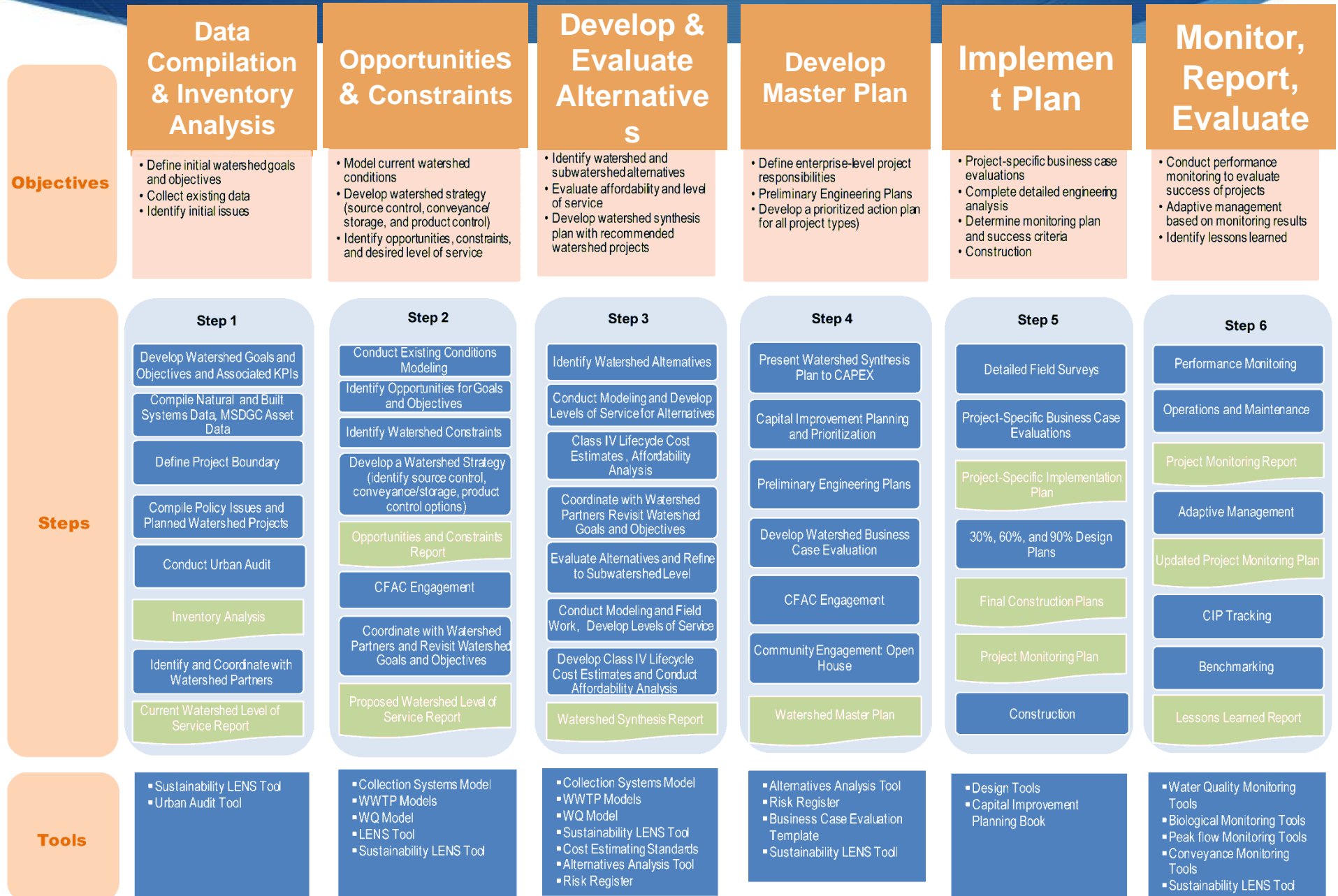


MSD Sustainable Infrastructure Solutions

- 💧 Wet Weather Quantity Management: Source Control
 - 💧 Removal of rainwater from entering the combined system through the use of sustainable infrastructure solutions
 - 💧 Direct
 - 💧 Enabled

- 💧 Water Quality Management
 - 💧 Quality of water body in MSD service area
 - 💧 Recreational & Stream Restoration projects to enhance public health and biological attainment of water bodies)

MSD Sustainable Watershed Evaluation Planning



Wastewater Infrastructure Planning

ASSET-CENTRIC APPROACH



Sewer Infrastructure Focus

Isolated Decision-making

Risk-based, End-of-Pipe Solutions

HOW DO MSD ASSETS
IMPACT **NATURAL SYSTEMS**?



HOW DO **NATURAL SYSTEMS**
IMPACT MSD ASSETS?

NATURAL SYSTEMS-BASED APPROACH



Systems Focus

Integrated Decision-making

Multi-objective Solutions

Paradigm Shift

Flooding



Engaging the community has been key

- More than 60 community presentations
- Publically accessible website
- Branding of program (Project Groundwork)
- Communities of the Future Advisory Committee (CFAC)
- Project Groundwork Partners program
- Community Council representation
- Business Association engagement
- Videos
- Kiosk in MSD offices
- Media coverage

“Transparency is the guiding principle of our community outreach and communications approach.”

Community Design Workshops created direct dialogue

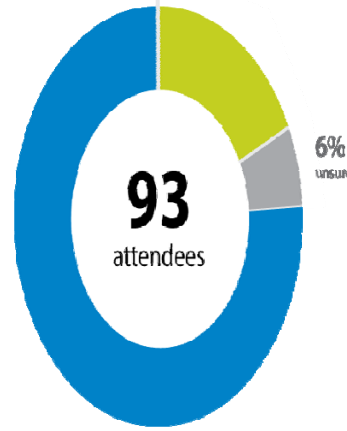
Community Design Workshop #1

89% support the Lick Run Alternative*
11% support the "deep tunnel" default



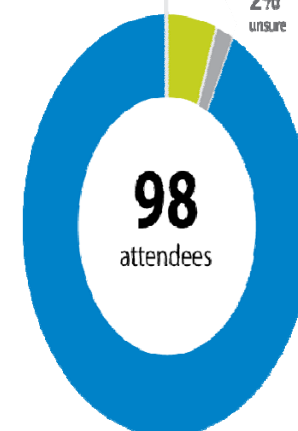
Community Design Workshop #2

78% support the Lick Run Alternative*
16% support the "deep tunnel" default



Community Design Workshop #3

93% support the Lick Run Alternative*
5% support the "deep tunnel" default
2% unsure



Lower Mill Creek Partial Remedy (LMCPR) - Default

Project Component	Original Project Estimate
Tunnel	\$ 104,783,000
Consolidation Sewers	\$ 12,128,000
Pump Station	\$ 15,688,000
Enhanced High Rate Treatment	\$ 13,712,000
Contingencies	\$ 36,579,000
Soft Costs	\$ 61,452,000
Total	\$ 244,342,000

