Blueprint Clintonville Integrated Solutions Project

Pilot Area Technical Committee (PATC) Approach and Interim Findings

One Water – Ohio WEA-AWWA 2014 Technical Conference & Expo

August 28, 2014

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BLUE PRINT COLUMBUS
Clean streams.
Strong neighborhoods.

What is Blueprint Columbus?

- Potentially a better approach addressing sanitary and stormwater
- Columbus' version of USEPA Integrated Planning Framework (June 2012)
- How?
  - Get the rain water out of the sanitary sewer
  - Get the rain water clean (green infrastructure)

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- Mandatory Lateral Lining and Sewer Main Lining
- Voluntary Sump Pump Program
- Mandatory and Select Roof Leader Redirection
- Green Infrastructure in Right-of-Way

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Blueprint Clintonville

- Very familiar to us & EPA
- Six sub-areas; six consultants
- 1000 Acres - 3000 homes
- Homes from 1920's to 1950's
- Ravines
- Engaged property owners
- Survey crews in field now
- How do we define goals?

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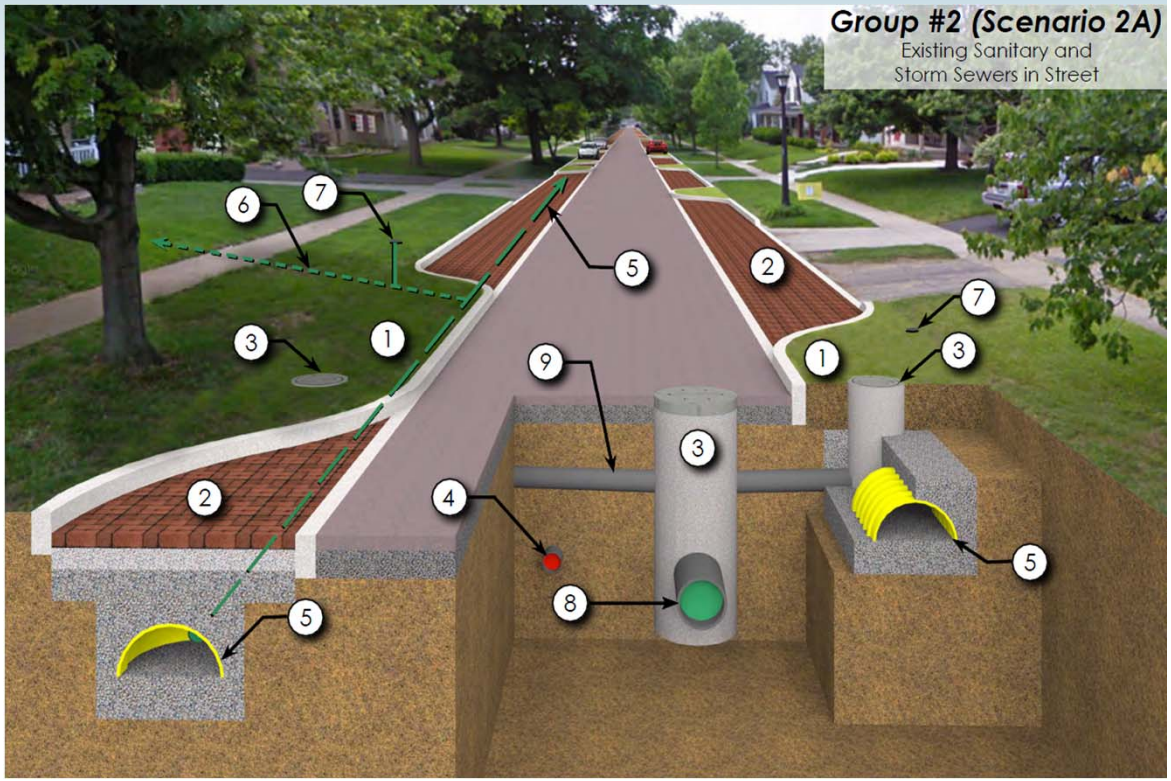
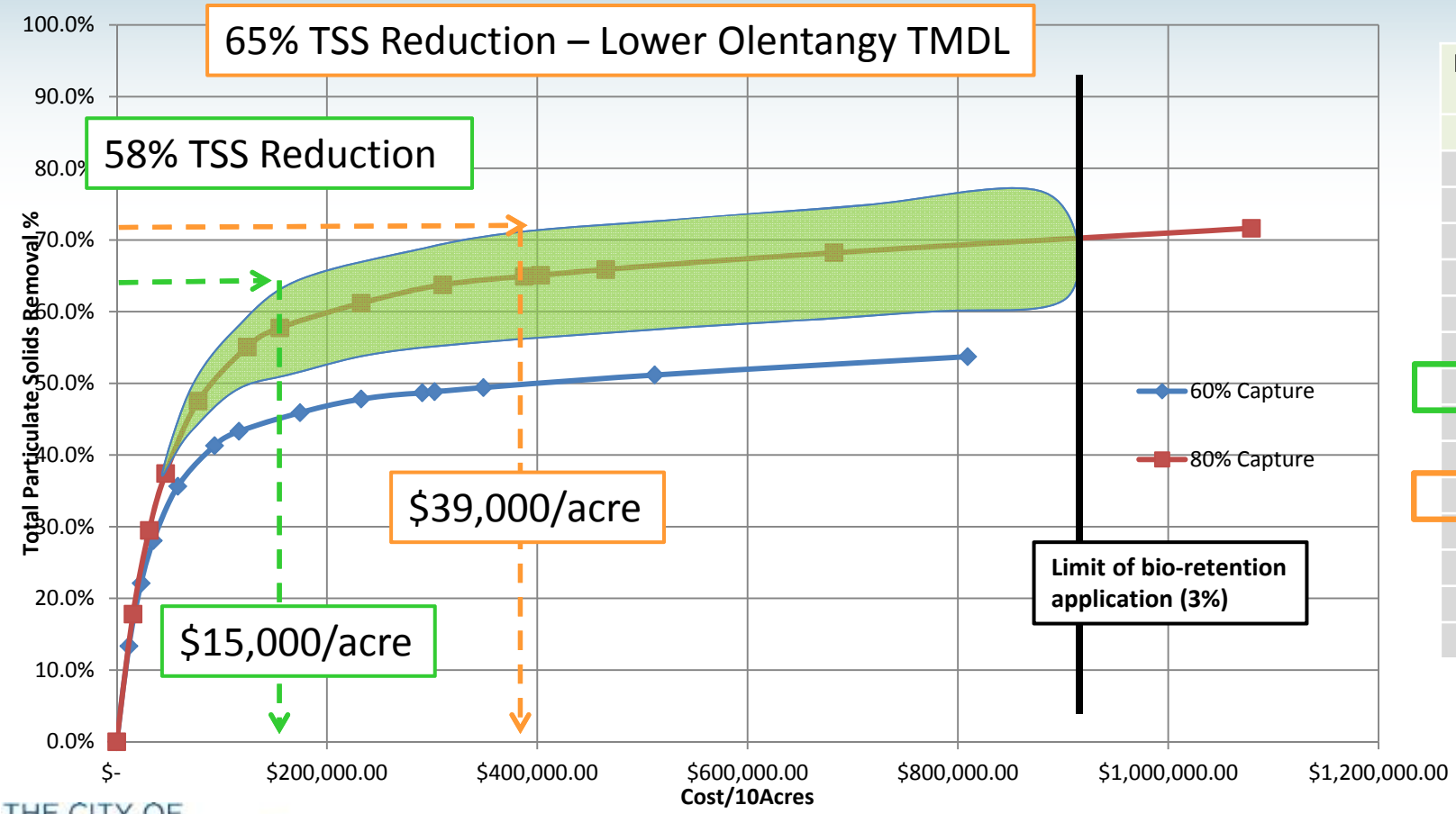
Identification of GI Level of Service

- Pilot Area Technical Committee (PATC) created by Steering Committee
- Three Levels of Service were identified:
  - LOS- Water Quality
  - LOS – Stormwater Quantity
  - LOS - Stream Degradation
- **Establish process of identifying target LOS's for use in future Blueprint areas**



LOS - Water Quality Determination

Performance Curve for Bio-retention
TSS Removal vs. Cost per 10 Acres
Medium Density Residential
0.01 Exfiltration Rate



Rainfall Depth (in)
0
0.05
0.1
0.15
0.25
0.4
0.5
0.75
1
1.25
1.3
1.5
2.2
3.5

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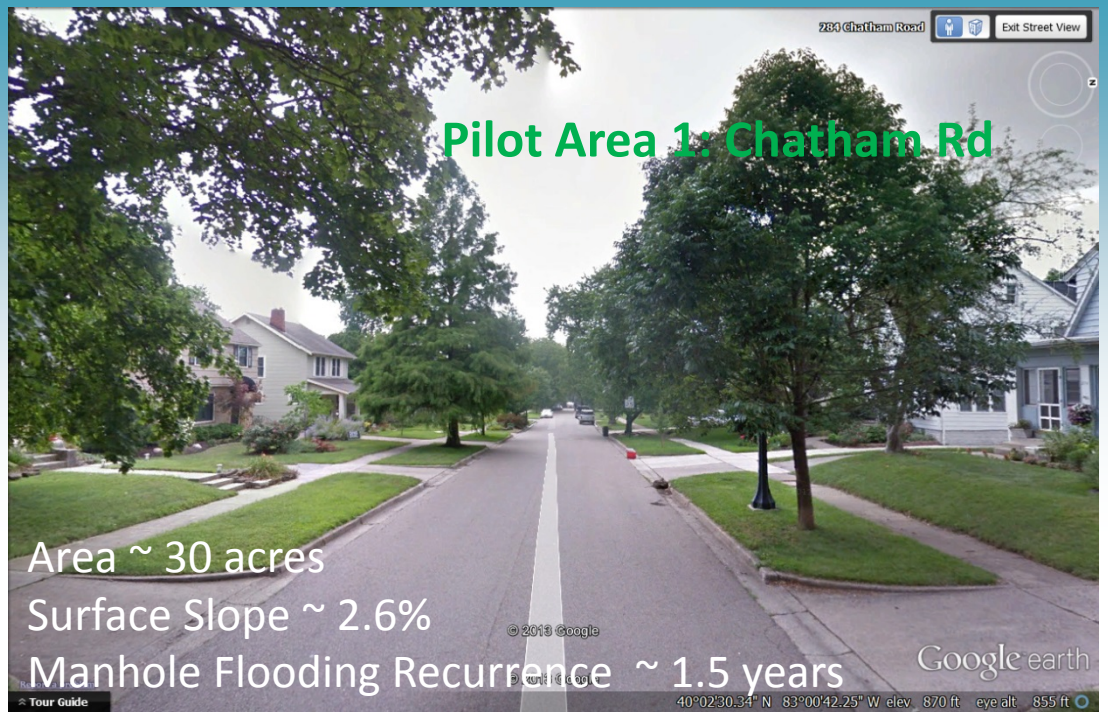
LOS – Stormwater Quantity Determination

- Lateral Lining and downspout/sump pumps decreases existing LOS
- Must maintain existing LOS
- Potential opportunity for improving LOS via additional green or gray?
- GI offers detention; gray transports downstream
- Evaluated two pilot areas in SWMM to establish modeling parameters
- GI needed to obtain 58% TSS removal still improves LOS Stormwater



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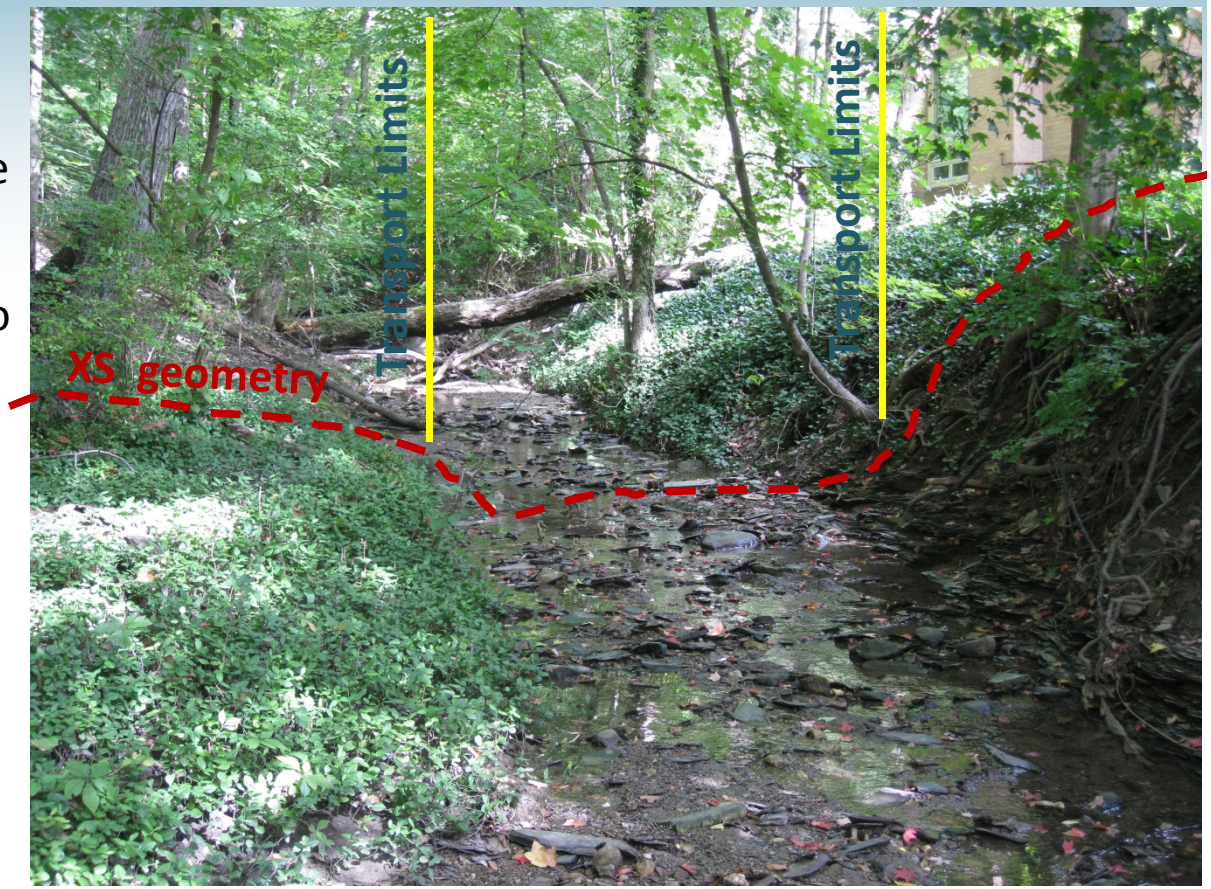
LOS - Stream Degradation Determination

- The I/I work results in increased runoff
- HECRAS model used to analyze stream
- Result: Design constraint set to not allow peak flow rate increase at storm outfalls



PATC Recommendations

- **GI can cost effectively improve water quality and flooding level of service for an approximate cost of $15k per acre of drainage area**
- Validated that a Knee of the Curve analysis can be used to establishing site specific target levels of service
- Water quality and flooding improvements can be optimized using iterative modeling process for combinations of green and gray alternatives
- Individual areas may have greater opportunities or constraints – one area may compensate for another to meet the target level of performance
- Process ensures consistency, but allows for flexibility and varying levels of service based on economic feasibility
- Generated Technical Memo to summarize findings and provide process map for use in future Blueprint areas
- Ultimately, Steering Committee to decide on LOS

Design Constraints

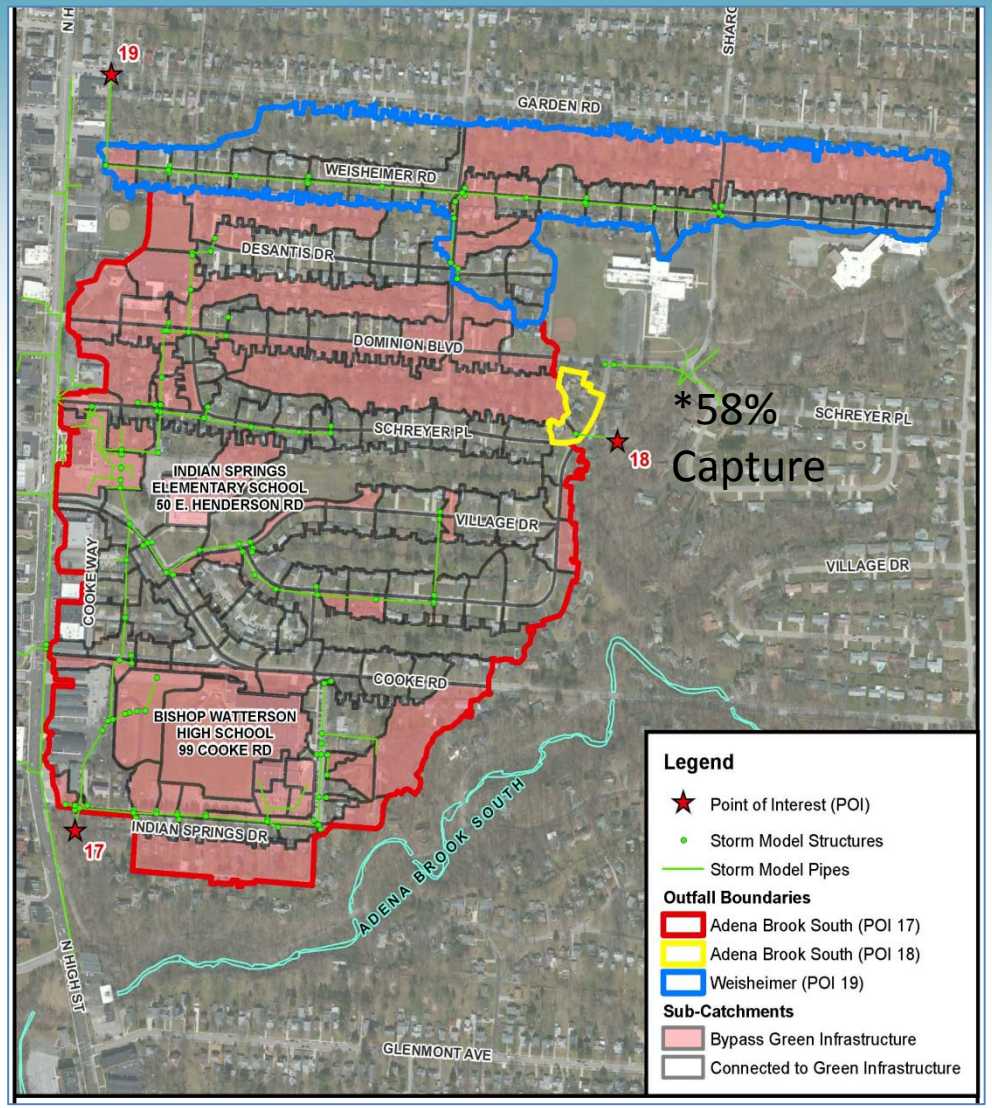
- Infiltration rates (or lack thereof) for native soils
- Underdrains are required
- 24-40 hour detention time
- 3:1 side slopes for rain gardens
- 5:1 impervious to pervious for porous pavements
- Siting and Design Guidelines
  - 22 ft curb to curb
  - Parking spaces
  - Distances from intersections
  - Trees
- SWDM compliance for disturbed area
- Coordination with other utilites
- And many others

Model Construction

- Received SWMM model from SSCM modeling consultant
- Received stormwater drainage boundary delineations from FCSWCD
- Each consultant further refined delineations
  - Reduced size of catchments to ~300 ft for scenario comparison
  - Incorporated topographic and field survey data
- Reconciled overlap of project areas
- Three scenarios:
  - Existing, - 50% of roof to street
  - Baseline, - 100% of roof to street
  - Proposed – GI to address additional water
- 0.06 in/hr infiltration rate for native soils
- Modeled gutters as channels and inlets as orifices
- Used 19 years of continuous rainfall data
- GI modeled as storage units
- Represented land cover and land use in high detail

Alternative development

- Each consultant approached this differently
  - Some used sector based approach, others area wide
- Varying amounts of existing stormwater infrastructure
- Some areas had large amounts of ravine
- Gray Infrastructure only where necessary
- Main tools were Rain Gardens and Pervious Pavers
- Some areas had opportunities for regional GI facilities (most cost effective)



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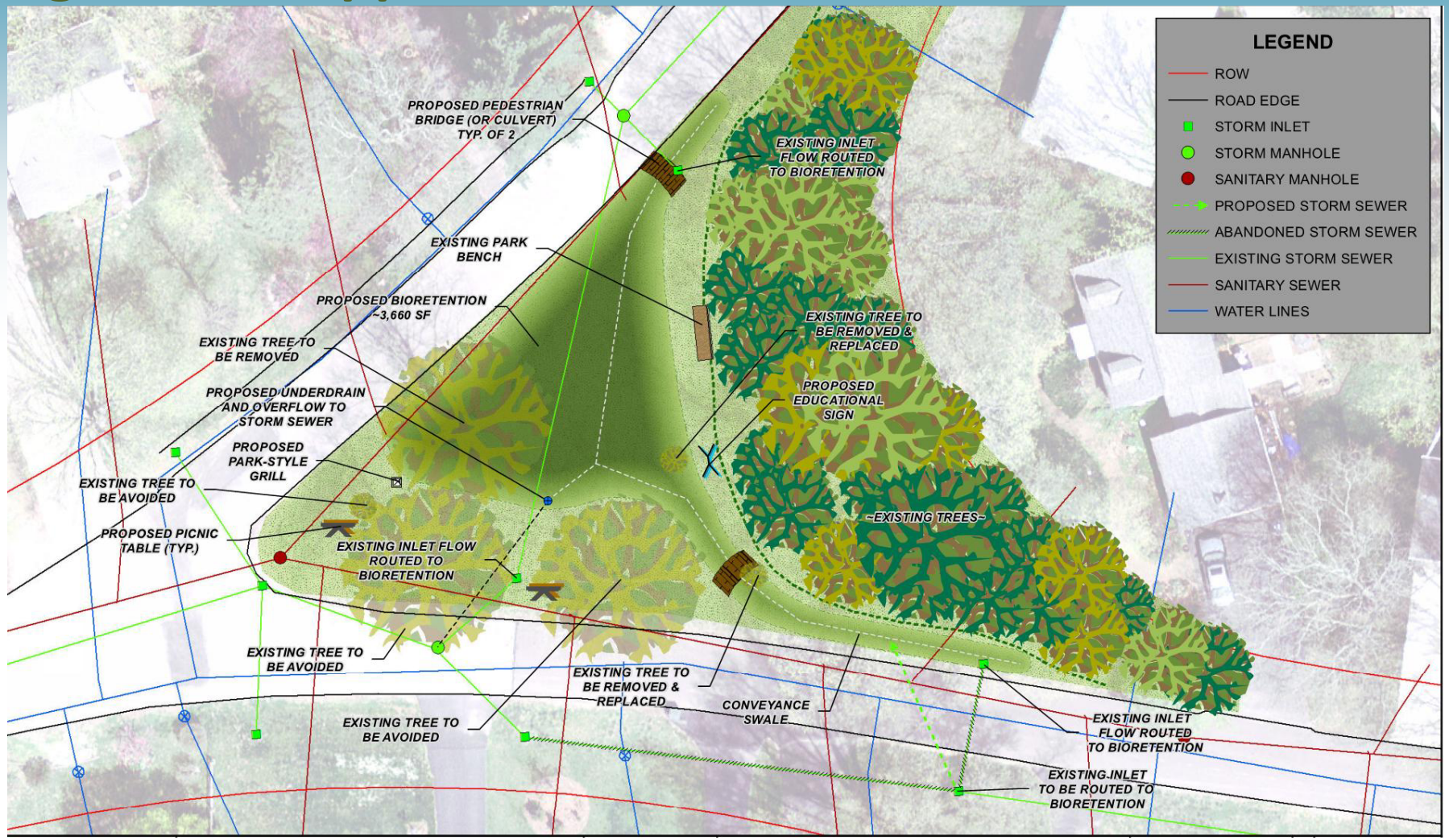
Regional GI Opportunities



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Rain Gardens

Layout focused on getting sidewalks on one side of the street and connecting to existing sidewalks/crosswalks (promoting pedestrian access to the local schools)

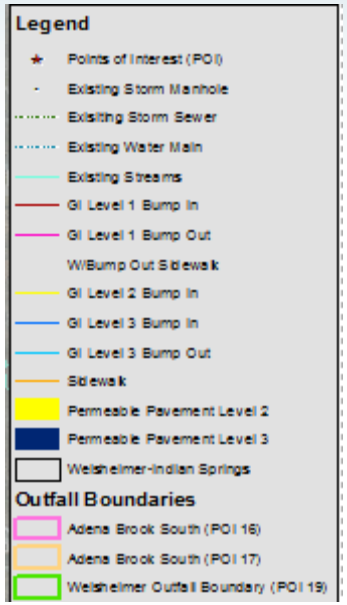
Bump Outs

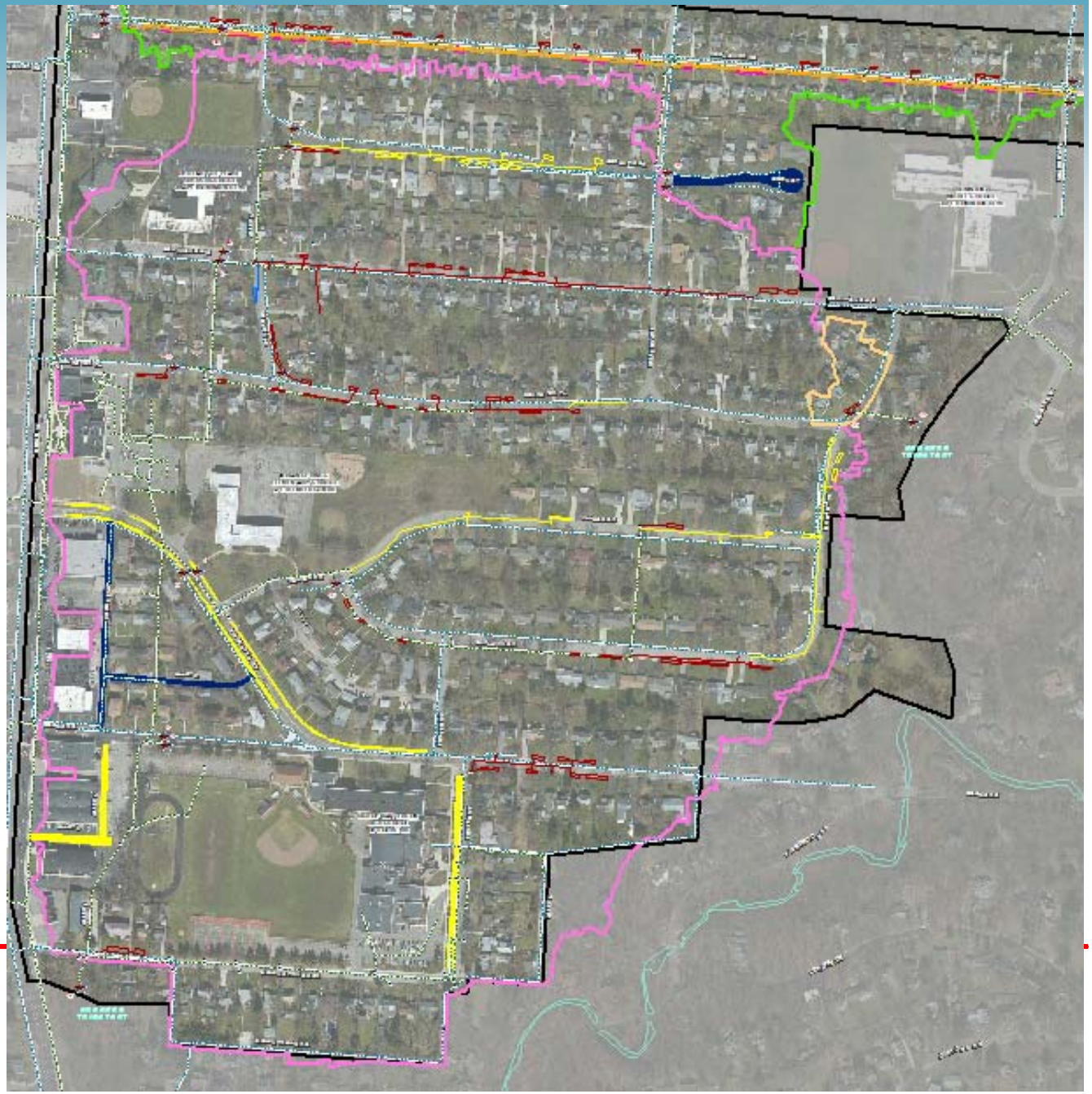
Pervious Pavement

Alternative evaluation

- Three tiered approach to alternative screening:
  - Spreadsheet → 1 year model run → 19 year model run validation
- 30 Year Lifecycle analysis
- Unit Prices – uniform capital and OM costs were provided to all
- TBL – social and environmental

Example Alternative





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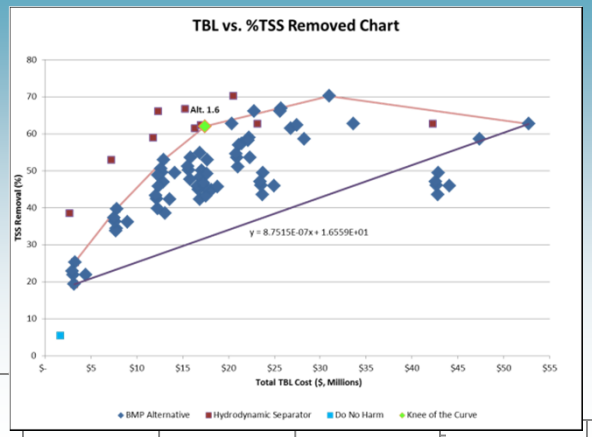
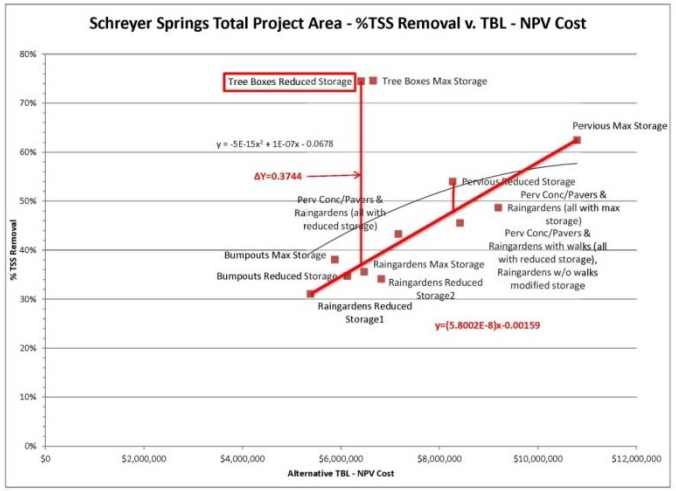
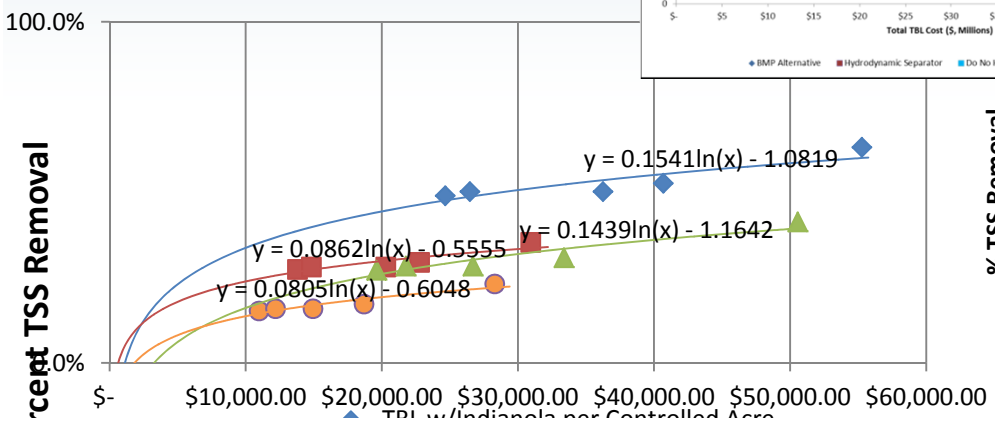
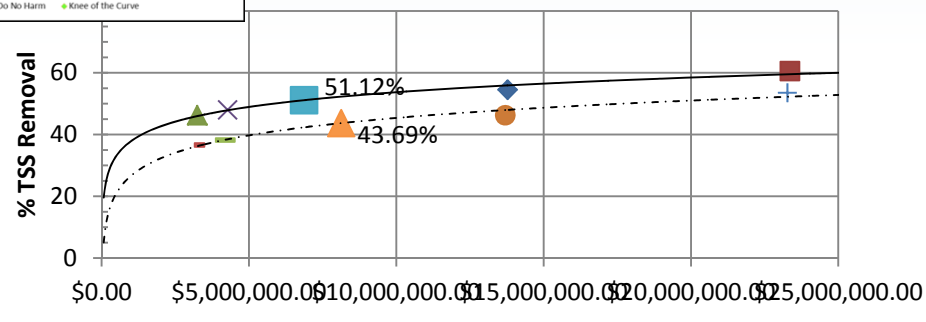
Alternative selection

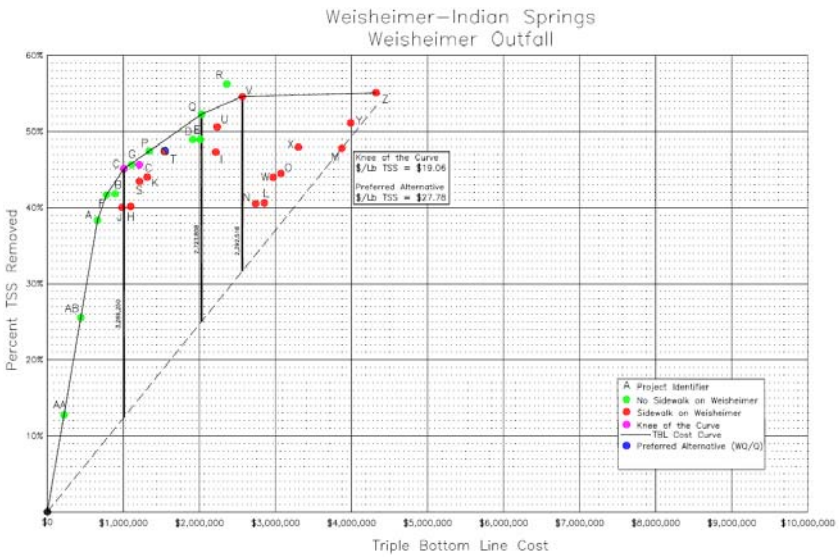
- Many consultants, many styles and approaches

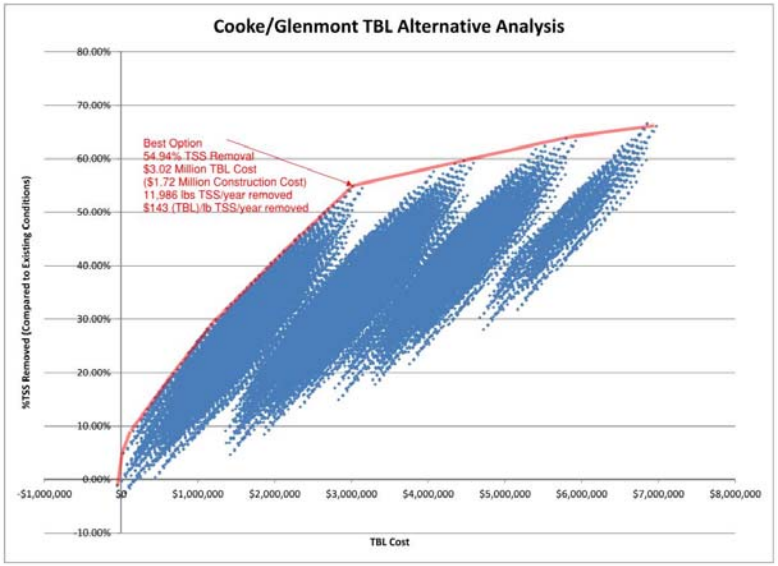






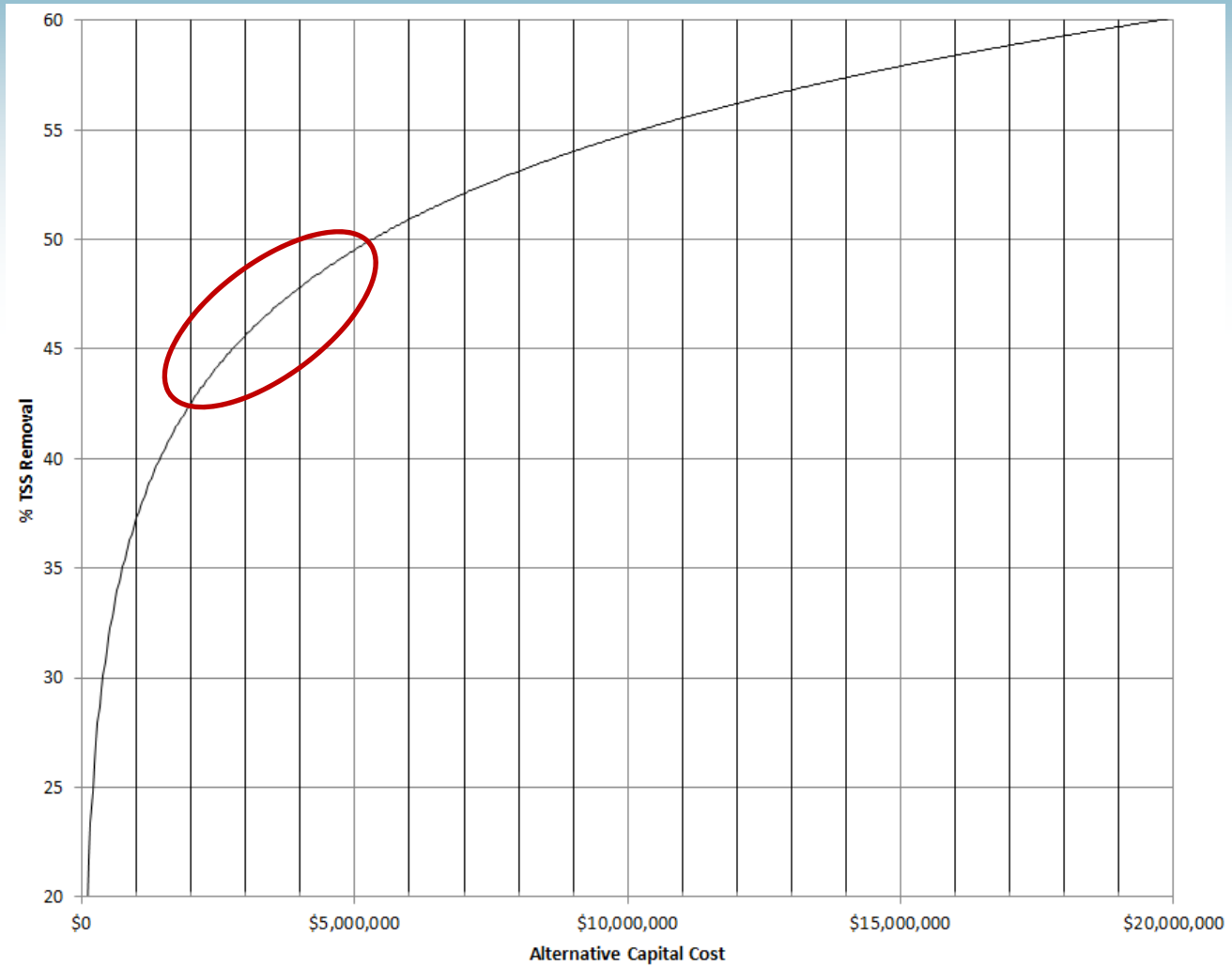






Knee of the Curve

- Visual – can perform on any curve, highly subjective, influenced by scale
- $3M Range!



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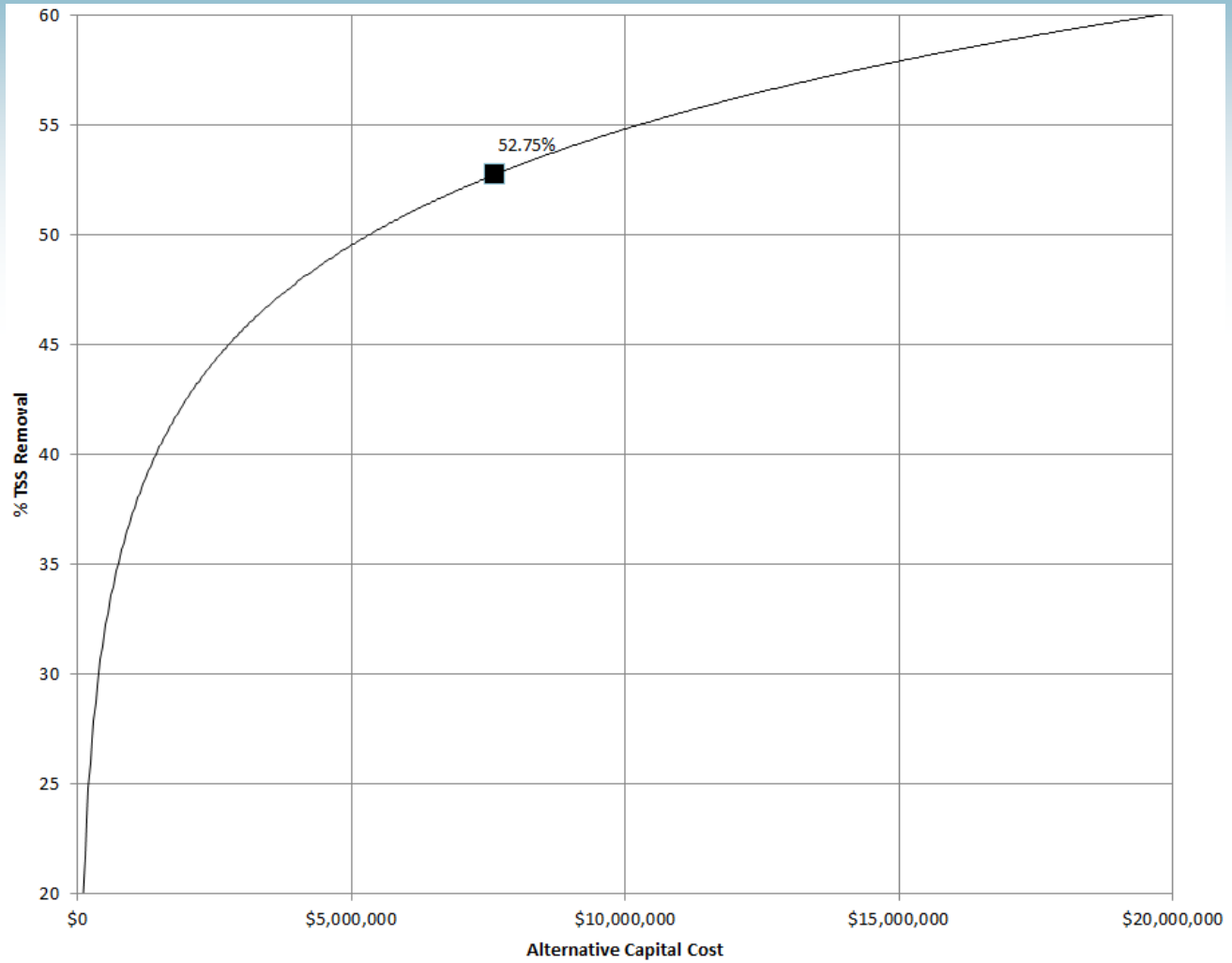
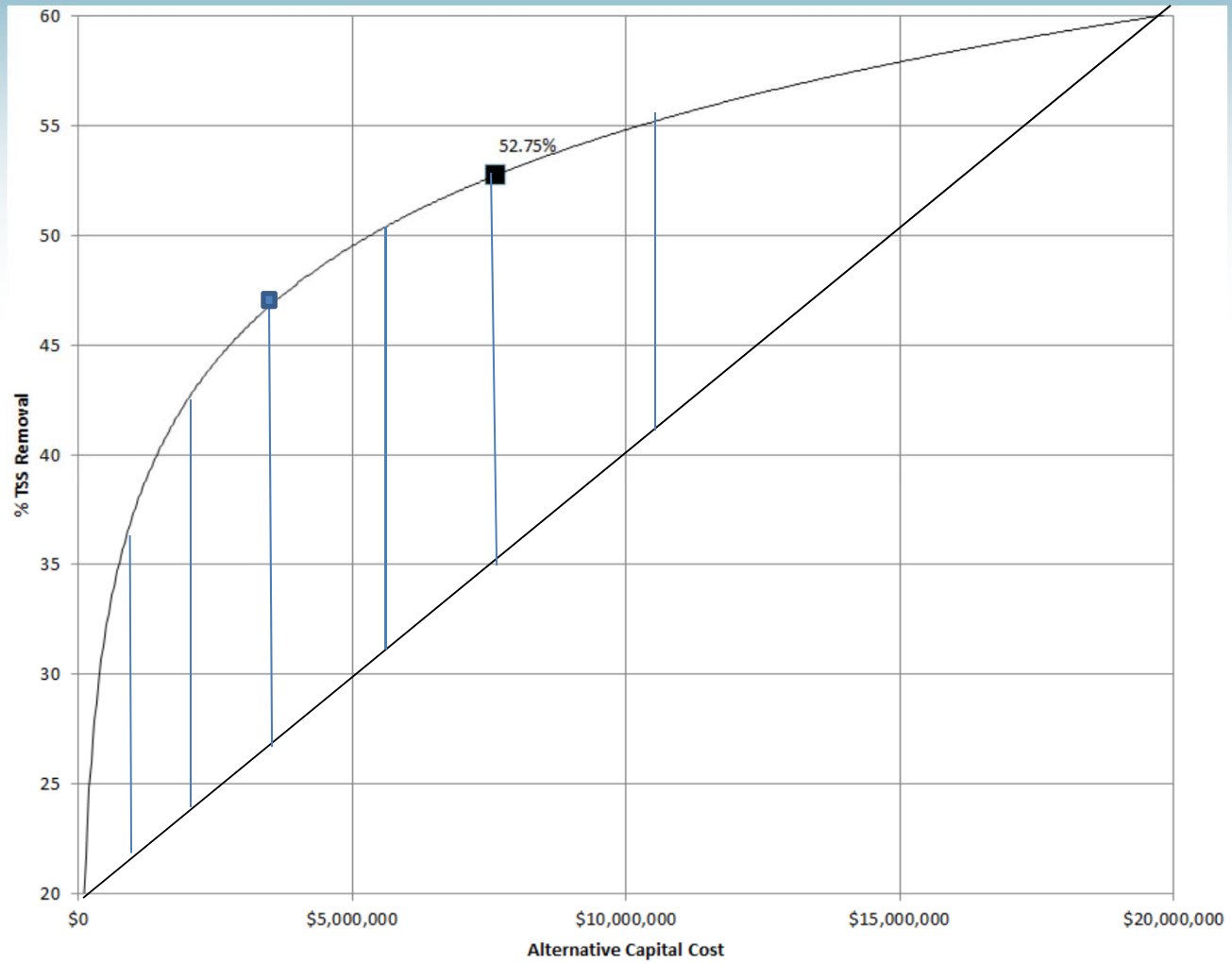
Knee of the Curve

- 1:1 slope – Objective, requires logarithmic best fit curve, tends to be high



Knee of the Curve

- "Kneedle" – Objective, works on any curve, requires broad spectrum of data points



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DRAFT Alternative Results

Area	Acres	Recommended Alternative Construction Cost	Cost per Acre	%TSS Removal	Lbs. TSS Removed per Year	Construction $/LB	Lbs Removed per Year per Acre
Overbrook Chatham	149	$2,009,140.00	$13,479.64	27	8681	$231.45	58.2
Blenheim Glencoe	244	$3,954,143.14	$16,225.45	48	30701	$128.80	126.0
Weisheimer Indian Springs	177	$7,087,686.69	$40,043.43	34	16254	$436.06	91.8
Cooke Glenmont	137	$1,722,902.00	$12,571.34	55	12714	$135.51	92.8
Morse Dominion	165	$9,645,337.00	$58,421.18	62	28384	$339.82	171.9
Schreier Springs	111	$7,487,966.00	$67,222.96	43	8759	$854.90	78.6
Average	164	$5,317,862.47	**$34,660.67**	**44.9**	17582.1	$354.42	103.2
Total	983	**$31,907,174.83**	NA	NA	**105492.4**	NA	619.4

Lessons Learned (so far)

- Costs are higher than anticipated and TSS removal is lower than anticipated
  - 58% at $15k/acre vs 45% at $34k/acre
- Made many conservative assumptions
  - % stormwater capture lower than anticipated
  - % roof area to street
    - Increase “Existing”, decrease “Baseline”
  - Rain garden side slope
  - Rain garden retention time
  - Tree drip lines
- Revisit Siting and Design Guidelines

Looking Forward

- Re-evaluate design constraints which may result in revised alternative analysis
- Refine unit price assumptions
- Compare alternatives based on effectiveness
- Present revised alternatives to the public
- Apply to Future Blueprint areas
  - Approximately 1000 acres per year
    - Linden
    - Miller/Kelton and Early Ditch
    - West Fifth
    - Livingston/James