

Prepared for
City of South Bend,
Indiana

CSO LTCP Re-evaluation Council Committee Update

06 October 2015

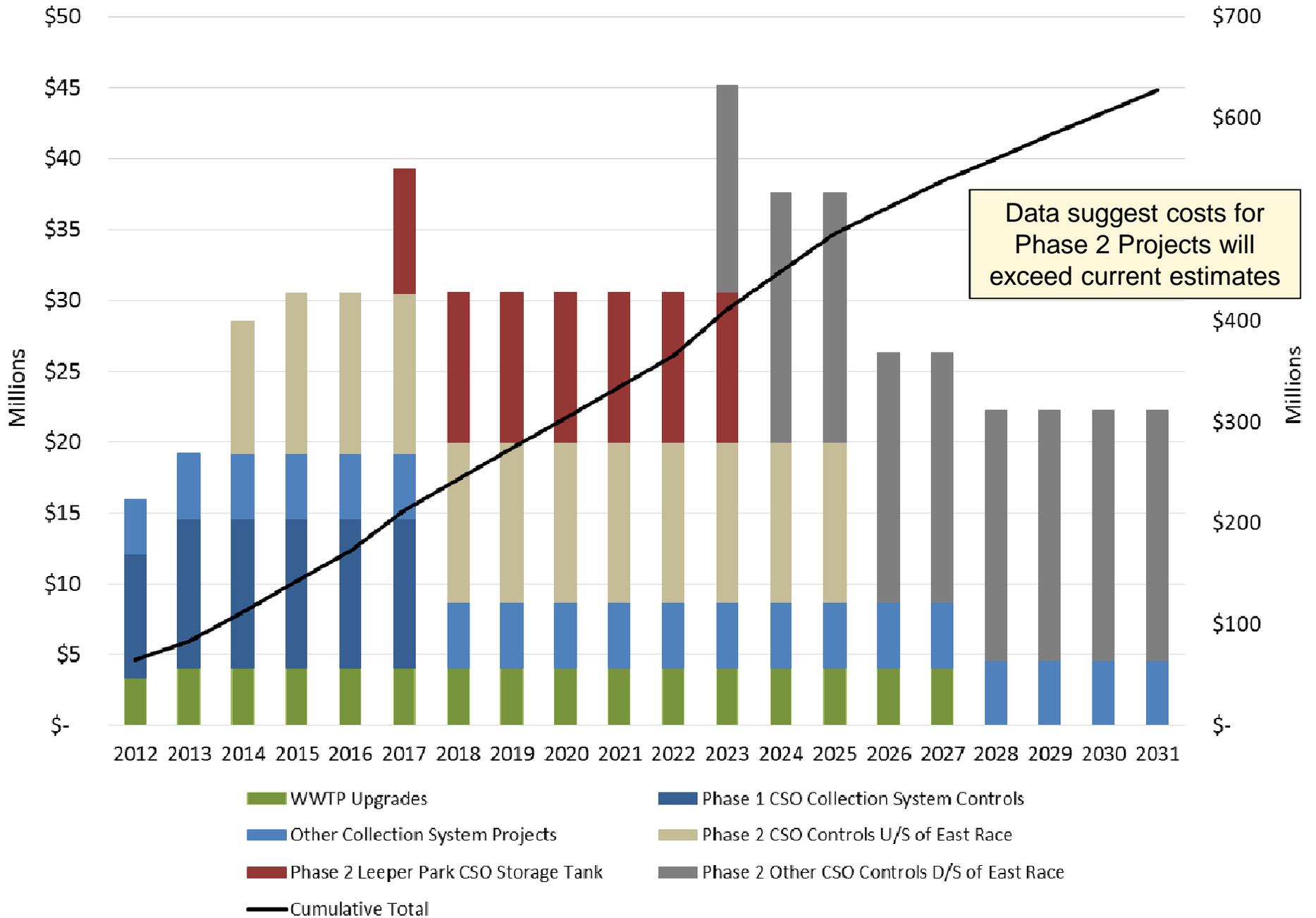


Agenda

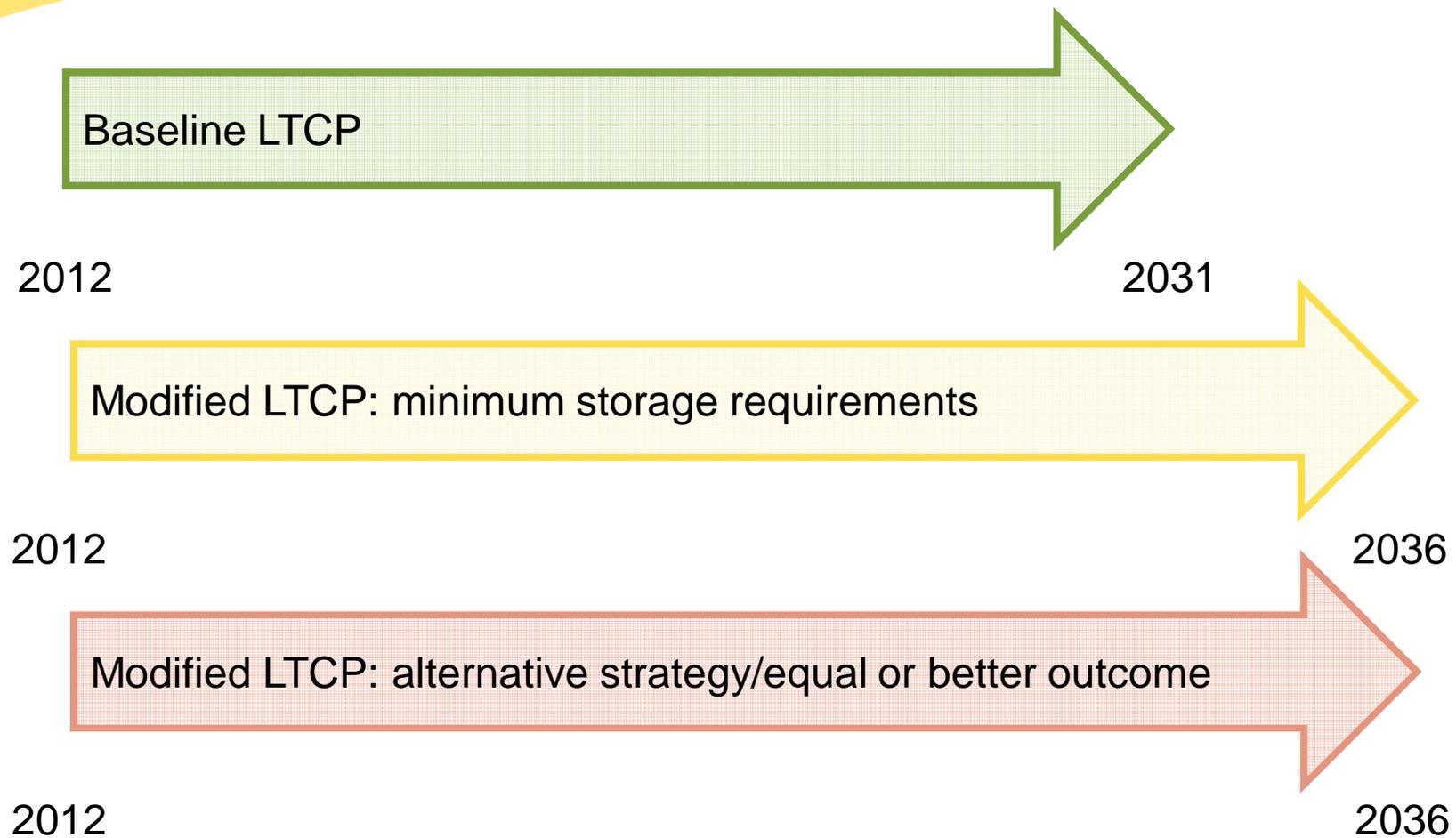
- Overview of CSO LTCP Implementation Options
- Source Management Tools
- Pathway Analysis
- LTCP Alternatives
- Phase 1 Completion Plan

Overview of CSO LTCP Implementation Options

South Bend LTCP Baseline Expenditure Schedule - 2015 Dollars



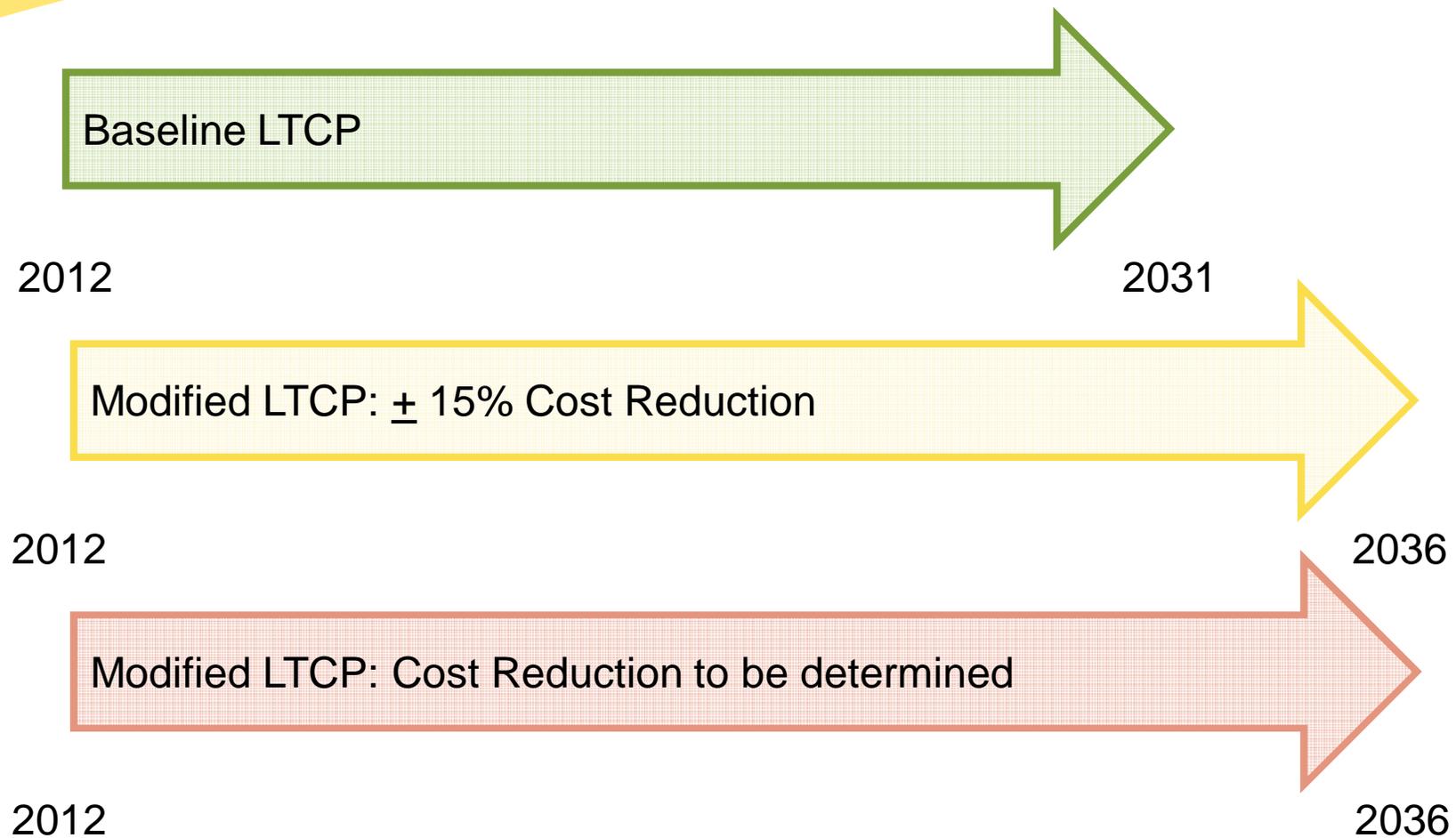
CSO LTCP Implementation Options



CSO LTCP Implementation Options

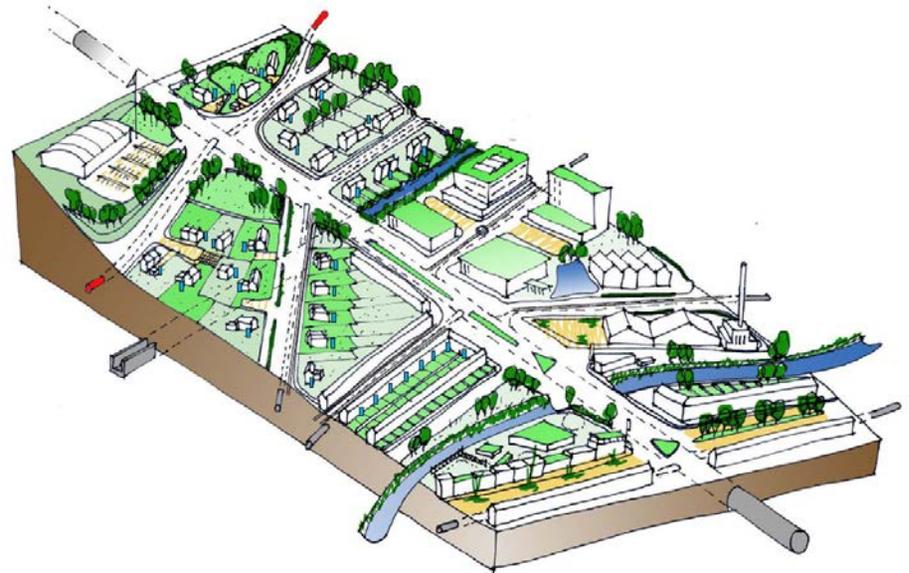
Project	Baseline LTCP	Modified LTCP: Minimum Volume	Modified LTCP: Alternative Strategy
WWTP Improvements	100 mgd	100 mgd	↓
Phase 1 Collection System Controls	Various	Various	✓
Memorial Park Storage Tank	3.9 MG	3.9 MG	↓
Old Fire Station Tank	1.0 MG	0.6 MG	↓
Ice Rink Parking Lot Storage Tank	1.0 MG	0.6 MG	↓
Randolph and Sampson Storage Tank	4.5 MG	2.7 MG	↓
Nuner School Storage Tank	0.3 MG	0.2 MG	↓
Leeper Park Storage Tank	8.7 MG	5.2 MG	↓
Brownsfield Storage Tank	1.0 MG	0.6 MG	✗
Storage Conduit	144 inch	90 inch	↓
Parallel Interceptor	144 inch	90 inch	↓
Other Collection System Projects	Various	Various	✓

CSO LTCP Implementation Options



Source – Pathway – Receptor Model

- Source
 - Rainfall to runoff
- Pathway
 - Collection/conveyance
- Receptor
 - Discharge



Source: CIRIA Retrofitting Surface Water Management Measures

CSO LTCP Re-evaluation

Source Management

Source Control – Green Stormwater Infrastructure

- Can't control rainfall
- Can affect the volume of runoff
- Can affect the rate of runoff
- Reduction in peak wet weather flow rates can translate to reduced overflows

GSI Measure	Public	Private
Green Roof	X	X
Blue Roof	X	X
Downspout Disconnect		X
Permeable/Pervious Pavers	X	X
Bioswales/Filter Strips	X	X
Dry Wells		X
Rain Gardens	X	X
Filter Boxes	X	X
Infiltration Basins	X	X
Surface Detention	X	X
Subsurface Detention	X	X

Source Control Impacts: Downspout Disconnection (1.4 inch event)

Combined Sewer Area	
Residential Roof Area (ft ²)	12,708,000
Total Roof Runoff (MG)	11.1 MG
Existing Conditions	
- Disconnection %	90%
- Runoff to Combined Sewer	6.0 MG
Proposed Conditions	
- Disconnection %	95%
- Runoff to Combined Sewer	5.8 MG
Est. Volume Reduction (MG)	0.2 MG
% of LTCP Storage Req'd	< 1%

Assumptions: 95% runoff from connected roof;
50% runoff from disconnected roof

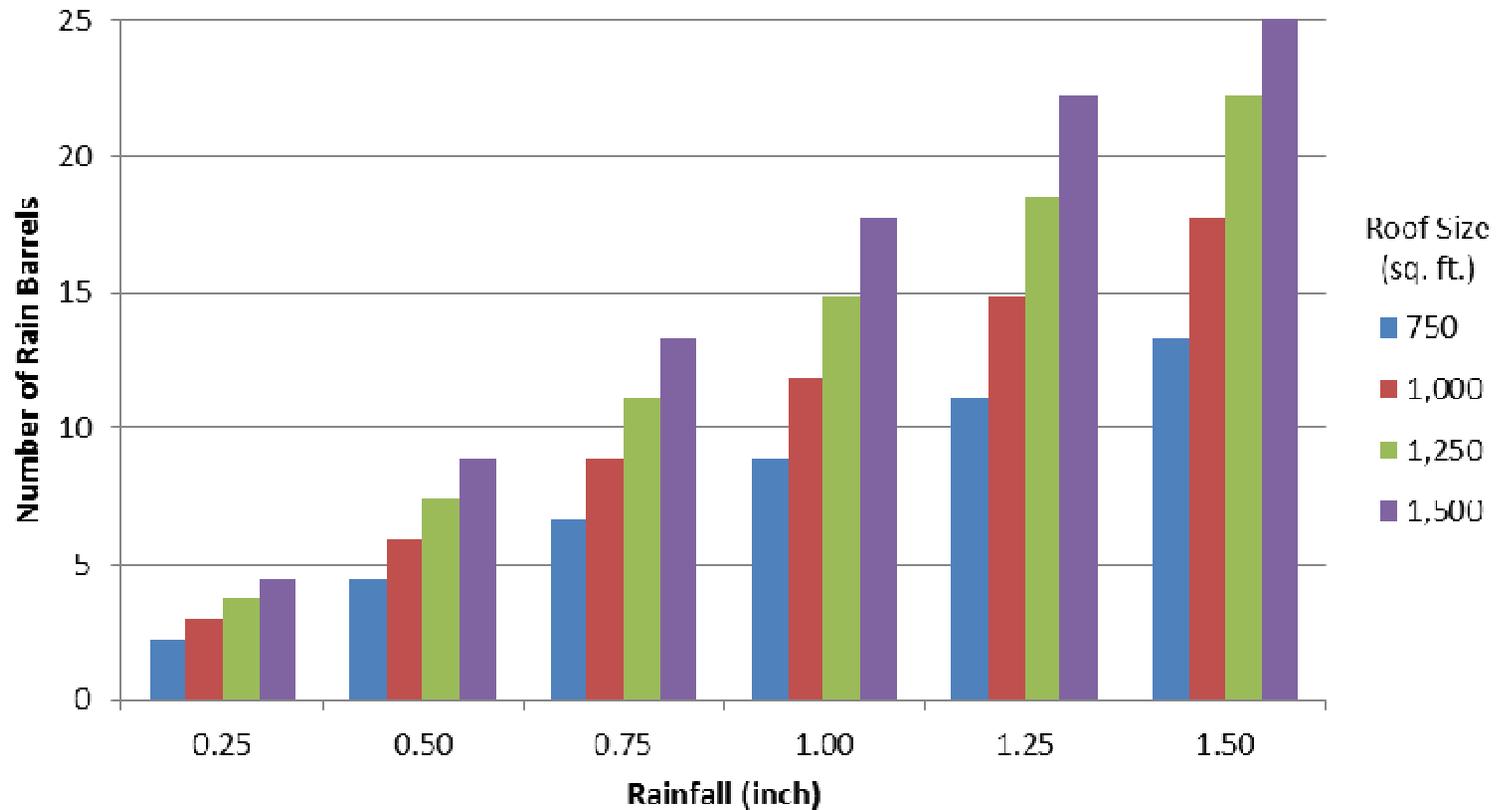


Source: www.watguardplumbing.com

LTCP Storage: 21.3 – 32.9 MG

Source Control Impacts: Rain Barrel Installation

Number of Rain Barrels Needed to Capture Rooftop Runoff



Source Control Impacts: Green Stormwater Infrastructure

- Initial calculations suggest an effective reduction in impervious area of up to 10% through right-of-way GSI
 - Bioswales bump-outs
 - Permeable, pervious paving in parking lanes, areas
 - Filter boxes in parkway areas
 - Dry wells, infiltration basins u/s of combined sewers



Source Control Impacts: Green Stormwater Infrastructure

CSO Basin	Potential GSI Area	Runoff Removed (MG) for Events in Typical Year				
		8-Sep	9-Sep	15-Sep	1-Nov	30-Dec
6	66	3.0	5.3	2.8	5.2	4.4
11	107	2.6	4.7	2.4	2.5	3.9
31	35	2.3	3.9	2.1	3.4	3.3

Average = 60,000 gallons/acre or 2.2 inches/acre

Green Stormwater Infrastructure Costs

Raingarden Bumpout (1000 ft²)

Installation Cost	\$15,000
Maintenance Cost	\$2,500/year
20-year Present Value	\$49,700
Volume Reduced	1380 gallons
Cost per Gal Removed	\$36/gallon

Permeable Pavement (1000 ft²)

Installation Cost	\$8,000
Maintenance Cost	\$3,000/year
20-year Present Value	\$49,800
Volume Reduced	1380 gallons
Cost per Gal Removed	\$36/gallon

Source Control Impacts: Green Stormwater Infrastructure

- Greater reductions in impervious area and runoff will require more aggressive measures outside of the public right-of-way
 - Green, Blue roofs
 - Permeable, Pervious paving in driveways and parking areas
 - On-site detention, retention, and/or infiltration



Source Control Summary

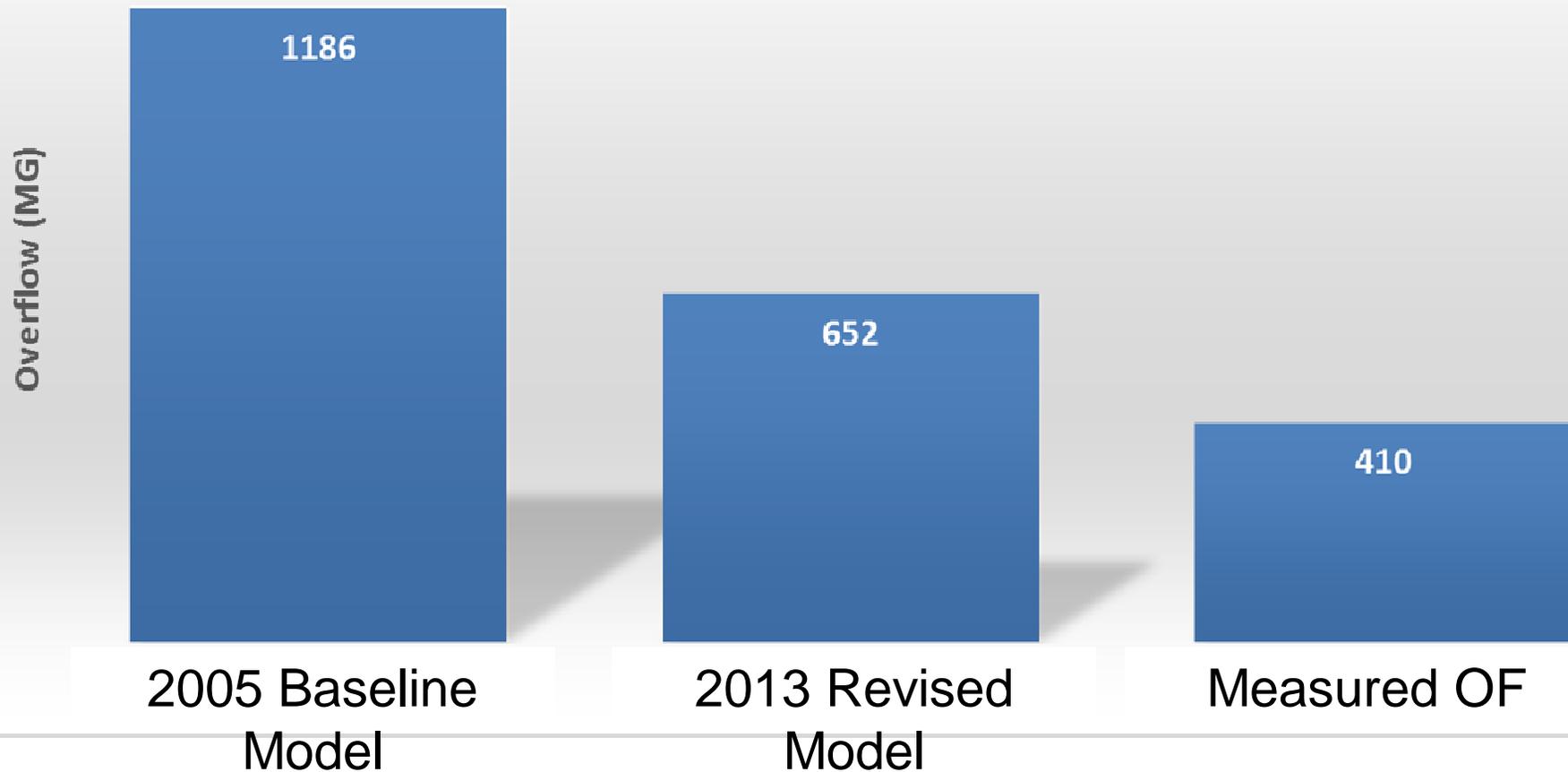
- Source control measures (GSI) can be effective at reducing the rate and volume of stormwater that must be conveyed and treated. Benefit is greatest for frequent, low intensity events.
- Role of GSI in overall plan must consider willingness of community to accept and implement measures.
- Effectiveness of GSI depends on proper application and long-term commitment to maintenance. Cost analyses must consider long-term maintenance costs.

CSO LTCP Re-evaluation

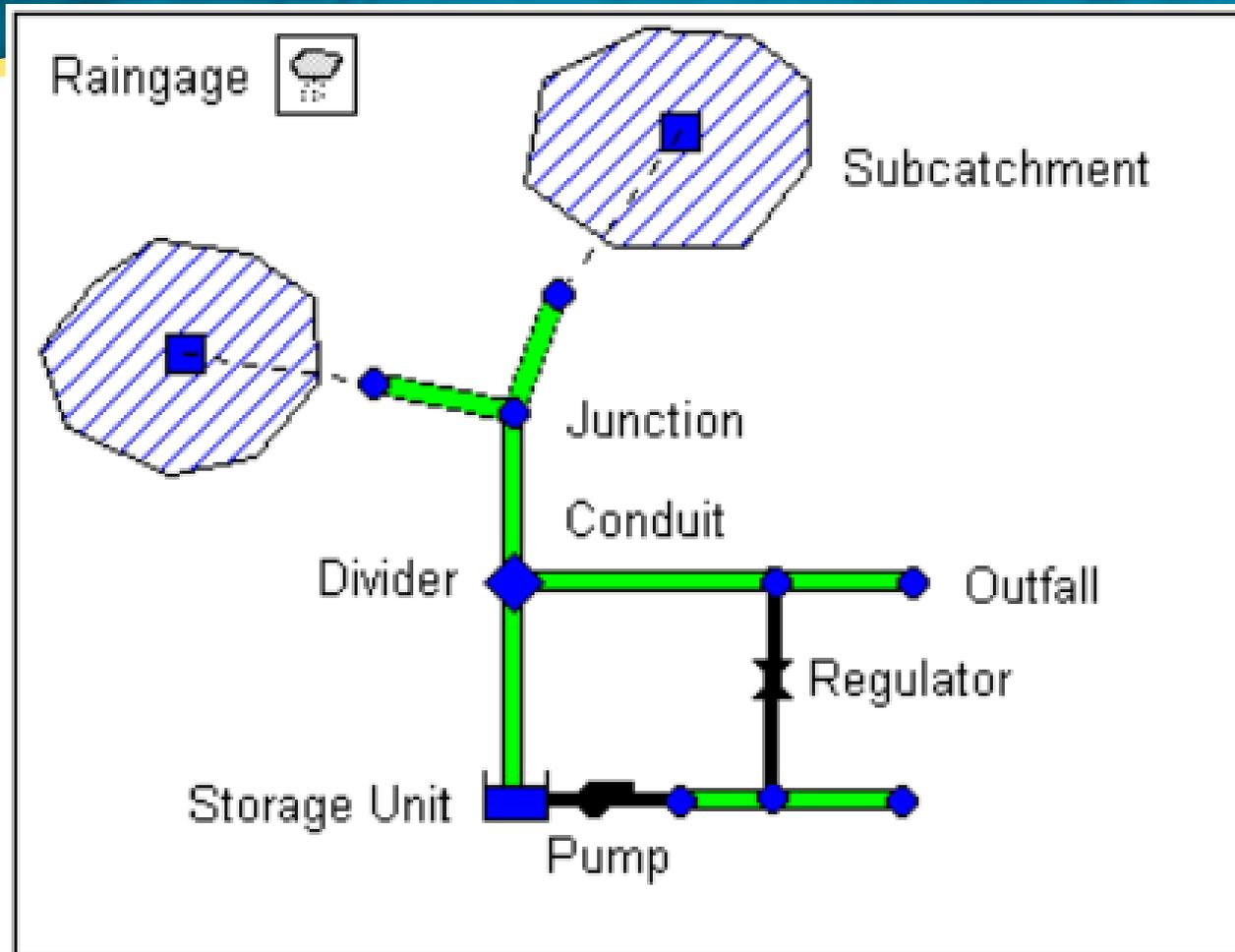
Pathway Analysis

Overflow Volumes

Measured vs. Modeled Overflows
2014

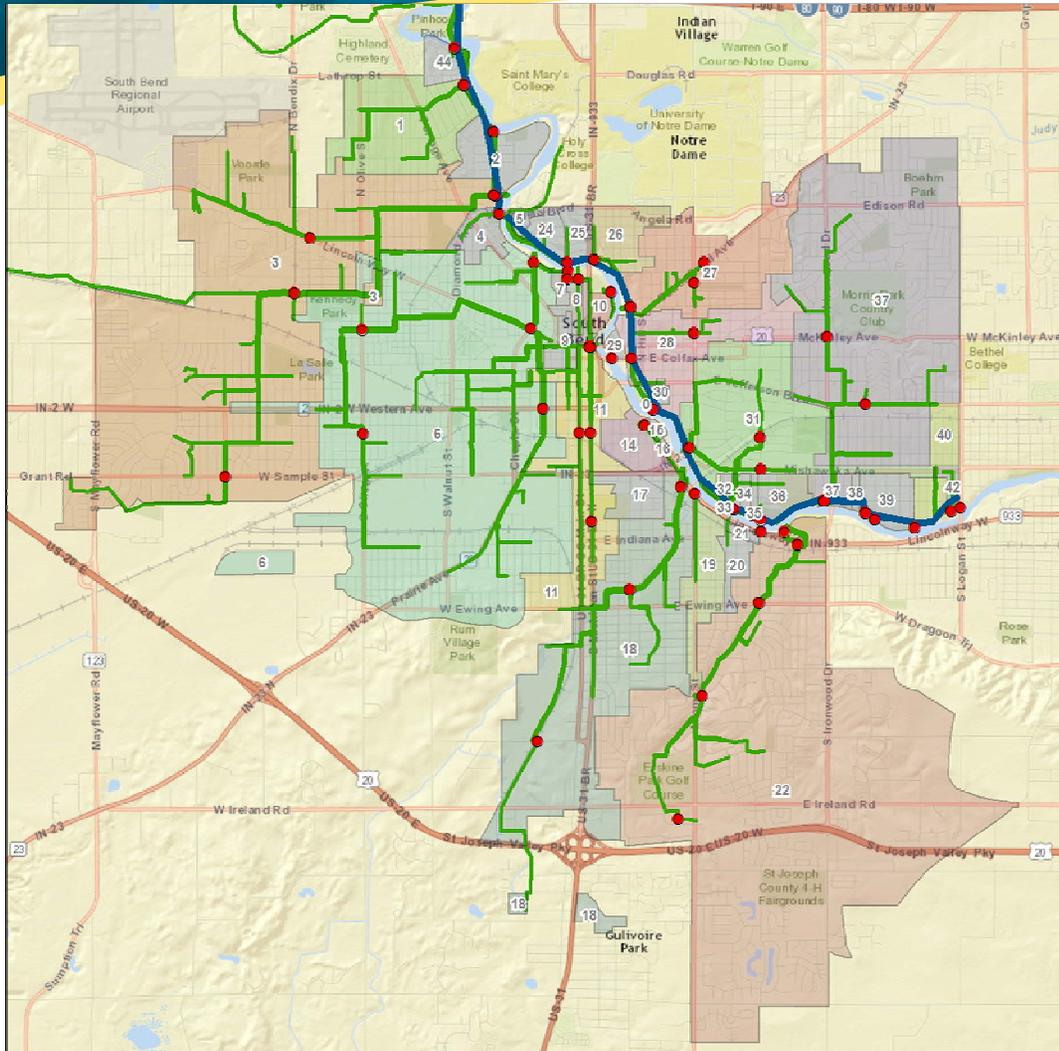


Conventional Modeling



Source: US EPA SWMM 5.0 Help Tutorial

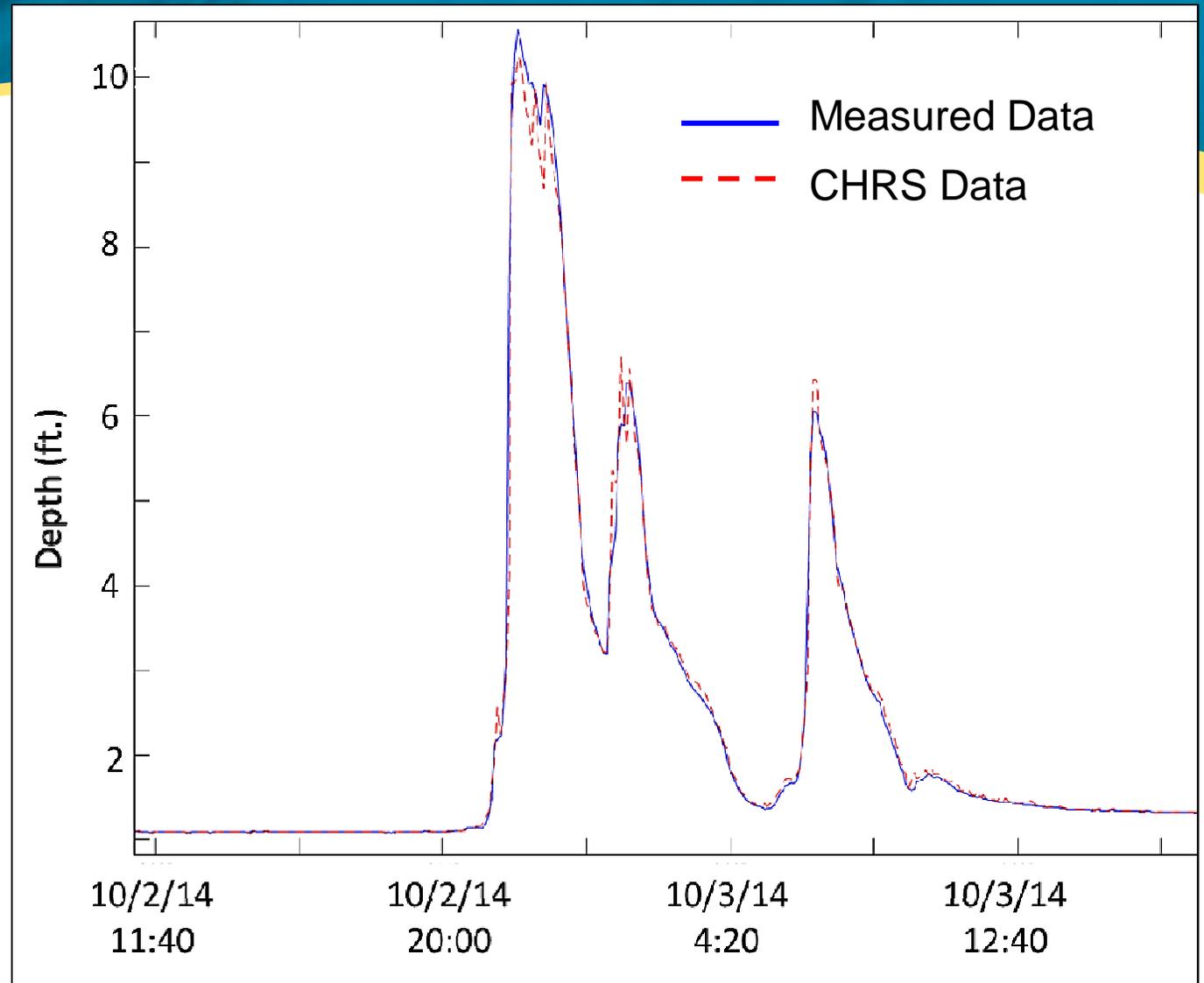
Cognitive Hydraulic Response System



- Pattern Recognition System
- 5 years of available data
- Eliminate uncertainty in model
- Continuous calibration possible

Calibration Results (ongoing)

- Accurate Model = Right-Sized LTCP
- Direct Pre- and Post Construction Comparison
- Platform for Optimization



LTCP Program – Phase 2 CSO Controls

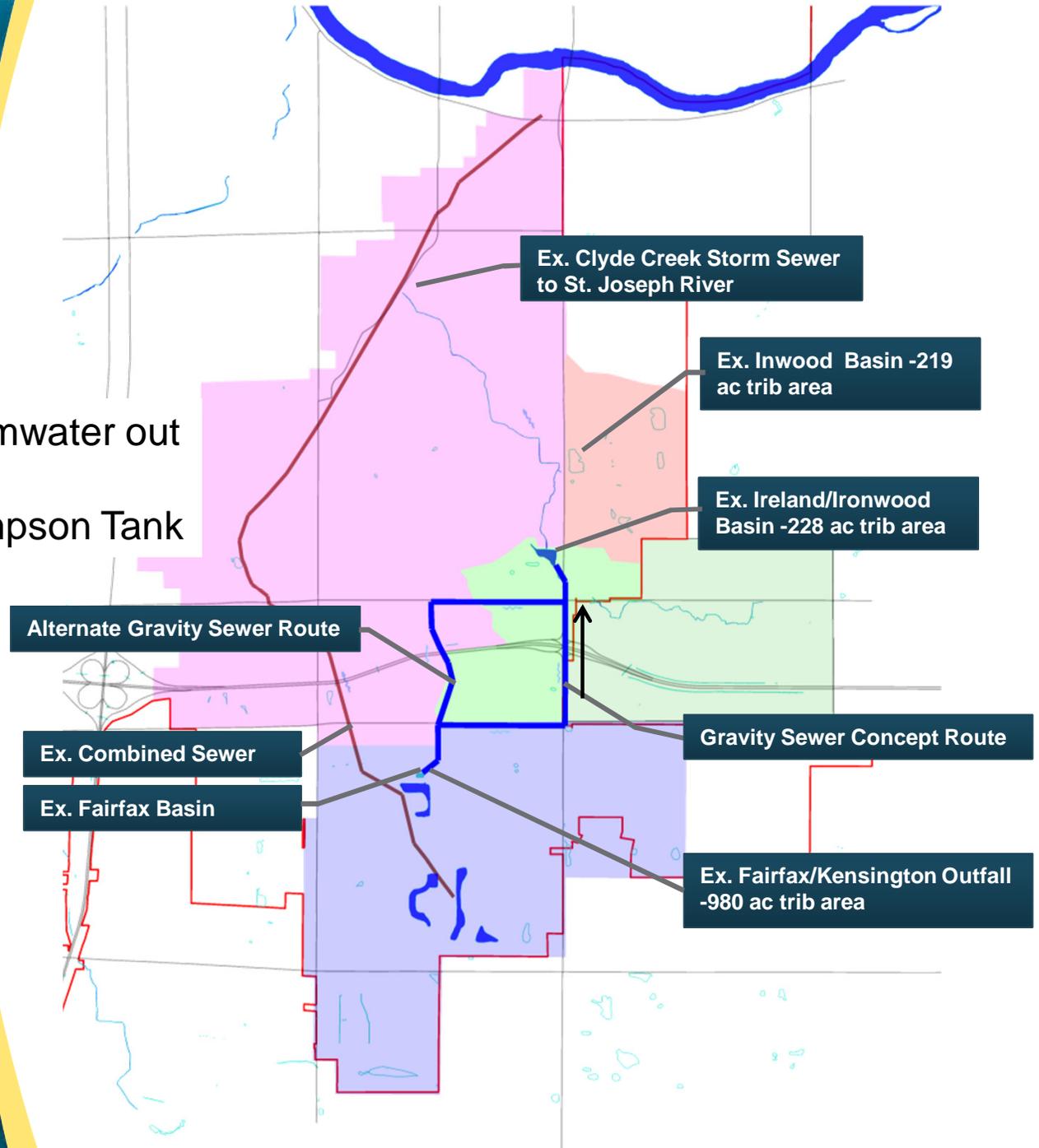


Kensington Separation



Kensington Separation

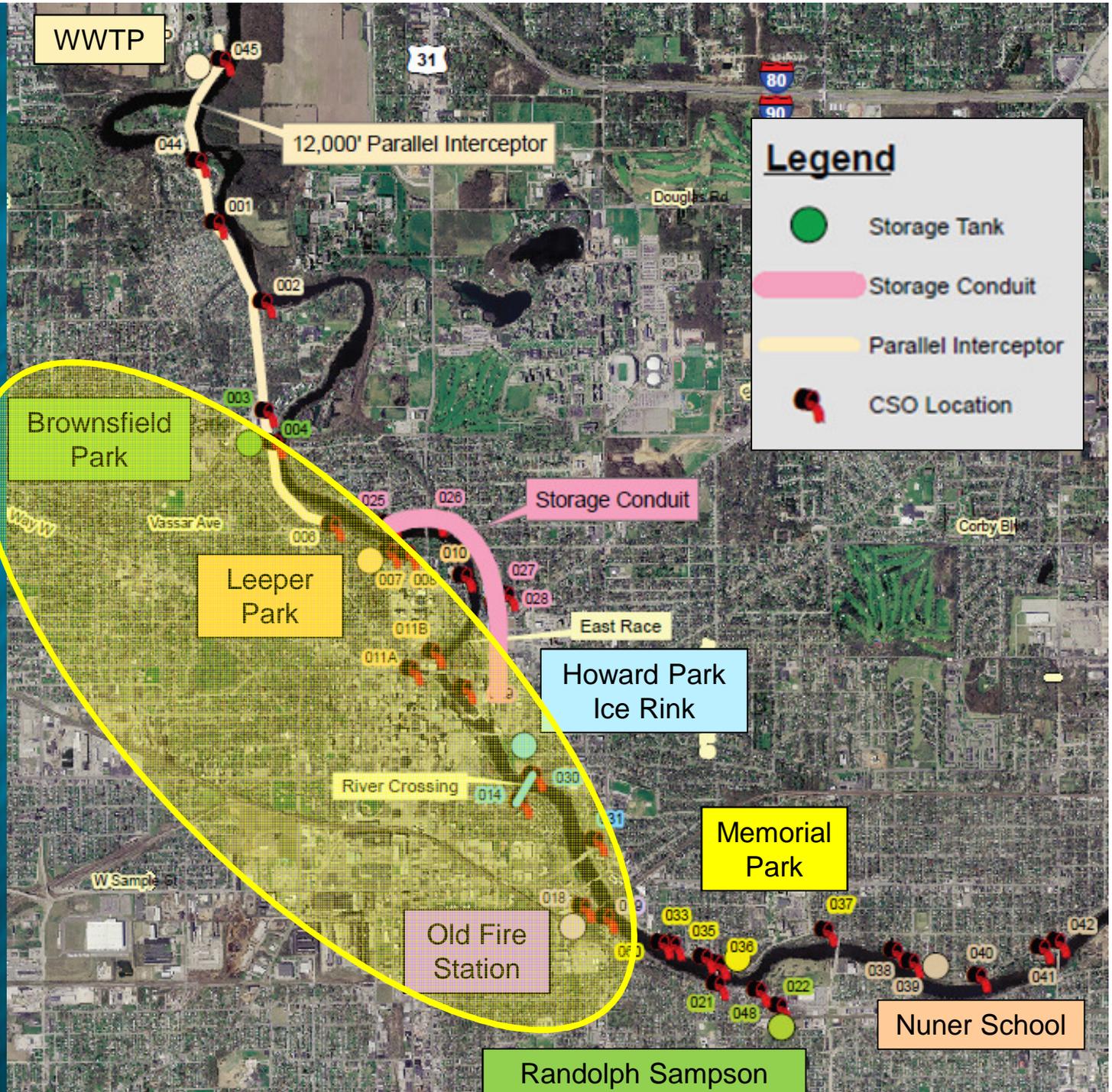
- Divert Kensington stormwater out of combined system
- Reduce Randolph Sampson Tank



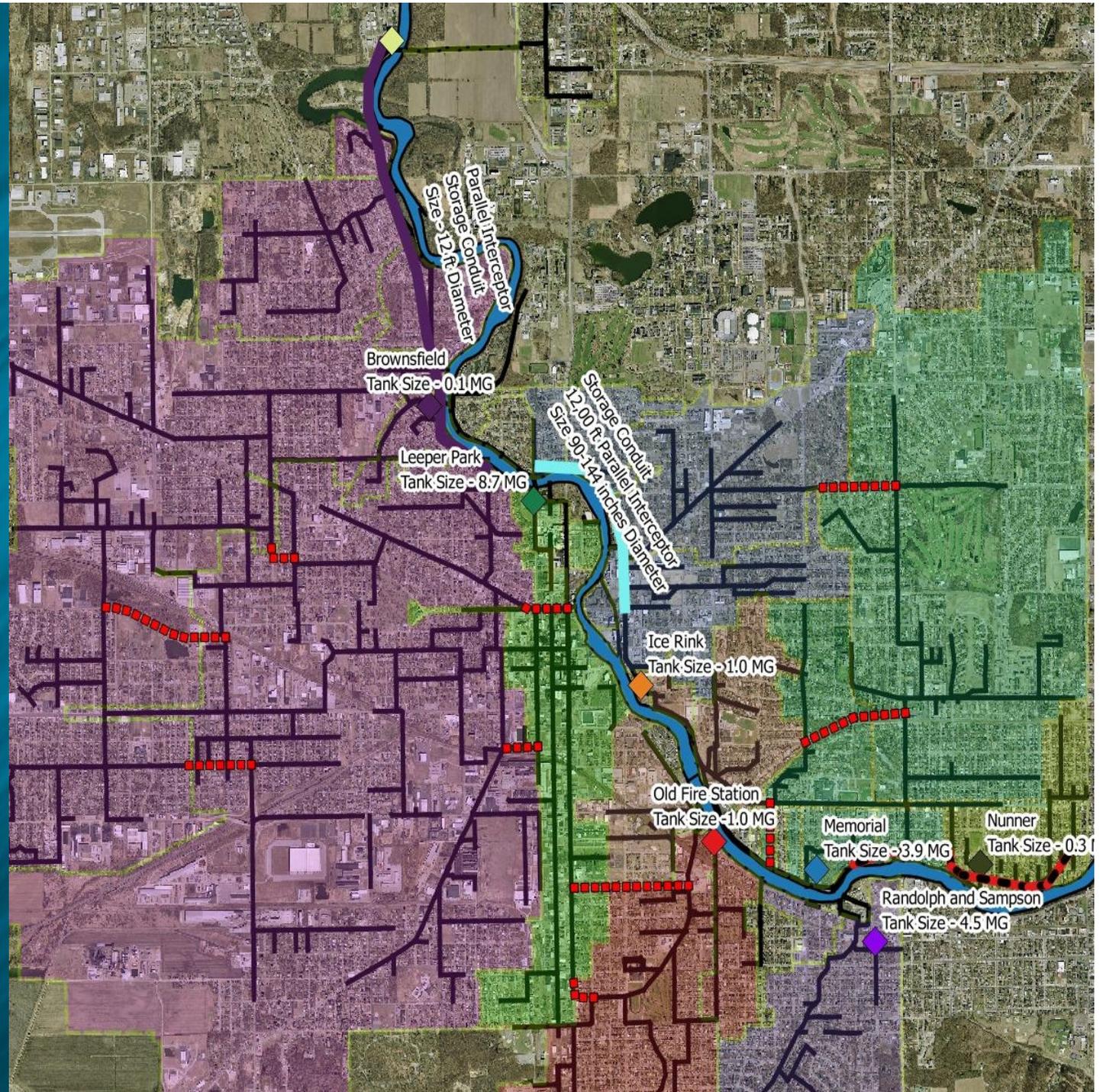
Kensington Separation Scorecard

Project	Control Concept 1	Comments
Other Collection Projects		New storm sewer improvements
Storage Conduit		
Leeper Park Tank		
Parallel Interceptor		
WWTP Upgrades		
Memorial Park Tank		
Ice Rink Parking Lot Tank		
Randolph & Sampson Tank		Reduced tank volume
Old Fire Station Tank		
Nuner School Tank		
Brownsfield Park Tank		

Internal Connections



Internal Connections

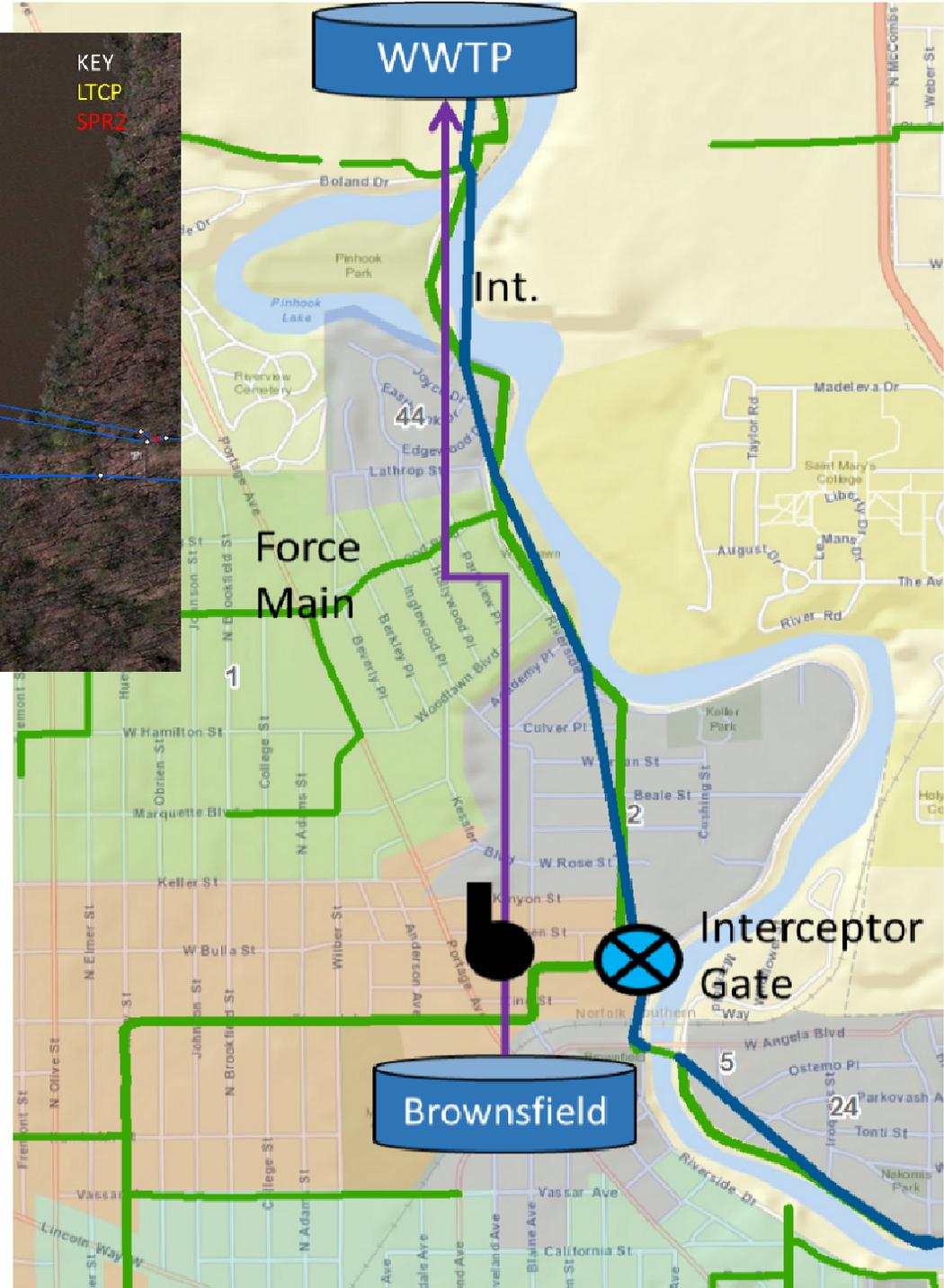


Internal Connections Scorecard - Check

Project	Control Concept 1	Comments
Other Collection Projects		New connecting sewers in collection system
Storage Conduit		
Leeper Park Tank		
Parallel Interceptor		
WWTP Upgrades		
Memorial Park Tank		
Ice Rink Parking Lot Tank		
Randolph & Sampson Tank		
Old Fire Station Tank		Reduced tank volume
Nuner School Tank		
Brownsfield Park Tank		

WWTP Storage and Force Main





WWTP Storage and Force Main

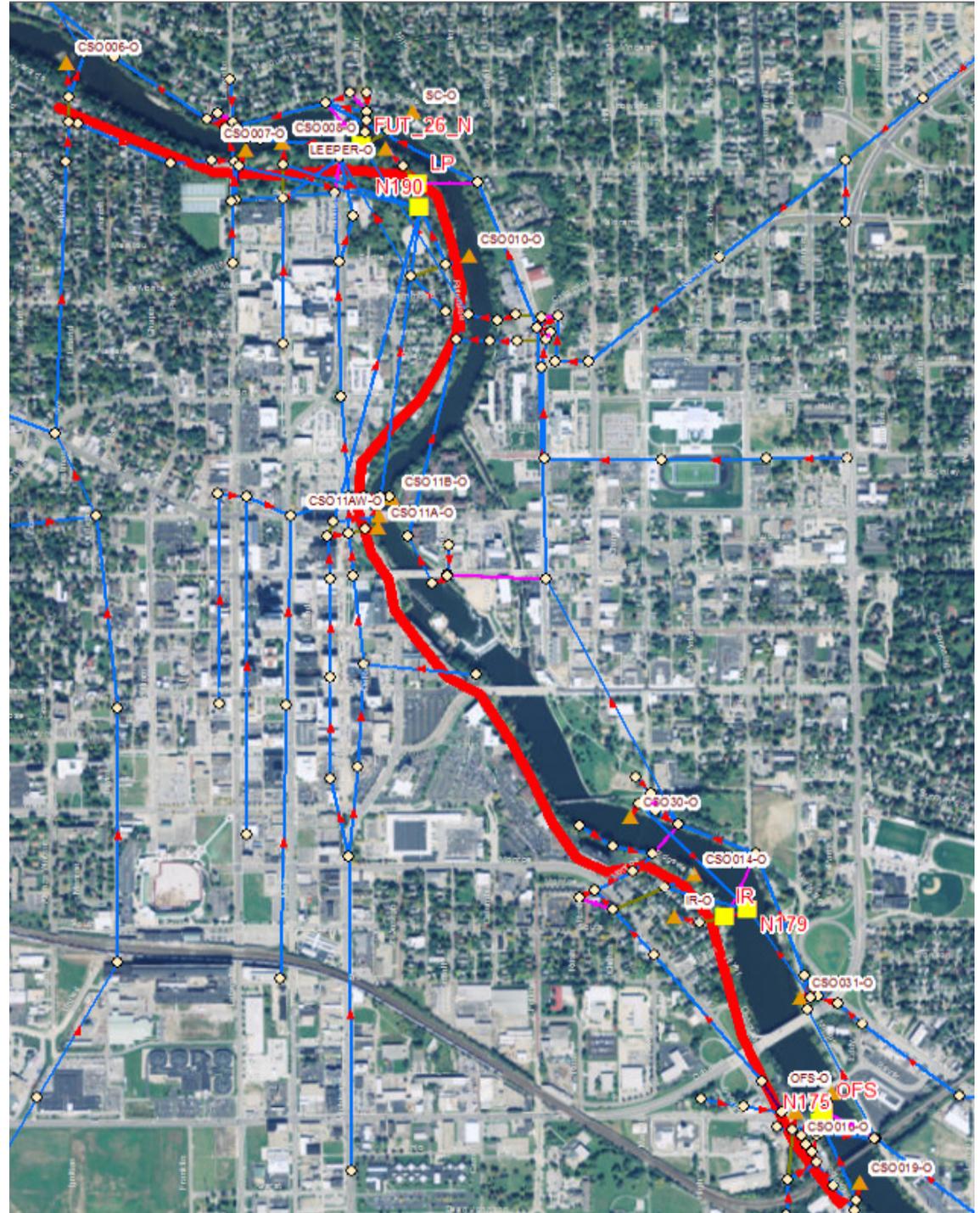
WWTP Storage and Force Main Scorecard

Project	Collection Concept 1	Comments
Other Collection Projects		New PS and Force Main
Storage Conduit		
Leeper Park Tank		
Parallel Interceptor		Replaced by Force Main
WWTP Upgrades		No capacity upgrades, new storage tank
Memorial Park Tank		
Ice Rink Parking Lot Tank		
Randolph & Sampson Tank		
Old Fire Station Tank		
Nuner School Tank		
Brownsfield Park Tank		

CSO Consolidation



CSO Consolidation



CSO Consolidation Scorecard

Project	Collection Concept 2	Comments
Other Collection Projects		New Interceptor Sewer, Eliminates River Crossing
Storage Conduit		
Leeper Park Tank		Eliminates piping to CSOs
Parallel Interceptor		Replaced by Force Main
WWTP Upgrades		
Memorial Park Tank		
Ice Rink Parking Lot Tank		Eliminates piping to CSOs
Randolph & Sampson Tank		
Old Fire Station Tank		
Nuner School Tank		
Brownsfield Park Tank		

Randolph – Sampson, Nuner Elimination





Memorial Park Tank @ 200%
300' L x 200' W
35' SWD

Valve Vault

Pump Station

Disinfection

Sluice Gate

Diversion Structure with Weir

Storm King

Proposed Outfall

Rotary Drum Sieve

Bending Weir

Clover St

Hildreth St

Bellevue Ave

Esther St

Twickenham Dr

Northside Blvd

Lincolnway

Vernon St

Hide Ct

Randolph – Sampson, Nuner Elimination Scorecard

Project	Collection Concept 3	Comments
Other Collection Projects	✓	
Storage Conduit	✓	
Leeper Park Tank	✓	
Parallel Interceptor	✓	
WWTP Upgrades	✓	
Memorial Park Tank	↑	Bigger tank collecting CSOs from 2 other tanks
Ice Rink Parking Lot Tank	✓	
Randolph & Sampson Tank	✗	
Old Fire Station Tank	✓	
Nuner School Tank	✗	
Brownsfield Park Tank	✓	

Potential Collection System and Control Concept Impacts Summary

Project	Kensington Separation	Internal Connections	WWTP Storage and Force Main	CSO Consolidation	Randolph-Sampson, Nuner Elim.
Other Collection Projects	↑	↑	↑	↑	✓
Storage Conduit	✓	✓	✓	✓	✓
Leeper Park Tank	✓	✗	✓	↓	✓
Parallel Interceptor	✓	✓	✗	✓	✓
WWTP Upgrades	✓	✓	↓	✓	✓
Memorial Park Tank	✓	✓	✓	✓	↑
Ice Rink Parking Lot Tank	✓	✓	✓	↓	✓
Randolph & Sampson Tank	↓	✓	✓	✓	✗
Old Fire Station Tank	✓	↓	✓	✗	✓
Nuner School Tank	✓	✓	✓	✓	✗
Brownsfield Park Tank	✓	✗	✓	✓	✓

CSO LTCP Re-evaluation

LTCP Alternatives

Level of Control Considerations

Level of Control

- No of overflow events allowed in a typical year
- Presumed to define conditions that will comply with water quality standards
- “knee of the curve” analysis may be used to define level of control

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Indiana Consent Decrees

- South Bend: 4 overflows/year
- Elkhart: 9 overflows/year
- Mishawaka: 0 overflow/year
- Indianapolis: 2-4 overflows/year
- Fort Wayne: 1-4 overflows/year
- Muncie: 0 overflows/year
- Anderson: 6-8 overflows/year

Overflow Disinfection Considerations

- Consent Decree requires South Bend to disinfect all overflows
- Requirement to disinfect overflows adds costs to proposed CSO control facilities for chemical feed systems (up to \$0.5 - \$1.0 million per site) and consolidation piping (millions of dollars)
- Common forms of disinfection would require chemical facilities at overflow points

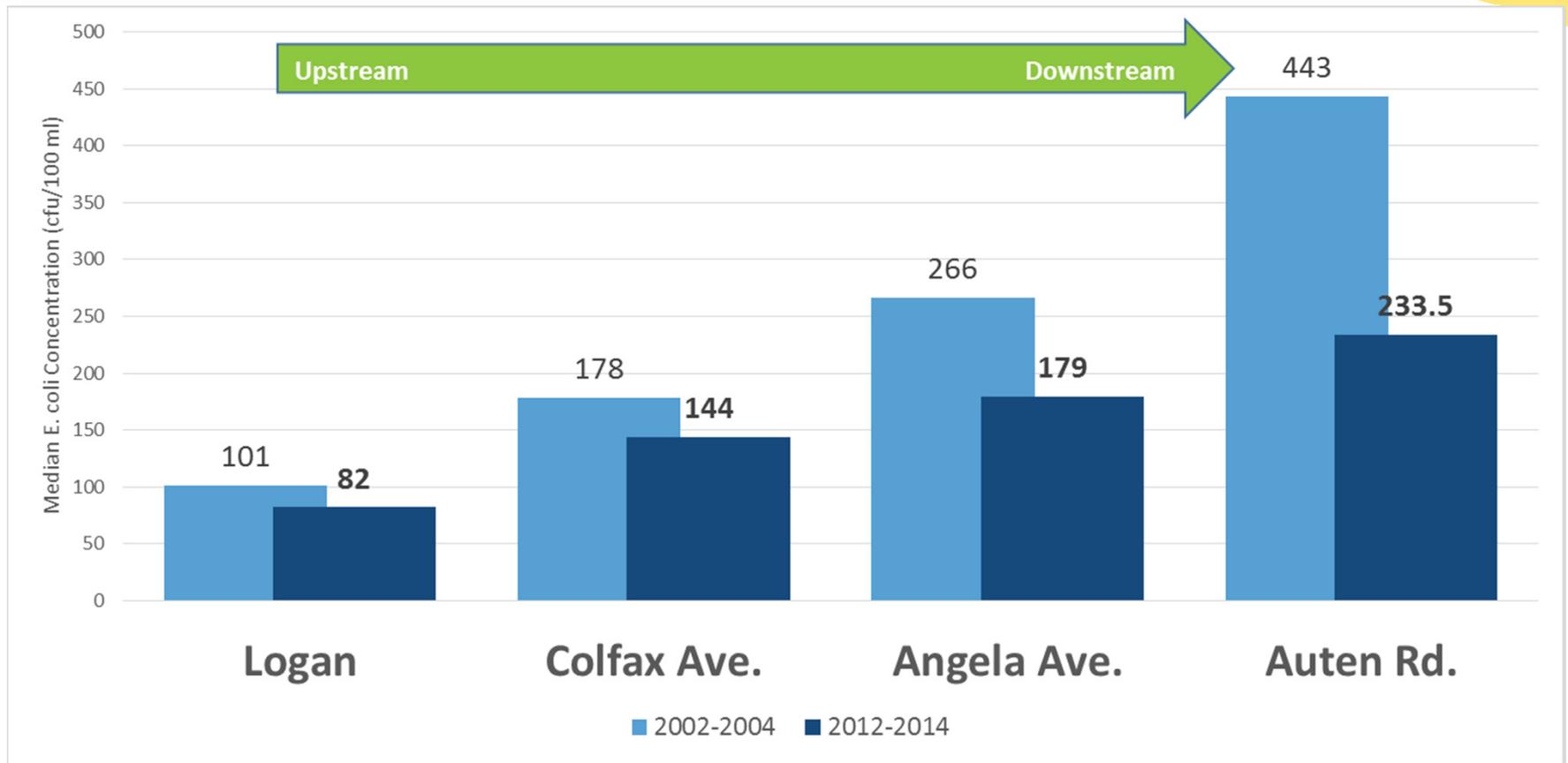
Water Quality Improvements

E. coli Concentrations – All Samples

- South Bend has an in-stream water quality monitoring program on the St. Joseph River
- There are four (4) sampling locations in the City
 - Logan St. Bridge (Boundary with Mishawaka)
 - Colfax Ave. Bridge
 - Angela Ave. Bridge
 - Auten Road Bridge (Downstream of City WWTP)
- Samples are taken weekly and analyzed for E. coli concentration
- Samples from 2012 – 2014 compared with samples from 2002 – 2004 to review impact of LTCP projects implemented

Water Quality Improvements

E. coli Concentrations – Wet Weather Samples



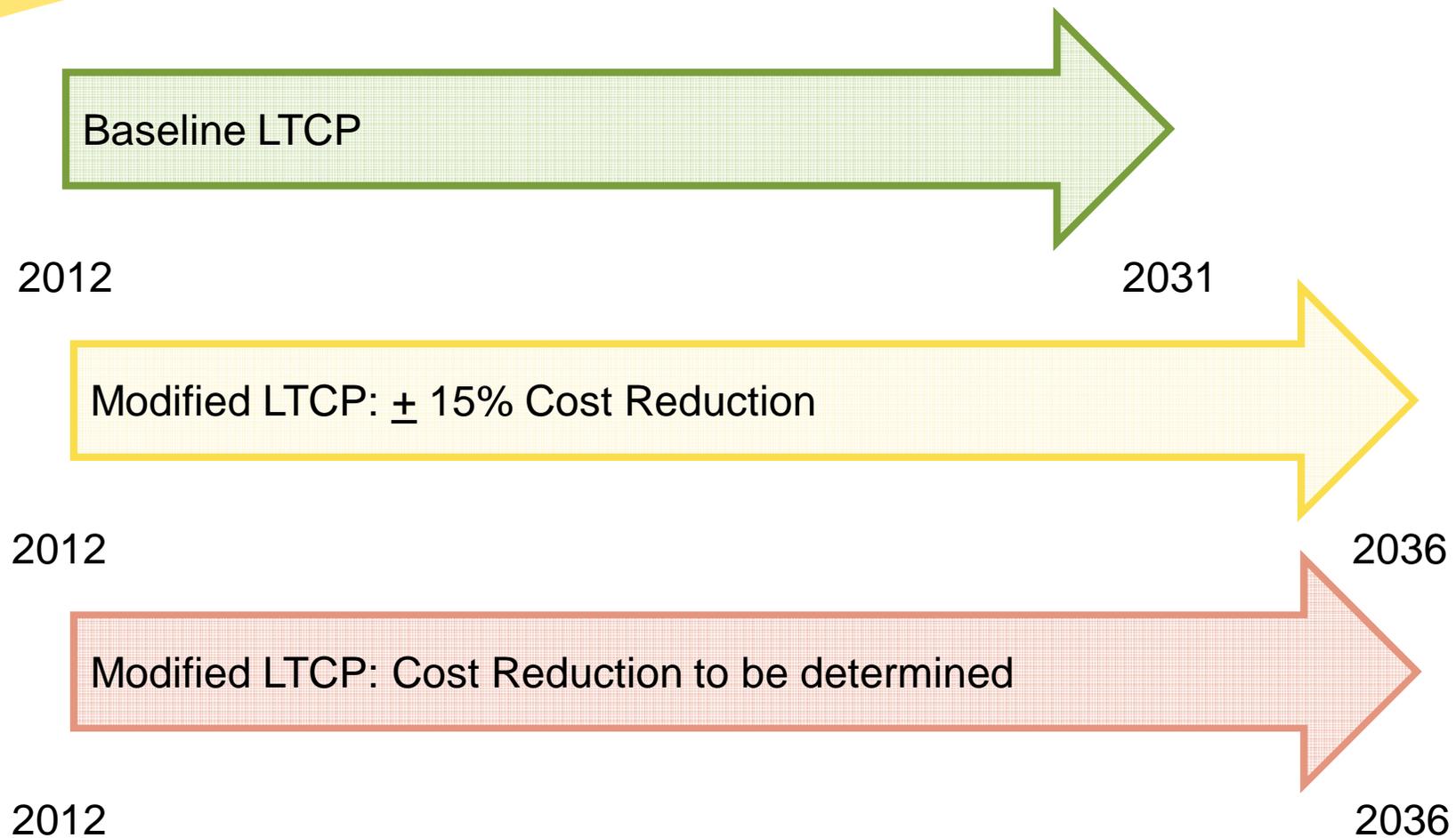
CSO LTCP Re-evaluation

Phase 1 Completion Plan

Phase 1 Completion Plan

- Sewer System Model Calibration
- High Level Assessment of Alternatives
- Coordination of Advisory Committee
- Update of Financial Capability and Integrated Planning Impacts
- Formulation of Regulatory Strategy

CSO LTCP Implementation Options



Phase 1 Completion Plan

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- High Level Assessment of Alternatives
- **Coordination of Advisory Committee**
- **Update of Financial Capability and Integrated Planning Impacts**
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