Low Impact Development Case Studies

FSA Winter Pre-Conference

December 4, 2019

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Low Impact Development

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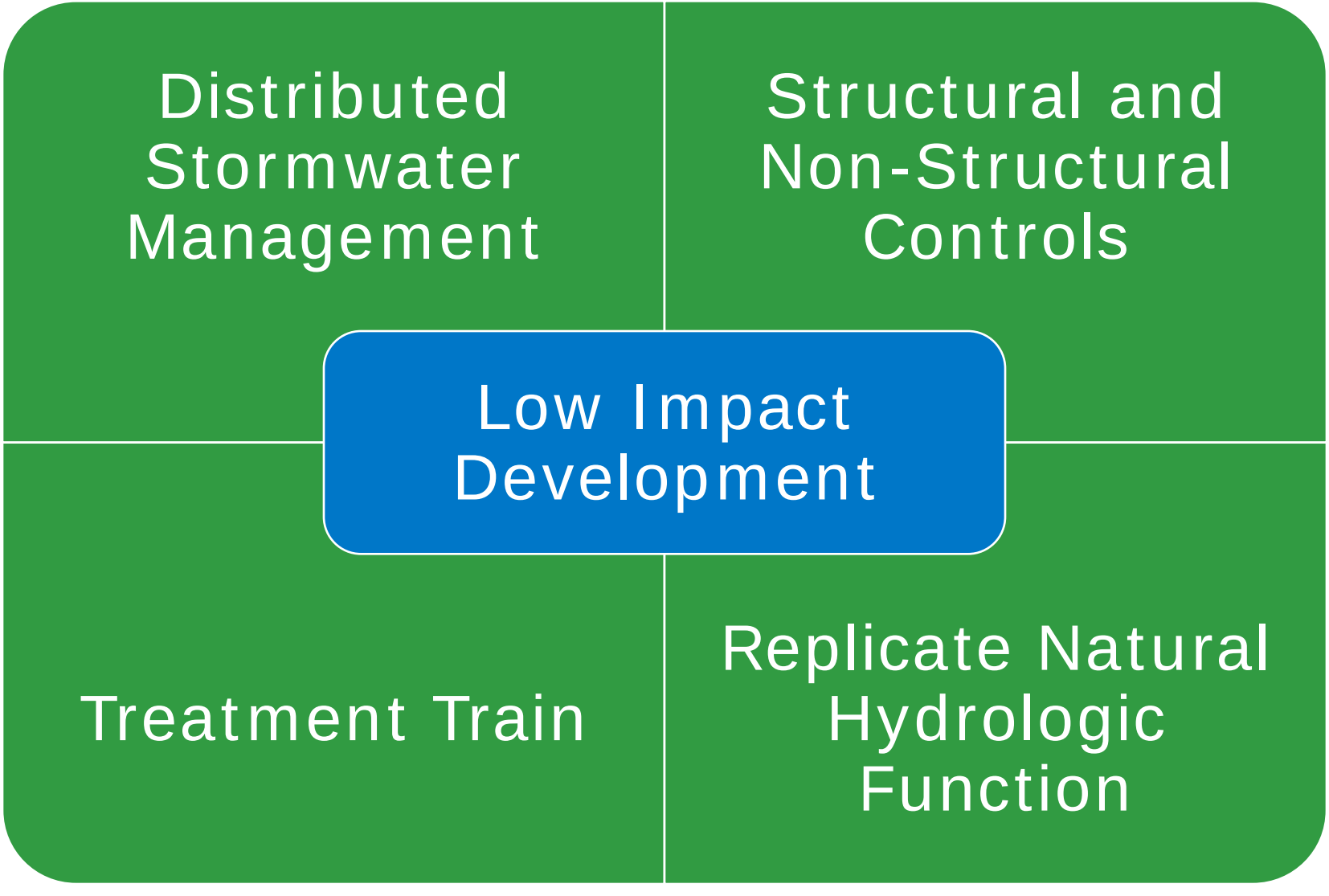

Low Impact Development

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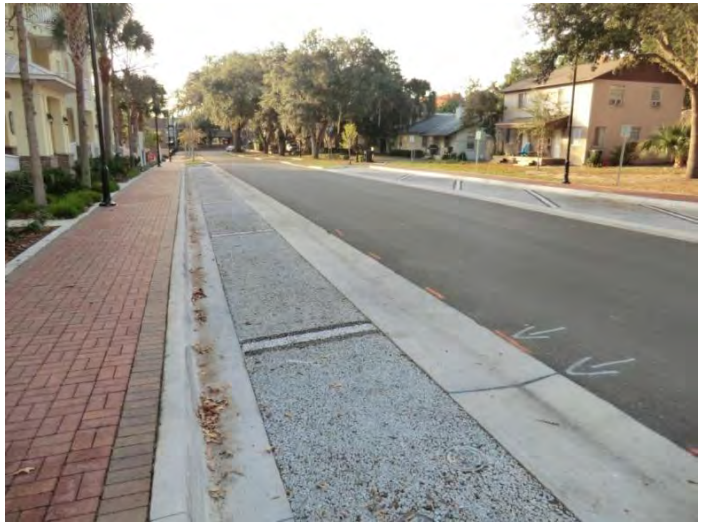

Minimize Soil Compaction

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Predevelopment Infiltration Testing

Limited Site Clearing

Minimize Soil Compaction

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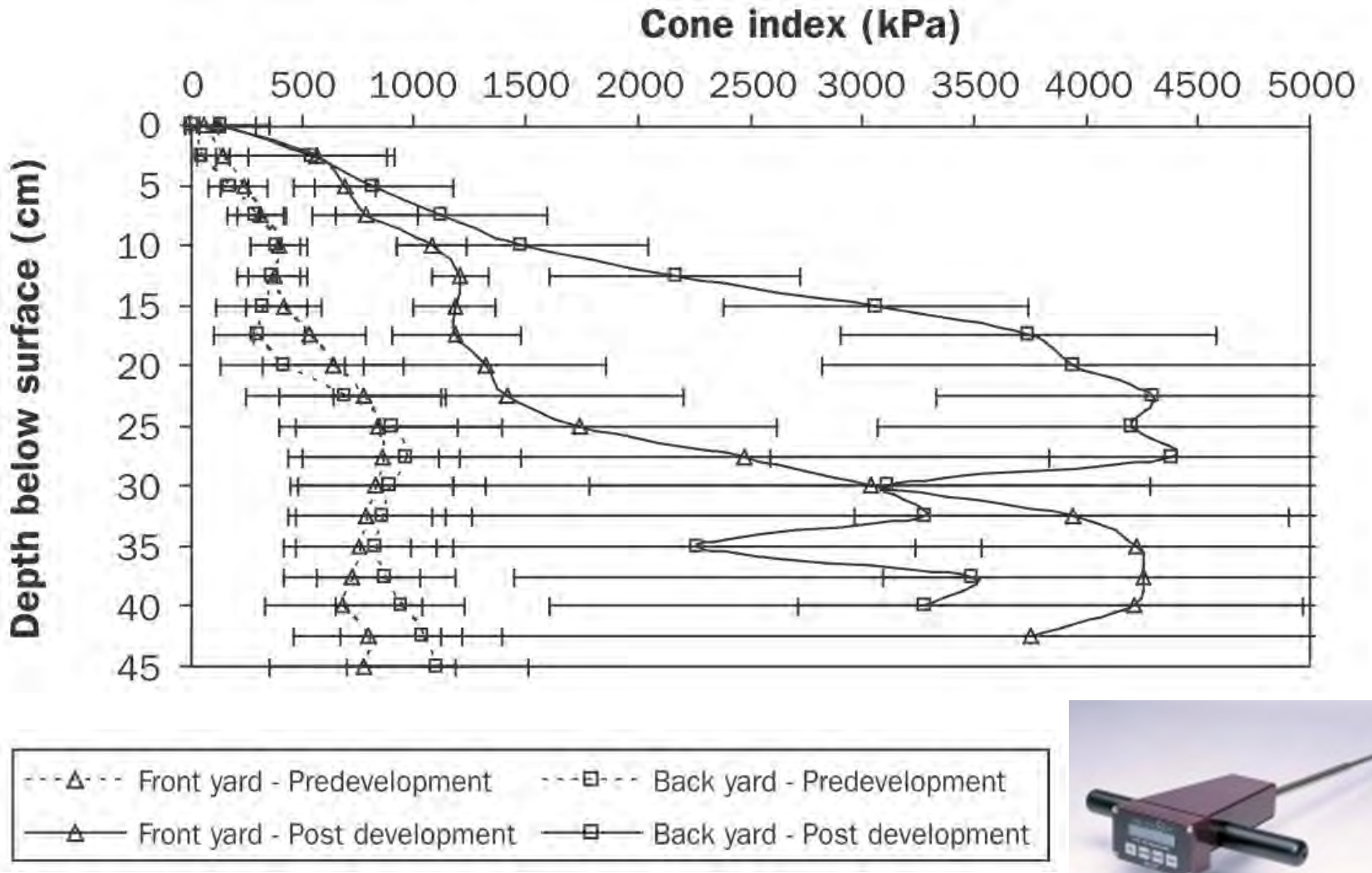

Minimize Soil Compaction

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	Infiltration Rate (Inches/Hour)	
	Pre-Development	Post-Development
Front Yard	33.0	6.9
Back Yard	23.2	0.3

Compaction results ~ 80-90% reduction in infiltration rate

Conveyance Swales

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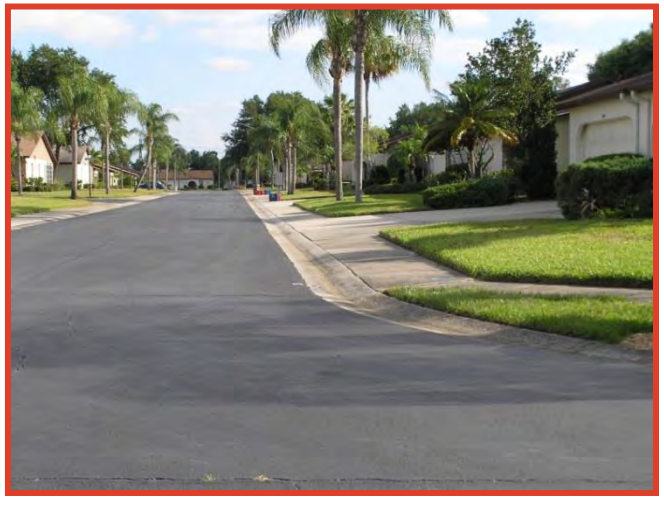
Sarasota County

JonesEdmunds

ATKINS

Southwest Florida Water Management District

- Not traditional LID
- Promote distributed infiltration
- Disconnect Impervious Areas



Versus

Conveyance Swales

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Results

- Concentration reductions
- Volume reductions
- Pollutant loads - reduced by **both** mechanisms

Conveyance Swales

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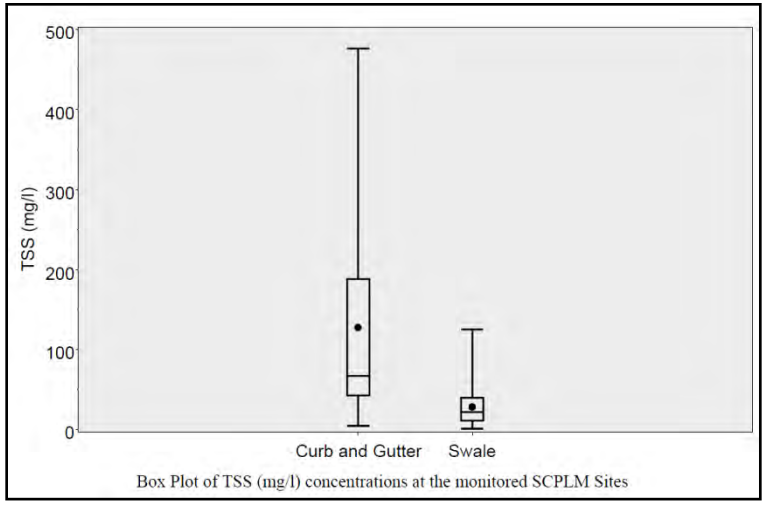
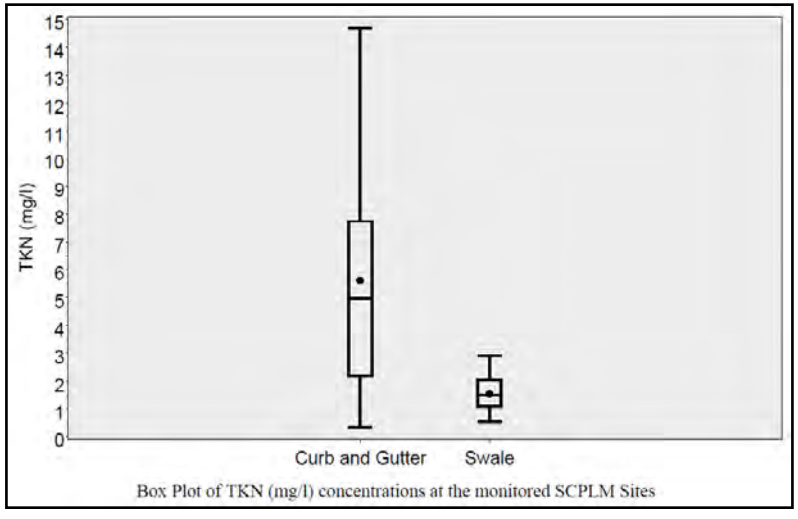
- TSS - 78% lower
- TN - 68% Lower
- TP - 20% Lower



Box Plot of TSS (mg/l) concentrations at the monitored SCPLM Sites



Box Plot of TKN (mg/l) concentrations at the monitored SCPLM Sites

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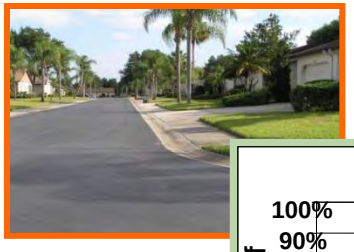
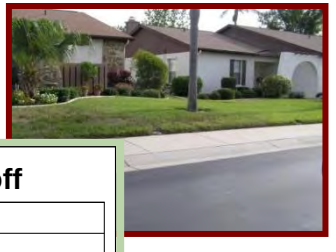
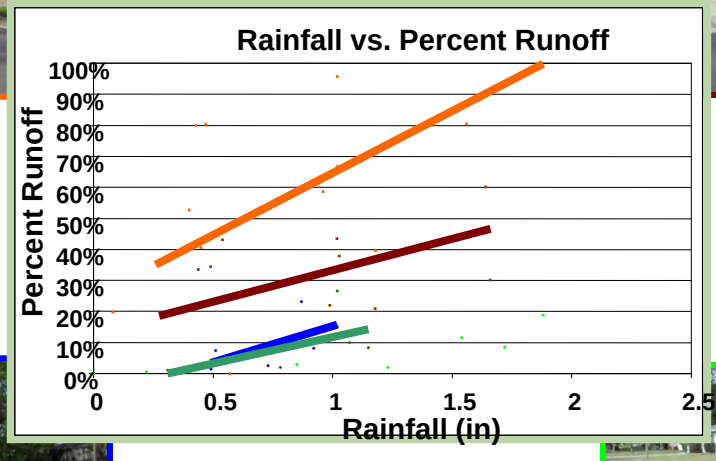
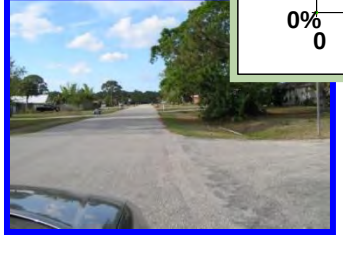
Runoff

- Runoff coefficients - 58% lower
- 3x as much rain without runoff
- Annual runoff volume - 5 times lower









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Results

- Observed 93% lower TSS load
- Observed 82% lower TP load
- Observed 95% lower TN load

Conveyance Swales

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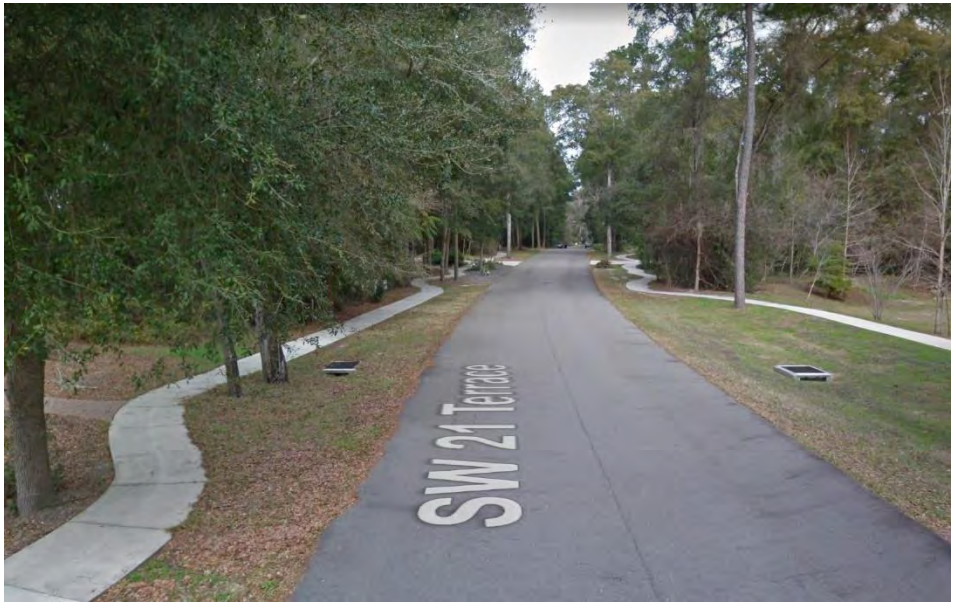
- Included in Duval County LID Manual
- Developed Mechanism for Permitting or Credit



Conveyance Swales

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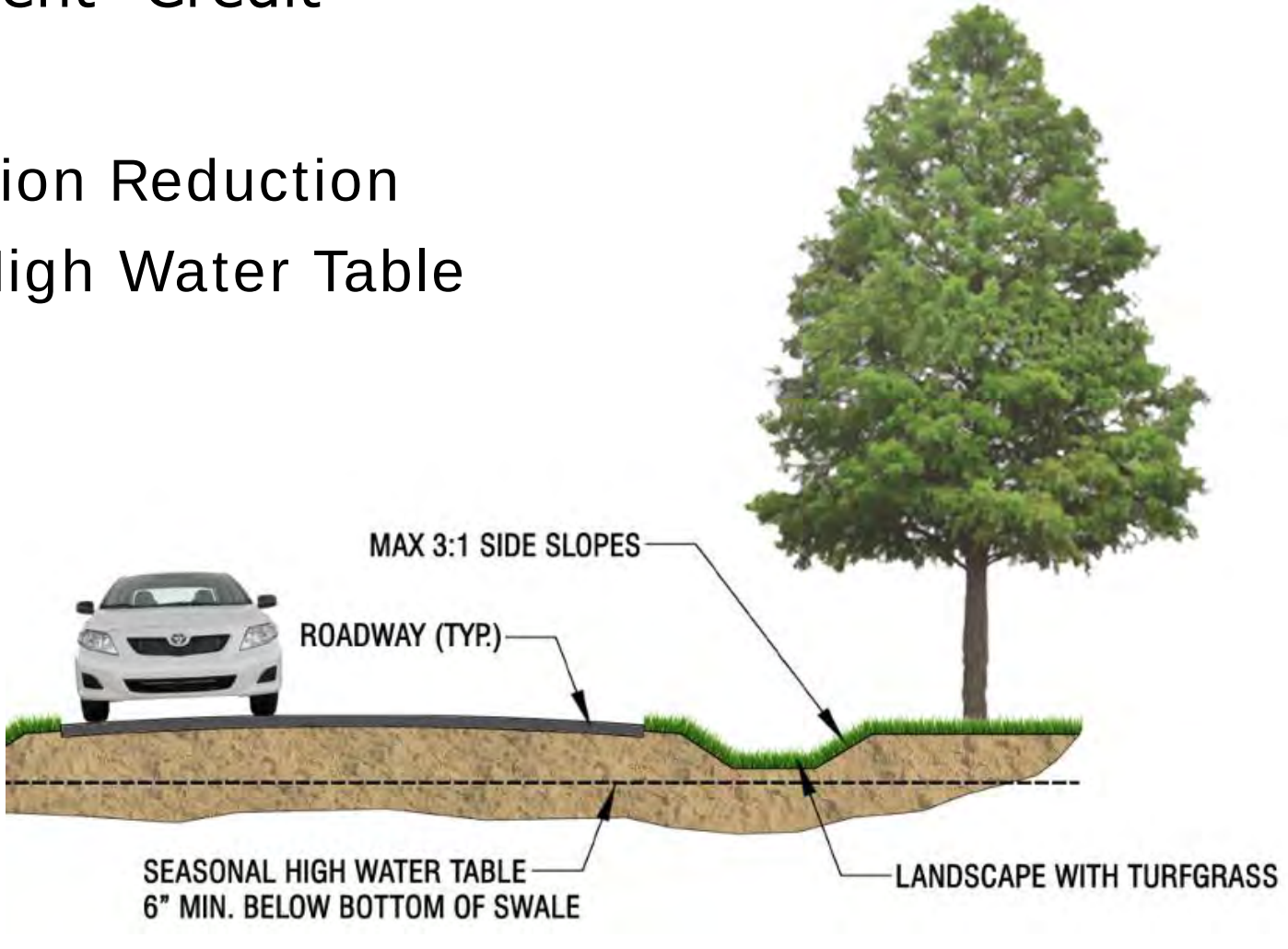
- Partial Treatment "Credit"
- Account for:
  - Concentration Reduction
  - Seasonal High Water Table



Conveyance Swales

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- Duval County SHWT Reduction Factors (SHWT 6 inches – 24 inches below surface)

Design Soil Infiltration Rate	Average Annual Performance Reduction
< 1 inch/hour	95%
1 to 5 inches/hour	75%
> 5 inches / hour	60%

- Duval County Average Annual Concentration Reduction in Swales

Pollutant	Average Annual Concentration Reduction
TN	30%*
TP	16%*
TSS	78%*

Bioretention

Example of "traditional" LID

Community facing large load reduction goals

LID Retrofit opportunity

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Existing Conditions

- Direct discharge to Indian River Lagoon
- Erosion problems
- Limited space within ROW
- High infiltration rates

Bioretention

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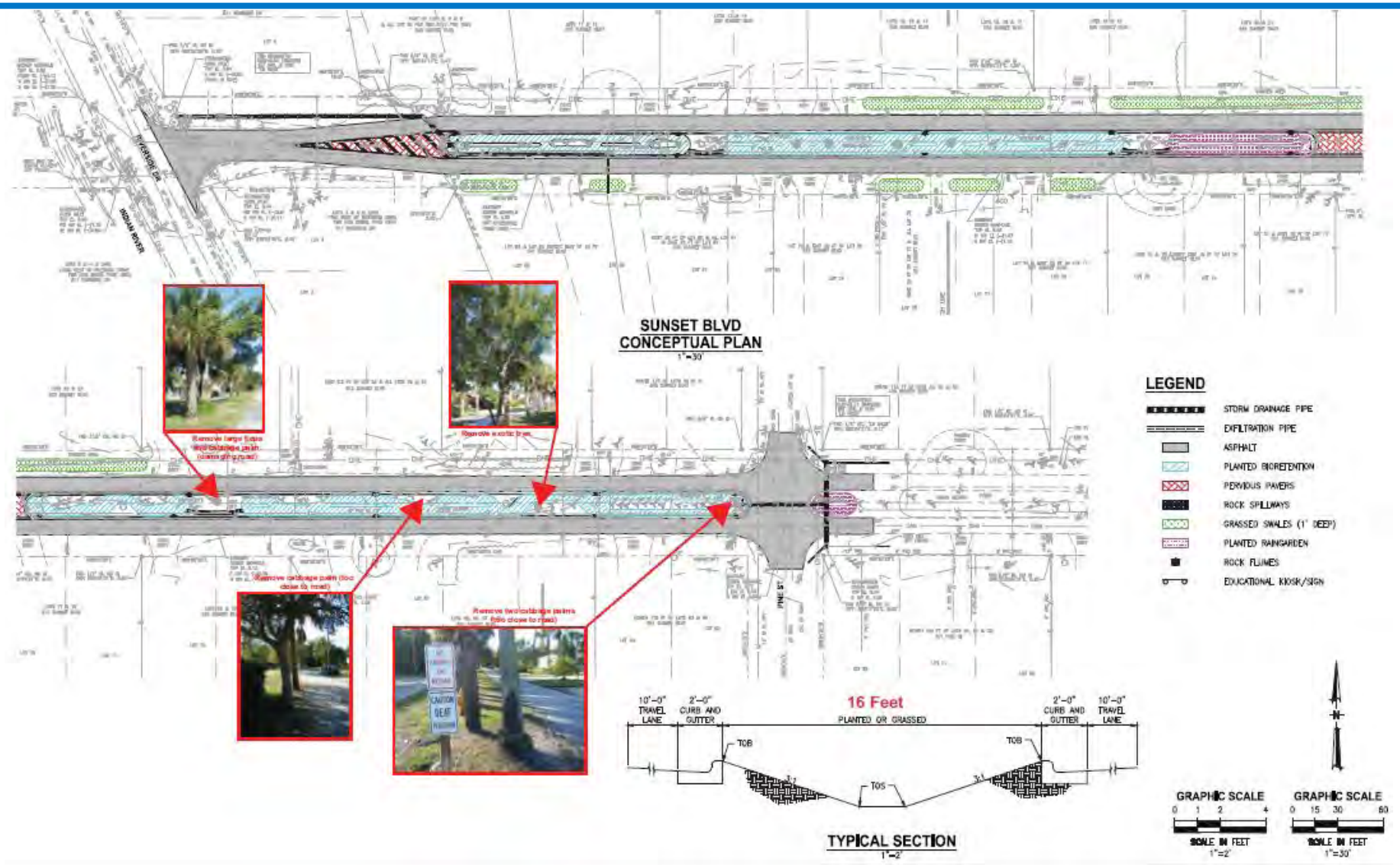

Bioretention

60% more volume than edge swales

Solution

- Offline Bioretention
- Median Swale/Inverted Median

Bioretention

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Solution

- Offline Bioretention
- Median Swale/Inverted Median

Bioretention

Solution

- Offline Bioretention
- Median Swale/Inverted Median

Bioretention

Performance

- 8” Rainfall
- Visual monitoring
- No observed runoff
- Recovered over night

Shallow Bioretention

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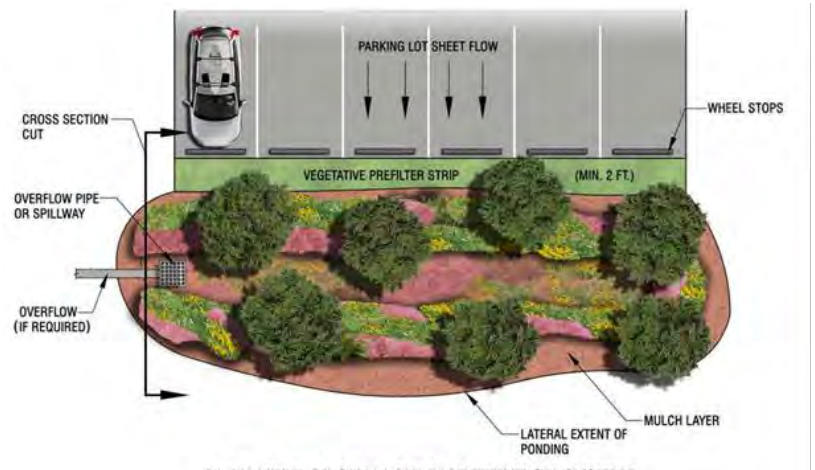
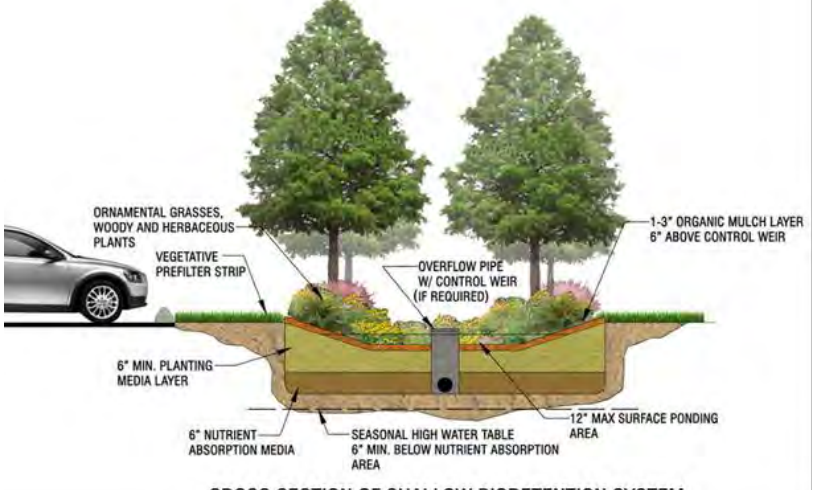
- Retention Credit
- Vegetated Retention System
  - Inverted Medians
  - Bio Swales



PLAN VIEW OF SHALLOW BIORETENTION SYSTEM



CROSS SECTION OF SHALLOW BIORETENTION SYSTEM

Shallow Bioretention

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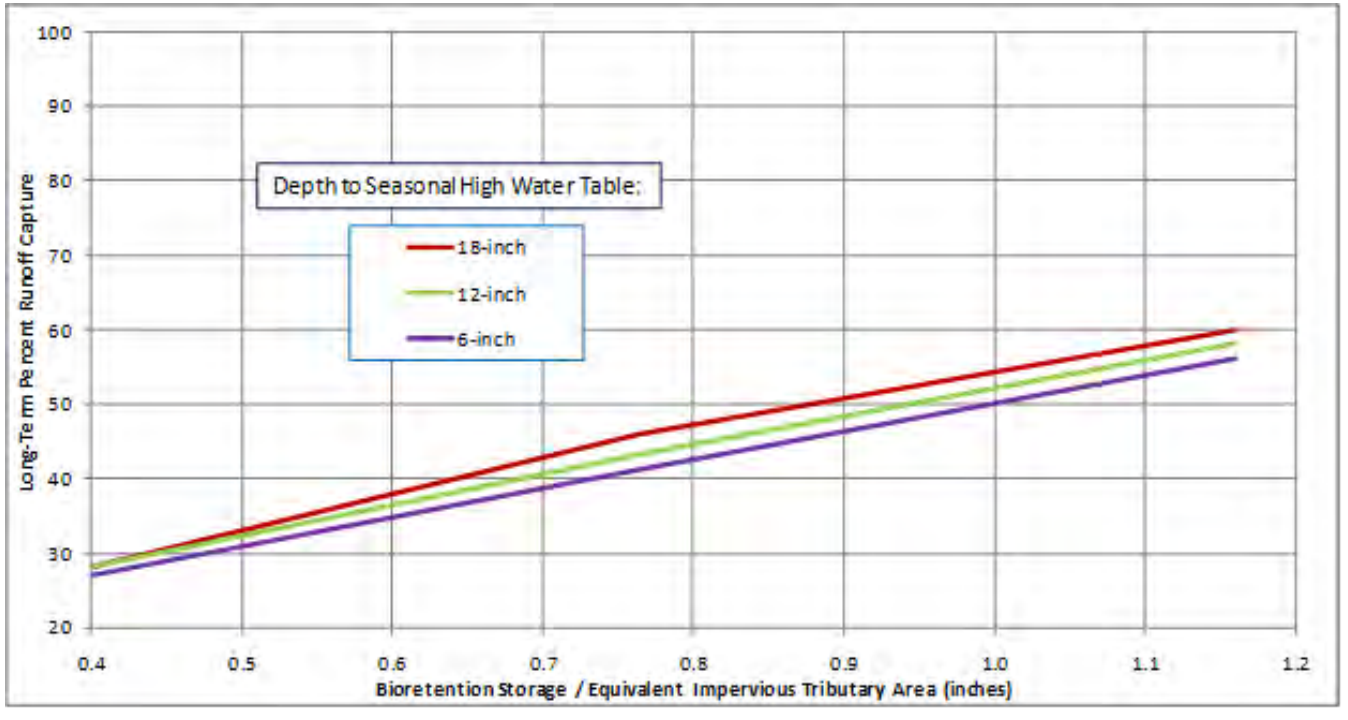
- Retention Credit
- Vegetated Retention System
  - Inverted Medians
  - Bio Swales
- Design Aid accounts for Seasonal High Water Table

Average Annual Runoff Capture Efficiency for a Bioretention System in City of Jacksonville



Alachua County Water Quality Code – LID Case Studies

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- Reviewed 10 recently permitted projects

Alachua County Water Quality Code – LID Case Studies

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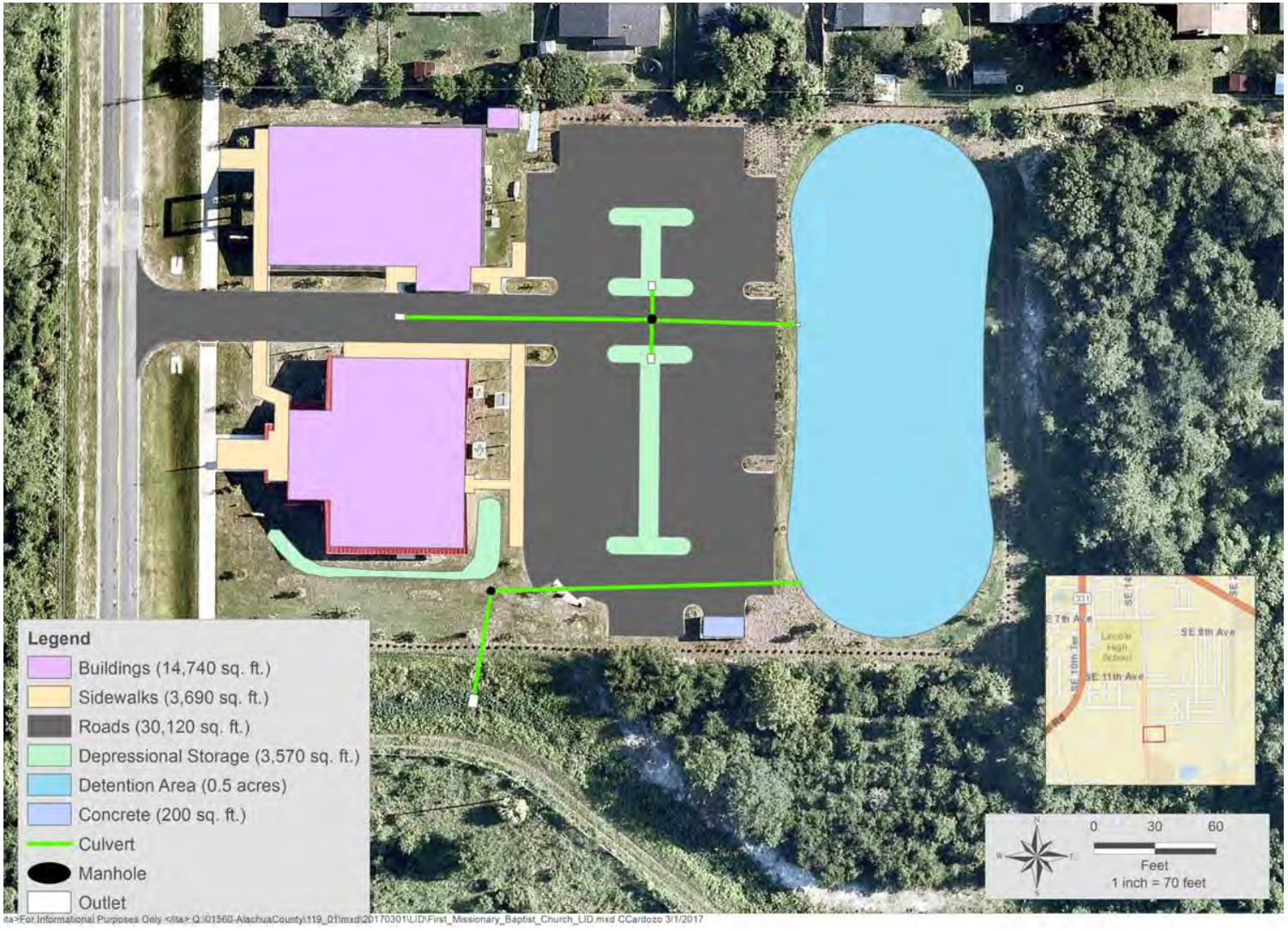
- Reviewed 10 recently permitted projects
- Redesigned stormwater system to meet new code



Alachua County Water Quality Code – LID Case Studies

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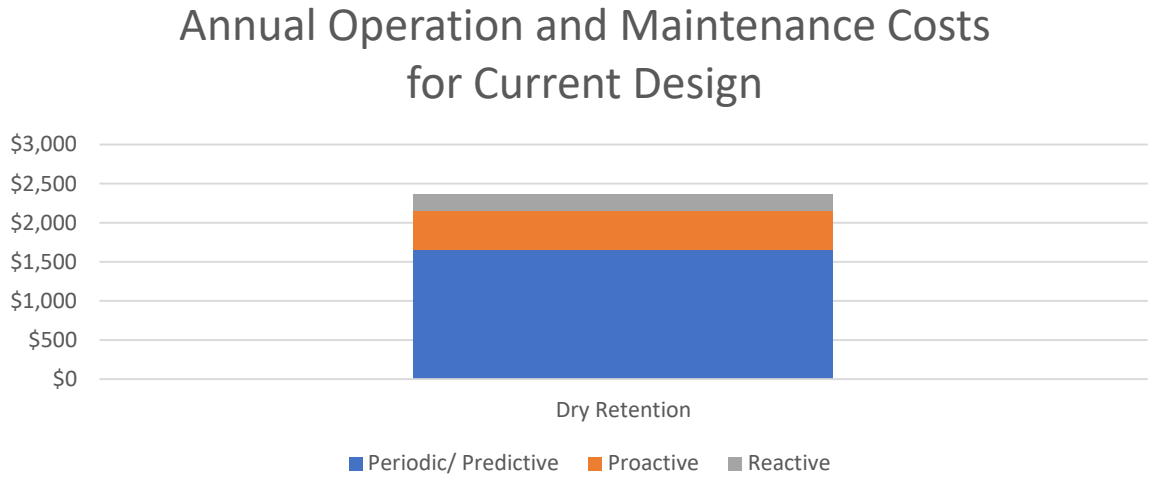
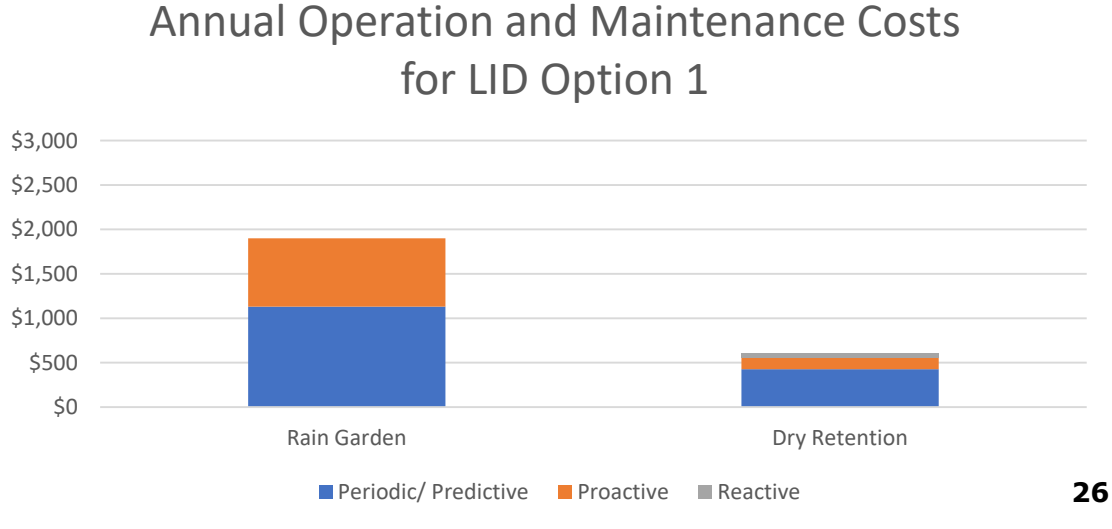
- Estimated Costs
  - Construction
  - Maintenance
- Compared Treatment Efficiencies





Alachua County Water Quality Code – LID Case Studies

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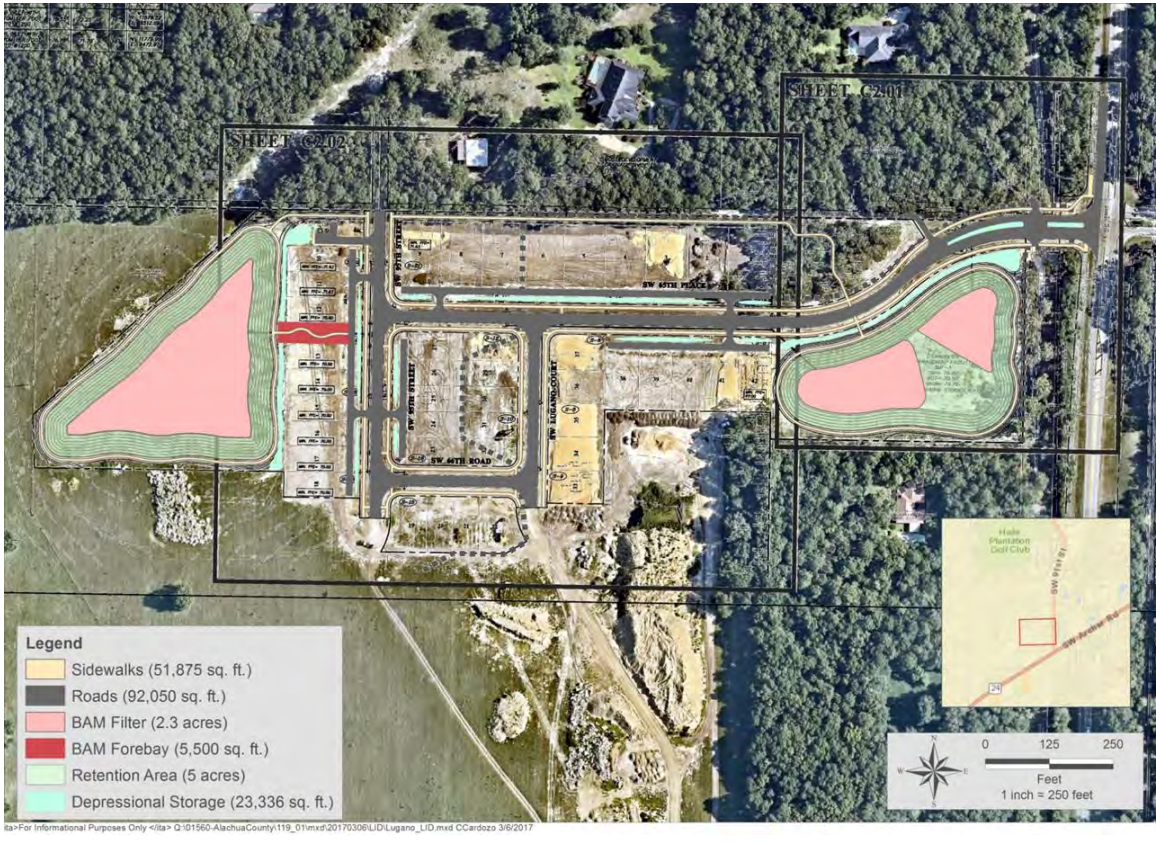
Results (Average)

- TN Removal Improved ~ 20%
- TP Removal Improved ~ 14%
- Construction Costs Increased ~ 12%
- Annual Maintenance Costs Increased ~ 34%



QUESTIONS?

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