Towne Centre Case Study

Applying the Runoff Reduction Methodology Enables Credible Cost Comparative Analysis and Incentives for Innovative Implementation of BMPs

Impediments to Innovative Stormwater Solutions:

We know BMP practices are good . . . but:

- How much value do you get from them?
- Which practices are best for which situations?
- How do they integrate with detention requirements?
- How many BMPs are too many? Isn't more always a good thing?

Methodology

- Runoff Reduction Method –Simple, based on SCS method, reduces curve number based on meeting specific design criteria

Bioretention Design Criteria		
	40% Volume Reduction	80% Volume Reduction
Sizing	Filter surface area = minimum 3% CDA*	Filter surface area = minimum 4% CDA*
Filter Media Depth	18" minimum	24" minimum
Sub-soil testing	Not- required	½" per hour minimum
Pretreatment	External OK	Grass filter strip or equivalent required

*CDA = Contributing Drainage Area

"The Runoff Reduction Method", *University Council on Water Resources*, December 2010;
http://onlinelibrary.wiley.com/doi/10.1111/j.1936-704X.2010.00388.x/pdf

The Runoff Reduction Method

CENTER FOR WATERSHED PROTECTION

Apply Runoff Reduction Practices to Reduce Treatment Volume & Post-Development Load in Drainage Area A

Credit	Unit	Description of Credit	Credit	Credit Area (acres)	Runoff Reduction (cf)	Remaining Runoff Volume (cf)
2. Rooftop Disconnection						
2.a. Simple Disconnection to A/B Soils (Spec #1)	impervious acres disconnected	50% runoff volume reduction for treated area	0.50	0.99	1707	1707
3. Permeable Pavement						
3.a. Permeable Pavement #1 (Spec #7)	acres of permeable pavement + acres of "external" (upgradient) impervious pavement	45% runoff volume reduction	0.45	1.55	2405	2940
3.b. Permeable Pavement #2 (Spec #7)	acres of permeable pavement	75% runoff volume reduction	0.75	0.32	828	276
6. Bioretention						
6.a. Bioretention #1 or Urban Bioretention (Spec #9)	impervious acres draining to bioretention	40% runoff volume reduction	0.40	4.10	5656	8483
	turf acres draining to bioretention	40% runoff volume reduction	0.40	2.80	813	1220
6.b. Bioretention #2 (Spec #9)	impervious acres draining to bioretention	80% runoff volume reduction	0.80	0.00	0	0
	turf acres draining to bioretention	80% runoff volume reduction	0.80	0.00	0	0

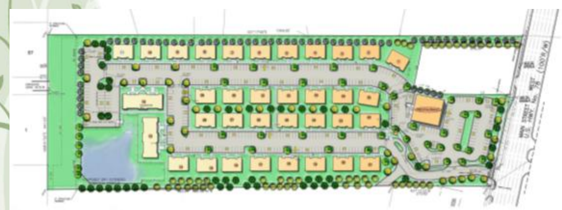
The Runoff Reduction Method

Center for Watershed Protection

Drainage Area A		A soils	B Soils	C Soils	D Soils	
Forest/Open Space -- undisturbed, protected forest/open space or	Area (acres)	0.0	0.0	0.0	0.0	
	CN	30	55	70	77	
Managed Turf -- disturbed, graded for yards or other turf to be	Area (acres)	0.0	3.1	0.0	0.0	
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0.0	5.7	0.0	0.0	
	CN	98	98	98	98	
					Weighted C	S
					85	1.79
		1-year storr	2-year storr	10-year sto	100-year storm	
$RV_{Developed}$ (in) with no Runoff Reduction		1.33	1.58	2.99	4.95	
$RV_{Developed}$ (in) with Runoff Reduction		0.97	1.22	2.63	4.59	
Adjusted CN		78.9	79.4	80.9	81.5	

Towne Centre Case Study

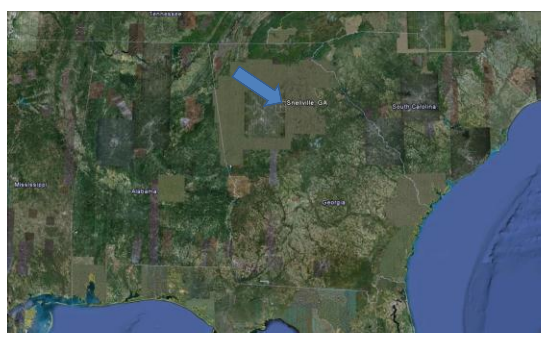
- Planned commercial development with 35 individual buildings and 80 total units
- First phase built in 2007
- Site is located in Snellville, Georgia



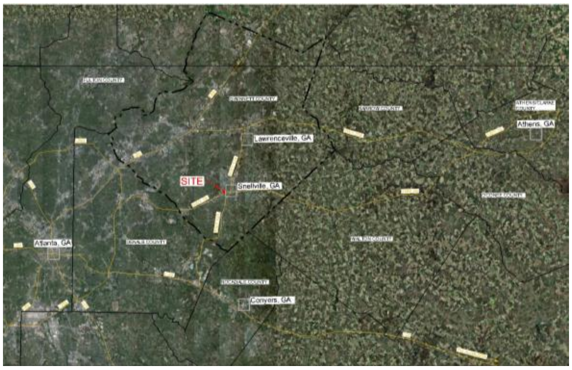
Towne Centre Case Study

- Long rectangular shape required long large pipes
- End-of-the-pipe solution required a large extended dry detention pond with a freestanding wall
- Natural gravelly sandy loam soils
- Regulations require large tree islands

Towne Centre Case Study – South East U.S.

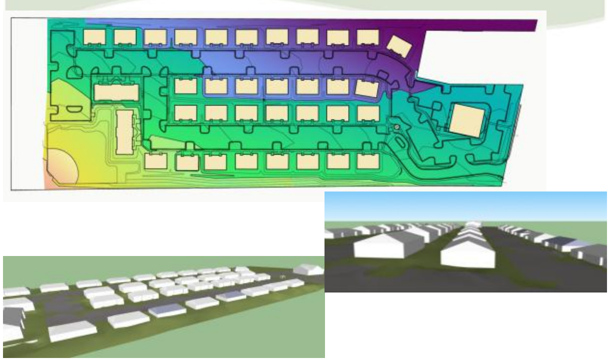


Towne Centre Case Study – Vicinity Map

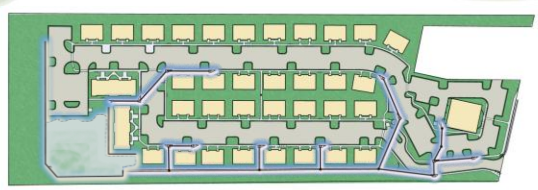


Towne Centre Case Study – Location Map

Towne Centre Case Study – Existing Design Layout & Grades

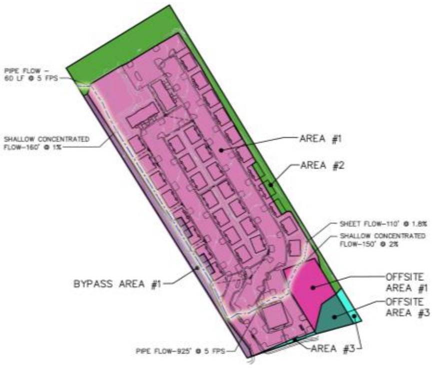


Towne Centre Case Study – Existing Stormwater Layout



Required Water Quality Volume:	27,628 CF
Required Channel Protection Volume:	82,497 CF
100 Year Storm Volume:	21,449 CF
Total CF Pond Storage Provided:	131,574 CF

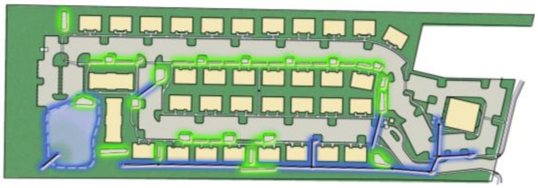
Towne Centre Case Study-
Existing Design Developed Drainage Areas



Towne Centre Case Study –
Four Alternatives

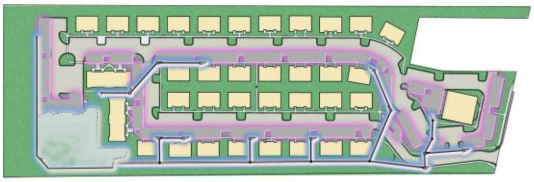
- Bioretention Alternate - Bioretention only
- Porous Alternate - Porous pavement only
- Soil Alternate - Soil amendments only
- Multiple Alternate - Bioretention, porous pavement, soil amendments & chamber system

Towne Centre Case Study –
Bio. Alt. Stormwater Layout



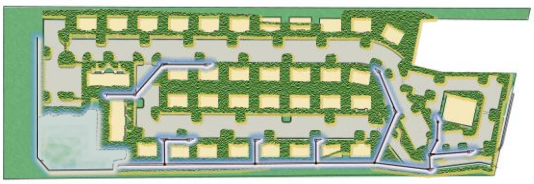
Required Water Quality Volume:	10,722 CF
Required Channel Protection Volume:	74,172 CF
100 Year Storm Volume:	19,564 CF
Total CF Pond Storage Provided:	104,440 CF

Towne Centre Case Study –
Porous Alt. Stormwater Layout



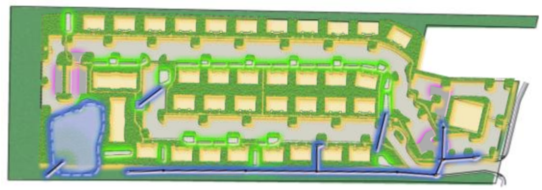
Required Water Quality Volume:	6,340 CF
Required Channel Protection Volume:	62,903 CF
100 Year Storm Volume:	22,121 CF
Total CF Pond Storage Provided:	91,364 CF

Towne Centre Case Study – Soil Alt. Stormwater Layout



Required Water Quality Volume: 23,718 CF
Required Channel Protection Volume: 66,749 CF
100 Year Storm Volume: 24,053 CF
Total CF Pond Storage Provided: 114,520 CF

Towne Centre Case Study – Multiple Alt. Stormwater Layout



Required Water Quality Volume: 3,460 CF
Required Channel Protection Volume: 56,614 CF
100 Year Storm Volume: 16,072 CF
Total CF Pond Storage Provided: 76,146 CF

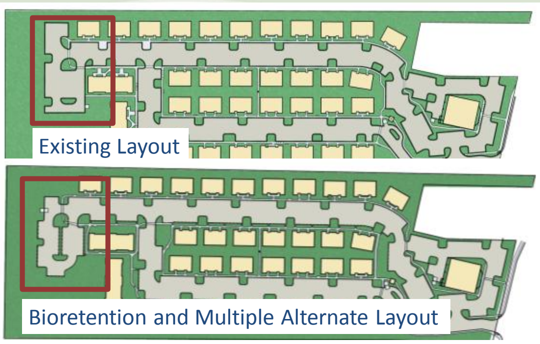
Towne Centre Case Study – Side-by-side Volumes

	EXISTING	BIO. ALT	POROUS ALT.	SOIL ALT.	MULTIPLE ALT.
TOTAL RUNOFF (CF)	276,946	252,680	237,568	237,640	219,033
DIFFERENCE	-	24,266	39,378	39,306	57,913
PERCENTAGE DIFFERENCE	0.00%	8.76%	14.22%	14.19%	20.91%
WQv	27,628	10,722	6,340	23,718	3,460
CPv	82,497	74,172	62,903	66,749	56,614
100 YR. VOLUME	21,449	19,564	22,121	24,053	16,072
TOTAL VOLUME DETAINED	131,574	104,458	91,364	114,520	76,146
DIFFERENCE	-	27,116	40,210	17,054	55,428
PERCENTAGE DIFFERENCE	0.00%	20.61%	30.56%	12.96%	42.13%

Towne Centre Case Study – Side-by-side Costs

	EXISTING	BIO. ALT	POROUS ALT.	SOIL ALT.	MULTIPLE ALT.
MOBILIZATION	$6,285.00	$5,545.00	$6,285.00	$6,285.00	$5,260.00
GRADING & EXCAVATION	$52,140.00	$34,140.00	$25,410.00	$32,880.00	$17,760.00
PAVEMENTS	$749,872.50	$775,677.50	$862,310.10	$749,872.50	$816,412.70
WALLS	$137,175.00	$48,600.00	$45,880.00	$43,800.00	$11,560.00
STORM UTILITIES	$123,889.00	$96,018.00	$114,038.00	$123,889.00	$87,108.00
LANDSCAPE	$143,520.00	$246,771.60	$143,520.00	$230,170.00	$328,421.60
DESIGN	$54,300.00	$54,600.00	$48,835.00	$47,560.00	$63,790.00
TOTAL PROJECT COST	$1,267,181.50	$1,261,352.10	$1,246,278.10	$1,234,456.50	$1,330,312.30
DIFFERENCE	-	$5,829.40	$20,903.40	$32,725.00	($63,130.80)
PERCENTAGE DIFFERENCE	0.00%	0.46%	1.65%	2.58%	-4.98%

Towne Centre Case Study – Possible Extra lot



Answers to Innovative Stormwater Solutions:

- How much value do you get from them?
- Which practices are best for which situations?
- How do they integrate with detention requirements?
- How many BMPs are too many? Isn't more always a good thing?

- To achieve more innovative stormwater solutions we need to:

- **Credit BMPs for their full contribution to water quality & quantity**
- **Perform comparative analysis for promising sites and situations**
- **Enact flexible stormwater regulations with higher water quality and quantity standards**

Conclusions from this case study?

- For appropriate sites, the initial cost of BMPs can be the same or lower cost as traditional stormwater practices. This does not take into account the added landscape value of the site.
- The creative opportunity for stormwater designers is huge.
- Bioretention is not always the best or most cost effective BMP.
- BMPs make noteworthy contributions to water **quantity**.
- Regulations can significantly affect the motivation for innovative design.