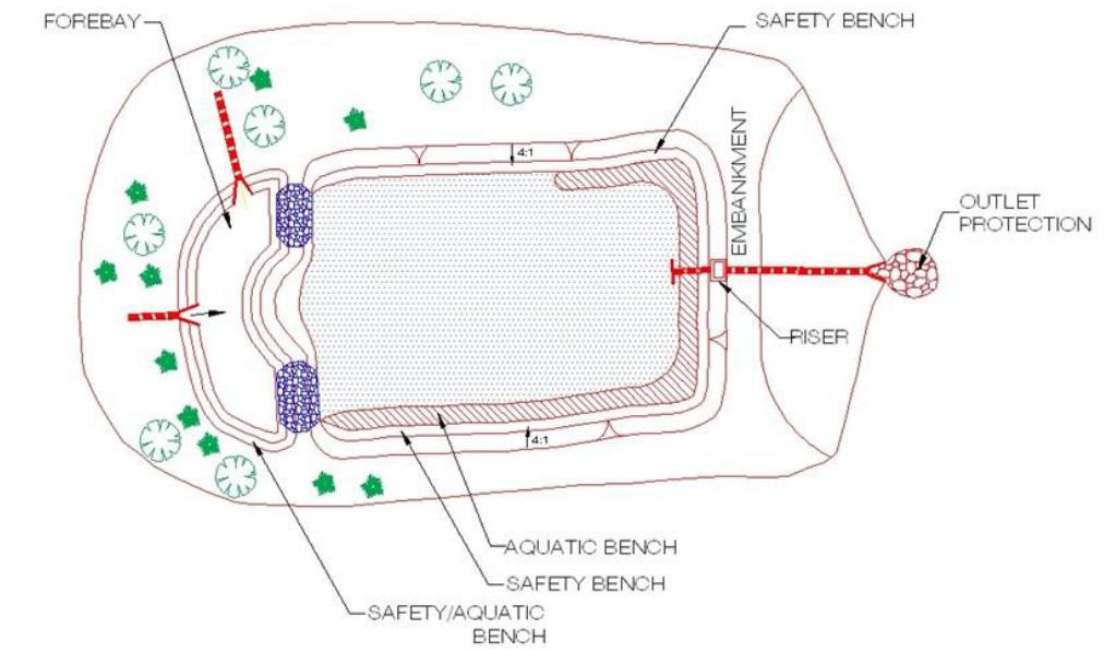


Detention Requirements

Chapter 2 and Appendix H

CENTER FOR WATERSHED PROTECTION

Quantity Control Requirements:

- 2-year storm: control peak discharge to pre-development conditions.
- 15-year storm: control peak discharge to pre-project conditions.

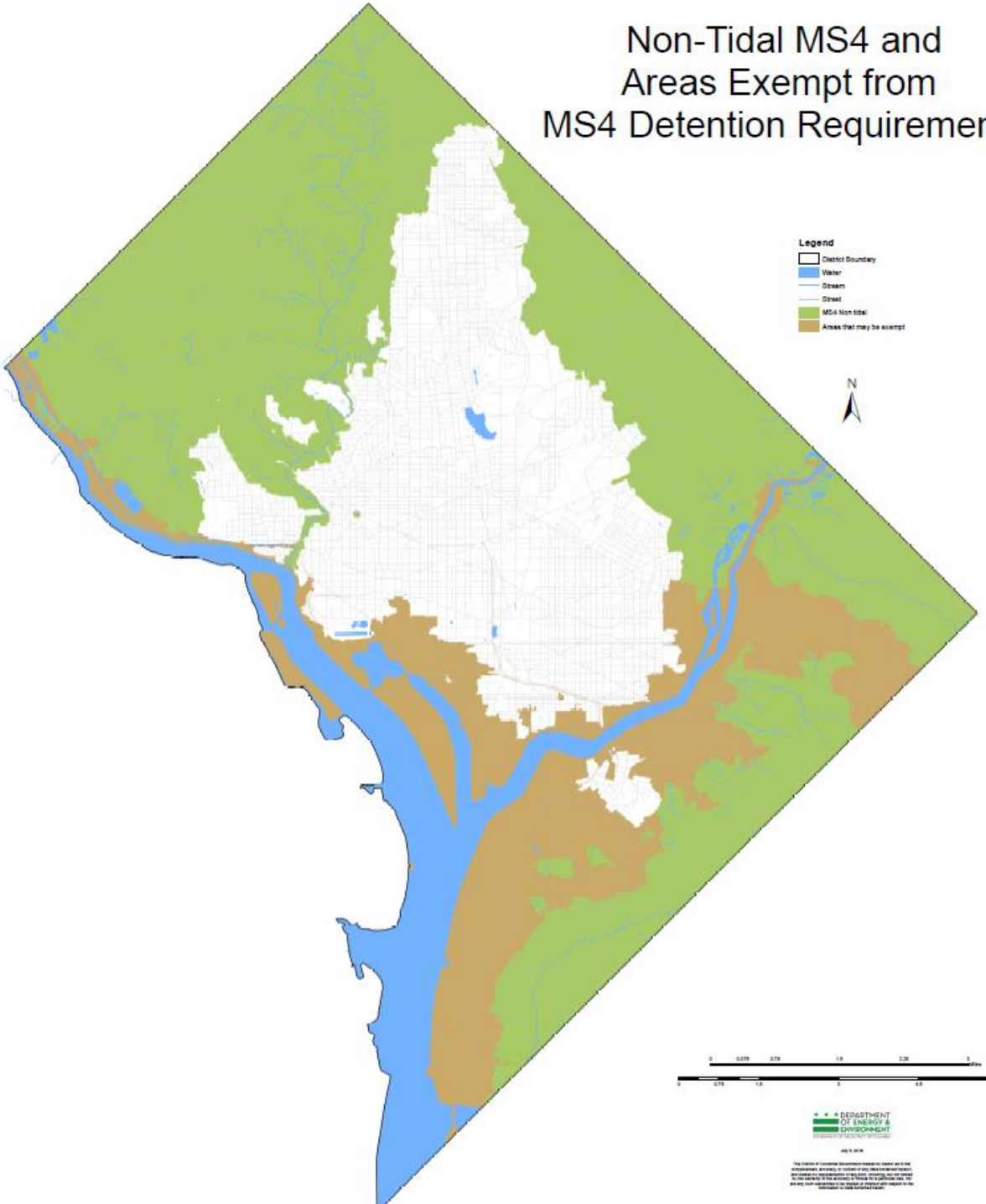
How to meet Detention Requirements

- Underground storage
- Above ground storage
- Increasing size of BMPs

Chapter 2 Note

- Note: 2-year post-development peak discharge requirements do not apply to projects when three conditions can be established:
  - (1) site discharges flow directly to, or through the separate sewer system, into the main stem of the tidal Potomac or Anacostia Rivers, the Washington Channel, or the Chesapeake and Ohio Canal;
  - (2) site discharges do not flow into or through a tributary to those waterbodies that runs above ground or that the District Department of the Environment (DDOE) expects to be daylighted to run above ground; and
  - (3) site discharges will not cause erosion of land or transport of sediment.

Non-Tidal MS4 and Areas Exempt from MS4 Detention Requirements



Pre-Development and Pre-Project Conditions

S.D.A. 1

Pre-Development CN = 70

Pre-Project:

Imp. Cover= 16,187 sf

CN = 98

Comp. Cover= 5,914 sf

CN = 74

Pre-Project CN: 92

S.D.A. 2

Pre-Development CN: 70

Pre-Project:

Imp. Cover= 15,593 sf

CN = 98

Comp. Cover= 12,125 sf

CN = 74

Pre-Project CN: 88

Post-Project Conditions (No BMPs)

S.D.A. 1

Post-Project:

Imp. Cover= 17,835 sf

CN = 98

Comp. Cover= 4,896 sf

CN = 74

Post-Project CN: 93

S.D.A. 2

Post-Project:

Imp. Cover= 17,468 sf

CN = 98

Comp. Cover= 10,250 sf

CN = 74

Post-Project CN: 89

Post-Project Conditions (With BMPs)

S.D.A. 1

Post-Project:

Imp. Cover= 17,835 sf

CN = 98

Comp. Cover= 4,896 sf

CN = 74

Post-Project CN: 93

BMP: 1,800 cf

Reduced Post-Project CN: 76 & 80

S.D.A. 2

Post-Project:

Imp. Cover= 17,468 sf

CN = 98

Comp. Cover= 10,250 sf

CN = 74

Post-Project CN: 89

BMP: 2,200 cf

Reduced Post-Project CN: 68 & 75

Based on the use of stormwater BMPs in the various drainage areas, the spreadsheet calculates an adjusted $RV_{Developed}$ and adjusted Curve Number.

D.A. 1

Land Area		Soils		
Natural Cover	Area (sf)	0.0		
	CN	70		
Compacted Cover	Area (sf)	4896.0		
	CN	74		
Impervious Cover	Area (sf)	17835.0	Weighted CN	S
	CN	98	93	0.77

	2-year storm	15-year storm	100-year storm
Runoff Volume (in) with no BMPs	2.43	4.38	7.51
Runoff Volume (in) with BMPs	1.13	3.08	6.21
Adjusted CN	**76**	**80**	**82**

D.A. 2

Land Area		Soils		
Natural Cover	Area (sf)	0.0		
	CN	70		
Compacted Cover	Area (sf)	10250.0		
	CN	74		
Impervious Cover	Area (sf)	17468.0	Weighted CN	S
	CN	98	89	1.22

	2-year storm	15-year storm	100-year storm
$RV_{Developed}$ (in) with no BMPs	2.09	3.98	7.07
$RV_{Developed}$ (in) with BMPs	0.73	2.61	5.70
Adjusted CN	**68**	**75**	**78**

Detention Calculations

	Area	2-Year Pre-Development Curve Number	2-Year Post-Development Reduced Curve Number	15-Year Pre-Project Curve Number	15-Year Post-Development Reduced Curve Number
SDA 1	22,731 sf	70	76	92	80
SDA 2	27,718 sf	70	68	88	75
Total Site	50,449 sf	**70**	**72**	**90**	**77**
Detention Required?		Yes		No	

Detention Required for 2-year storm only!

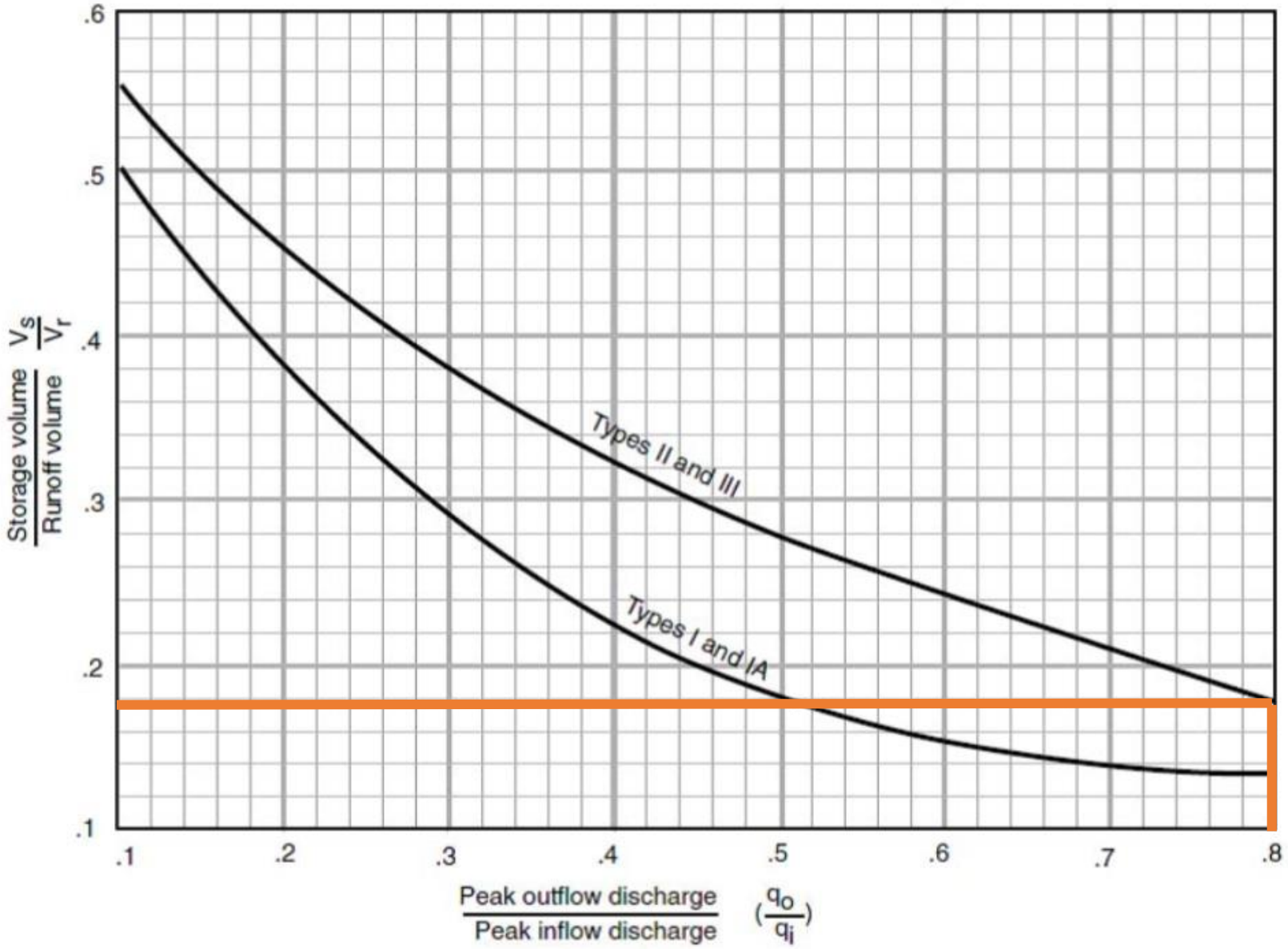


Figure H.1 Approximate detention basin routing for rainfall types I, IA, II and III.

Detention Calculations – Appendix H

Vs/Vr = 0.18 (from the graph)

$$Vr_2 = 53.33 \; x \; Q_2 \times Am$$ m Appendix H)

(55.33 is conversion from in-mi^2 to acre-feet)

Vr_2 = 53.33 x 0.91 in x 0.00181 mi^2 =0.088 ac-feet

Vs/Vr x Vr2 = 0.18 x 0.088 = 0.0158 ac-feet = **690 cf**

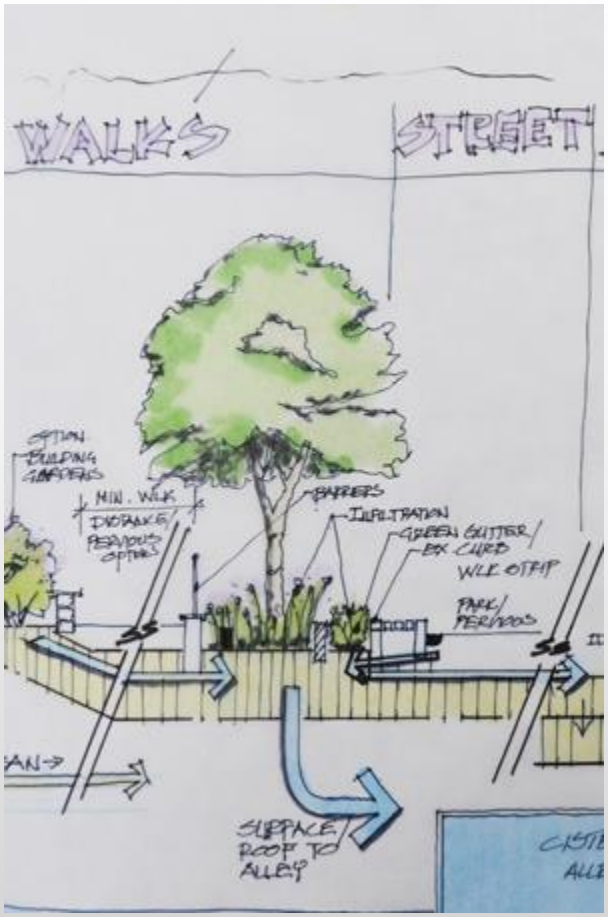
Reconstruction of Existing Public Right-of-Way (PROW)

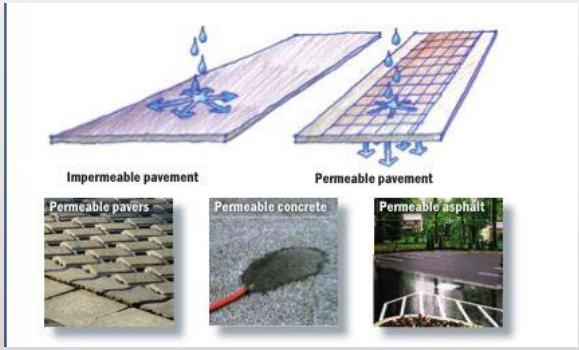
MEP tailored to the streetscape portion of a Major Regulated Project


AVEDA
BED BATH &
BEYOND
寢具·浴具·家用品
713


capital bikeshare

Rain gardens will reduce runoff from storms.

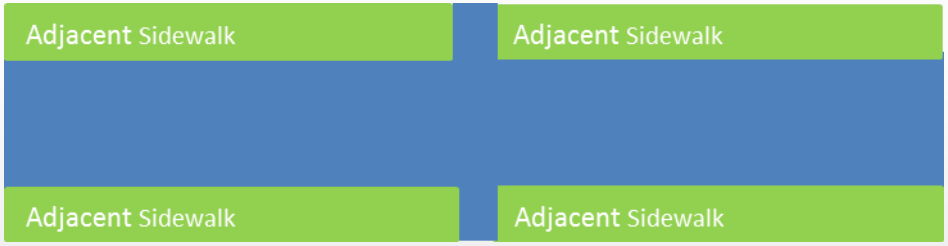


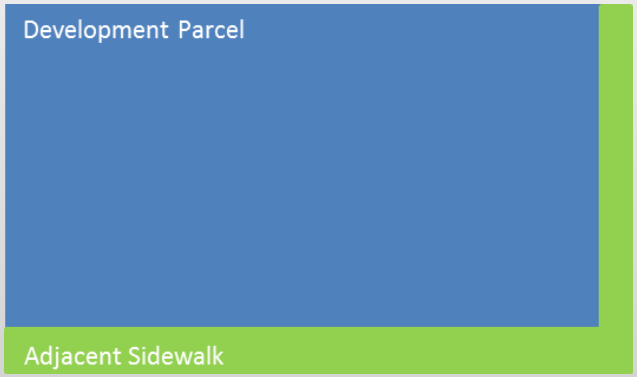


When PROW MEP applies…

- Reconstruction of Existing Public right-of-way
- Type 1: Federal or municipal
  - roads, alleys, sidewalks, trails, etc.

- Type 2: Private development
  - adjacent sidewalks and alleys





When PROW MEP does not apply…

- A major regulated project that does not disturb the adjacent public right-of-way
- Voluntary retrofits of existing PROW
- PROW disturbance that is limited to
  - Trenches
  - Driveways
  - Utilities
  - Aprons
  - Minor disturbance

Principles of PROW MEP include…

- Maximize BMP placement
- Maximize BMP sizing
- Innovate--integrate “green” with “grey” infrastructure
- Minimize impervious widths
- Maximize land cover types with little stormwater runoff
- Maximize tree canopy
  - planting or preserving trees, amending soils, increasing soil volumes and connecting tree roots with stormwater runoff
- Use impervious surface disconnection strategies
  - e.g., draining sidewalk area to continuous tree planting strip
- Manage comingled stormwater runoff
  - prioritize the conveyance and control of roadway runoff
  - Over-control the roadway runoff beyond LOD to compensate for less retention elsewhere
- Use porous pavement or pavers for low traffic roadways, on-street parking, shoulders or sidewalks
- Integrate BMPs into traffic calming measures

Parcel PROW MEP steps include…

- Calculate SWRv
- Prioritize managing roadway runoff inside the curb line
- Place, size and design PROW BMPs to maximize retention
  - Stormwater Management Guidebook Chapter 3 BMP specifications
  - Stormwater Management Guidebook Appendix B BMP priorities and limitations
  - DDOT LID Standards and Specifications

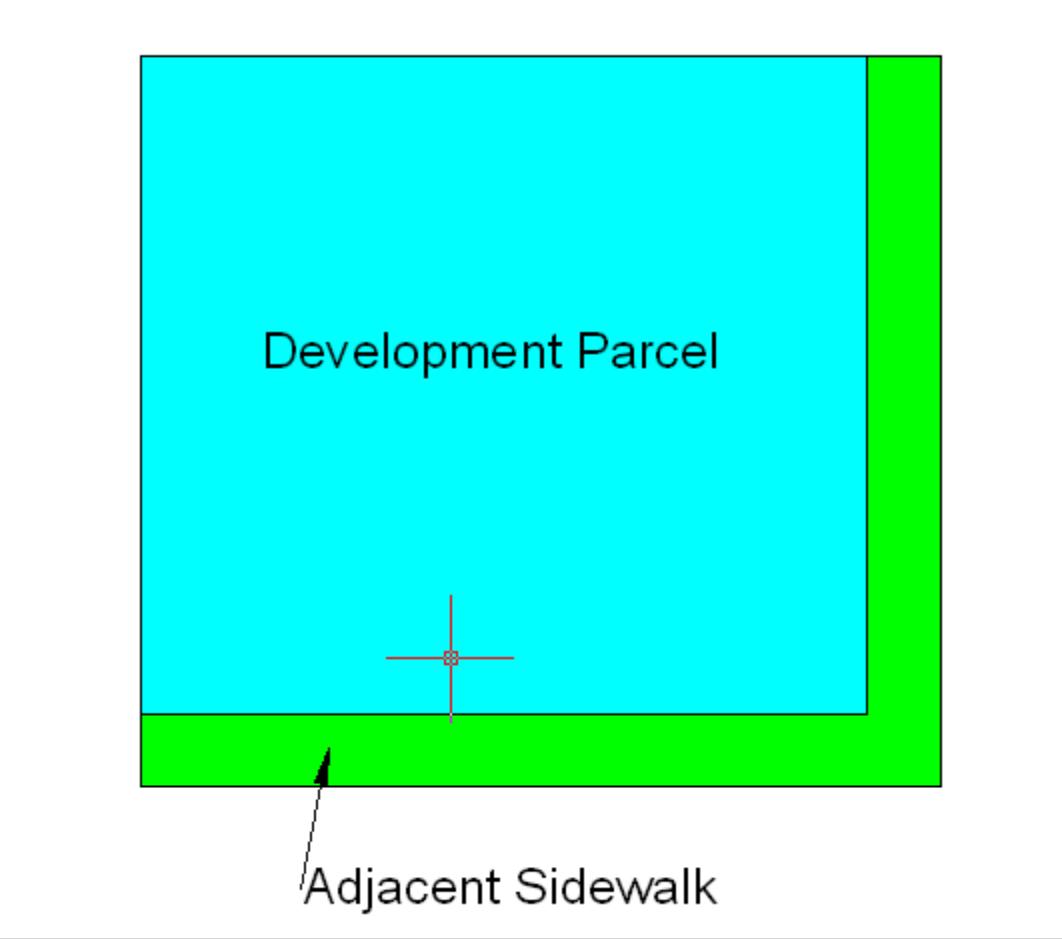
    dc.gov/DC/DDOT/Projects+and+Planning/Environment/Low+Impact+Development

Design Example: Scenario

- Corner property includes 200 ft x 10 ft adjacent PROW disturbance (sidewalk)
- SWRv = 1.2 in x (0.95x100%) x 2000 ft^2 x 7.48/12
- SWRv = 1,421 gallons

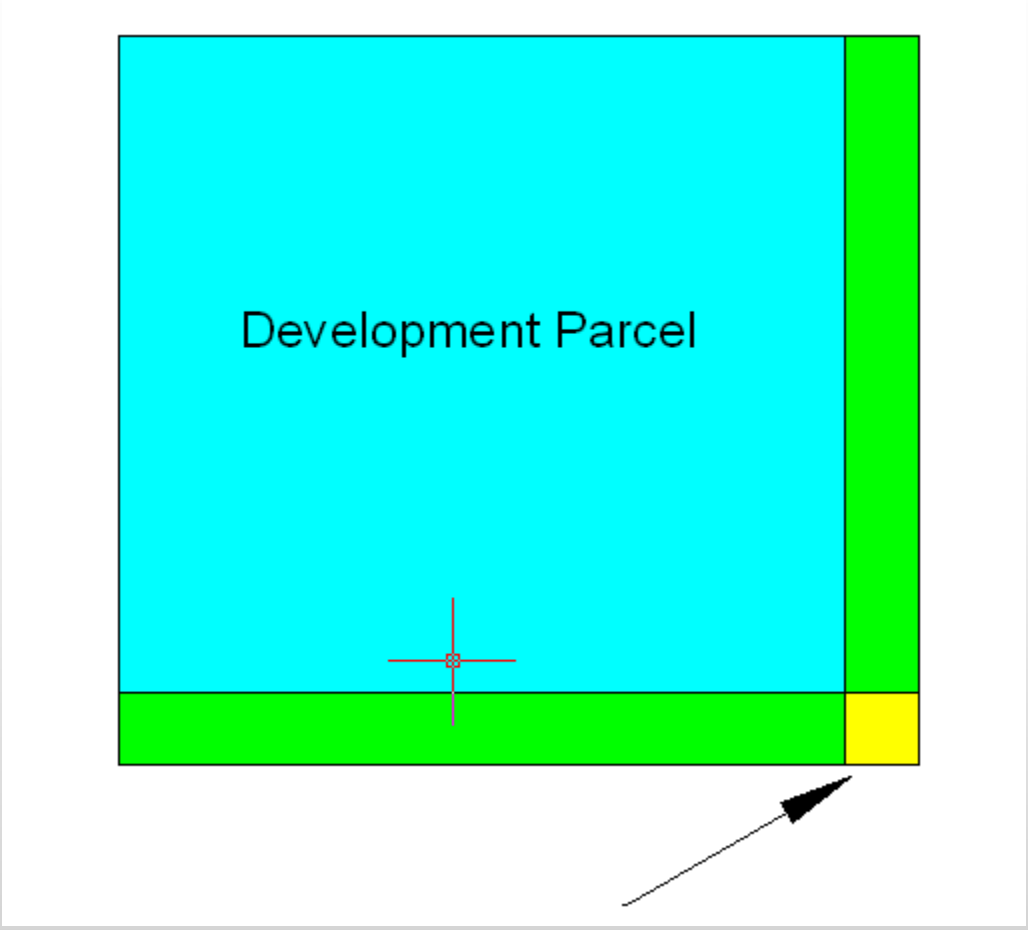
- Poor infiltration rate on site
- Sufficient head available for underdrain connections.

Design Example: Site Plan



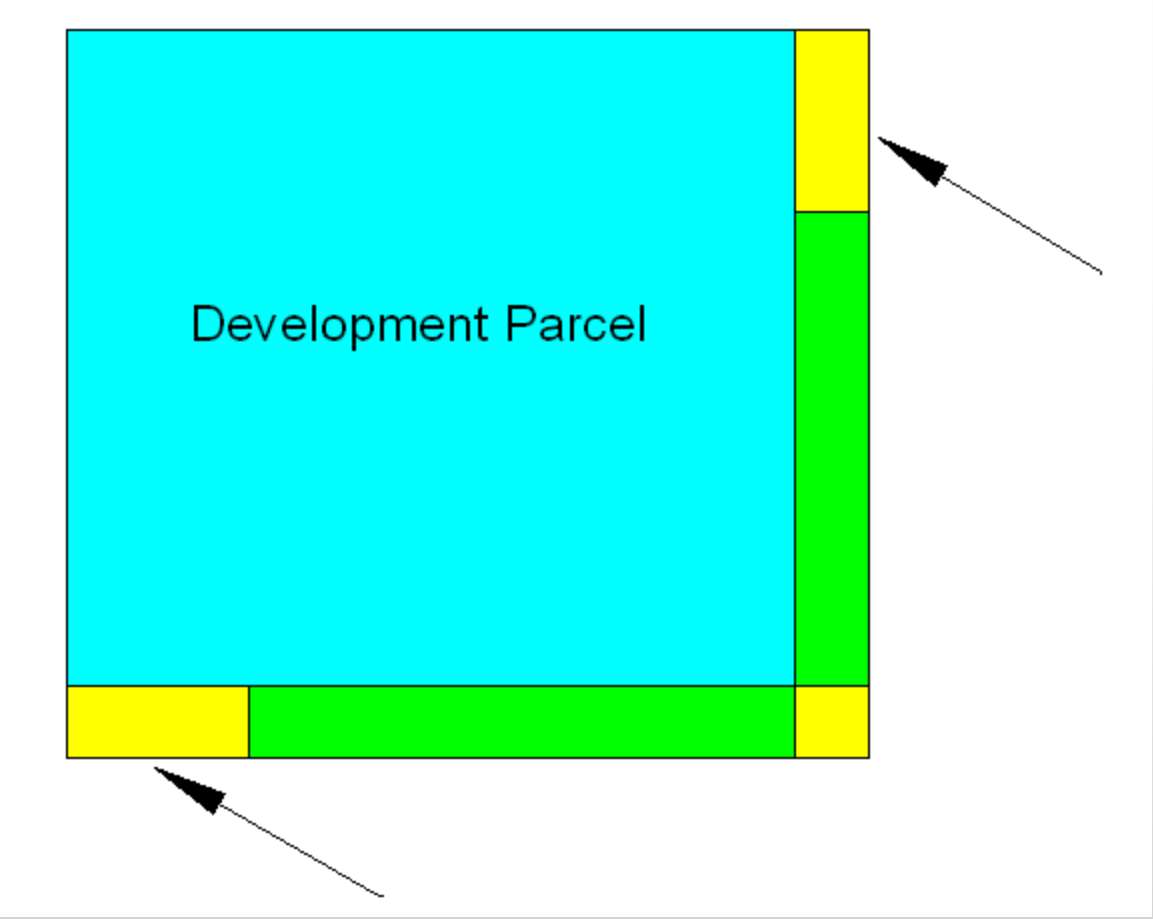
Design Example: Limitations

- ADA Crossing Requirements



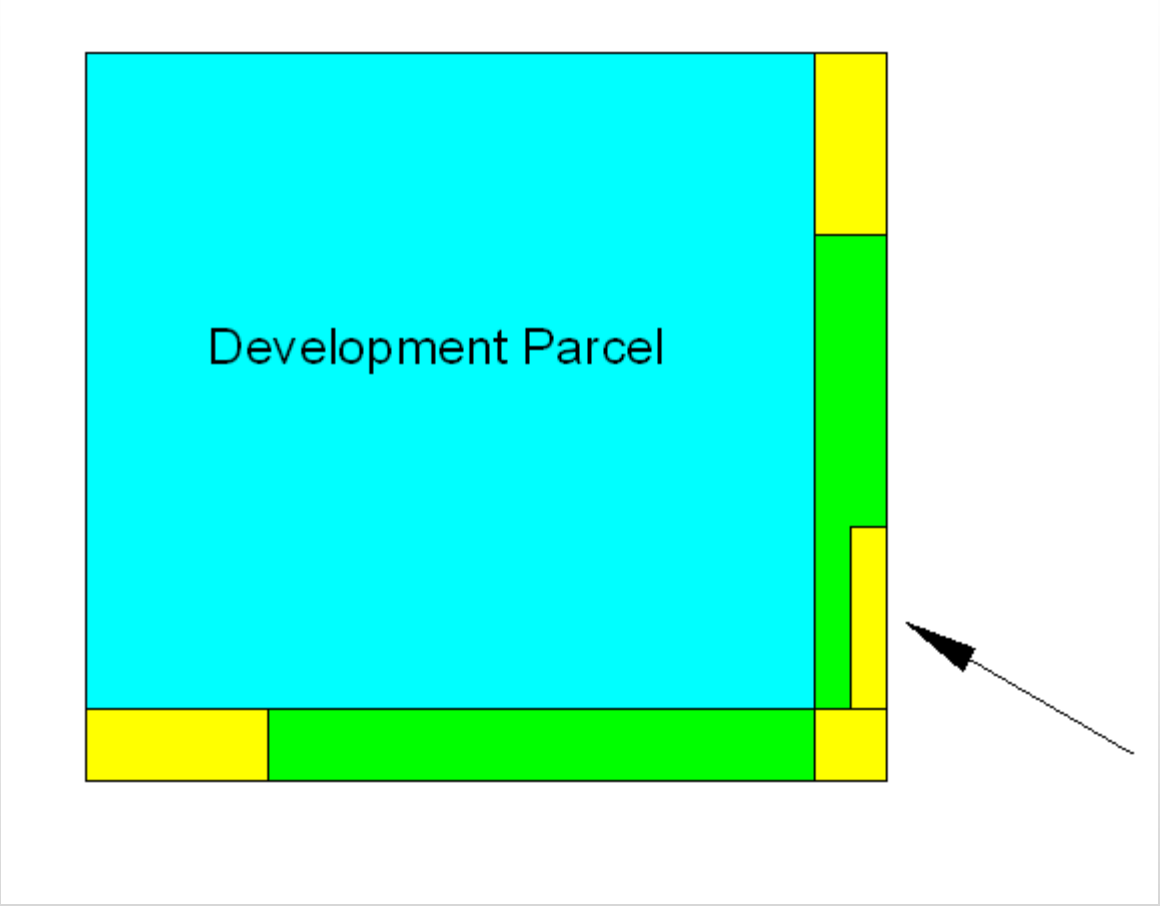
Design Example: Limitations

- Driveways



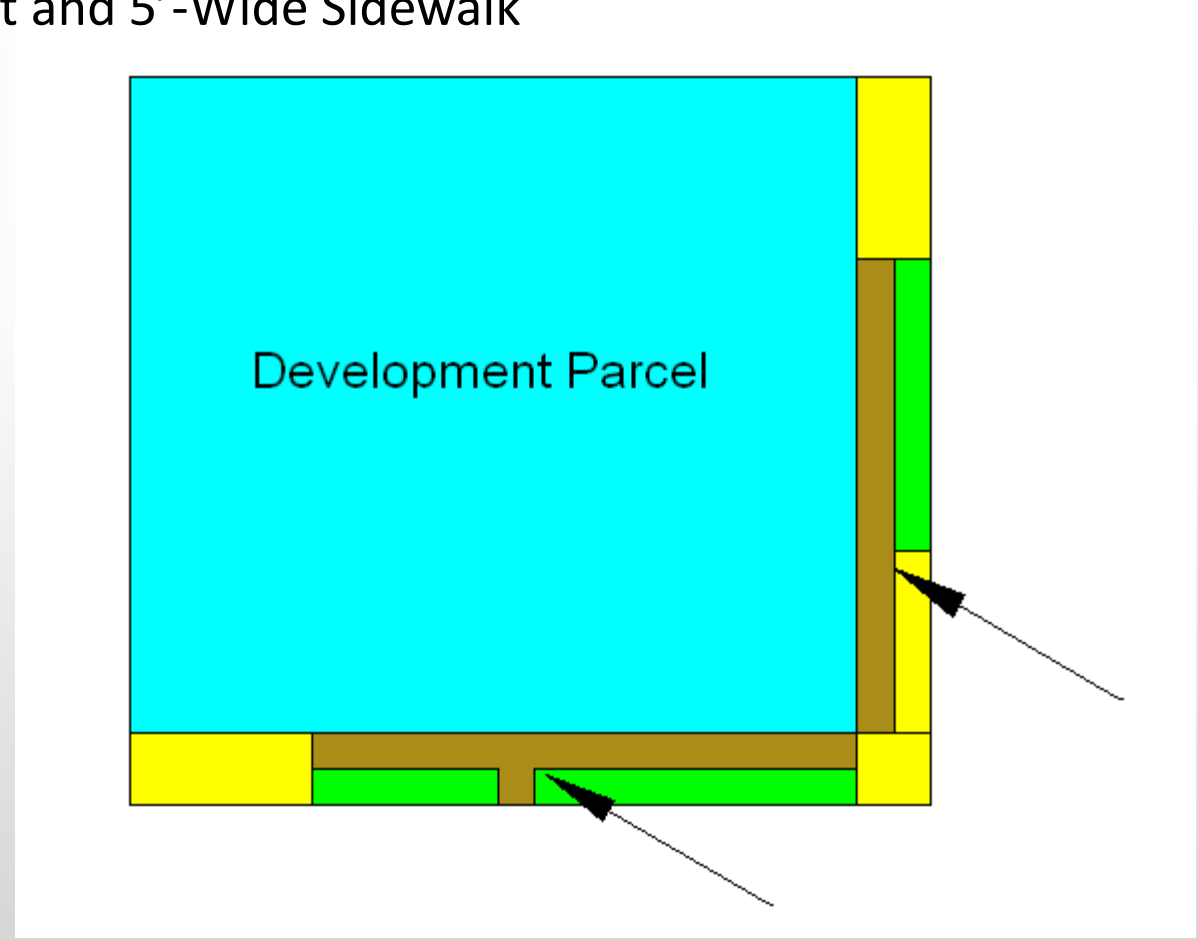
Design Example: Limitations

- Bus Stop



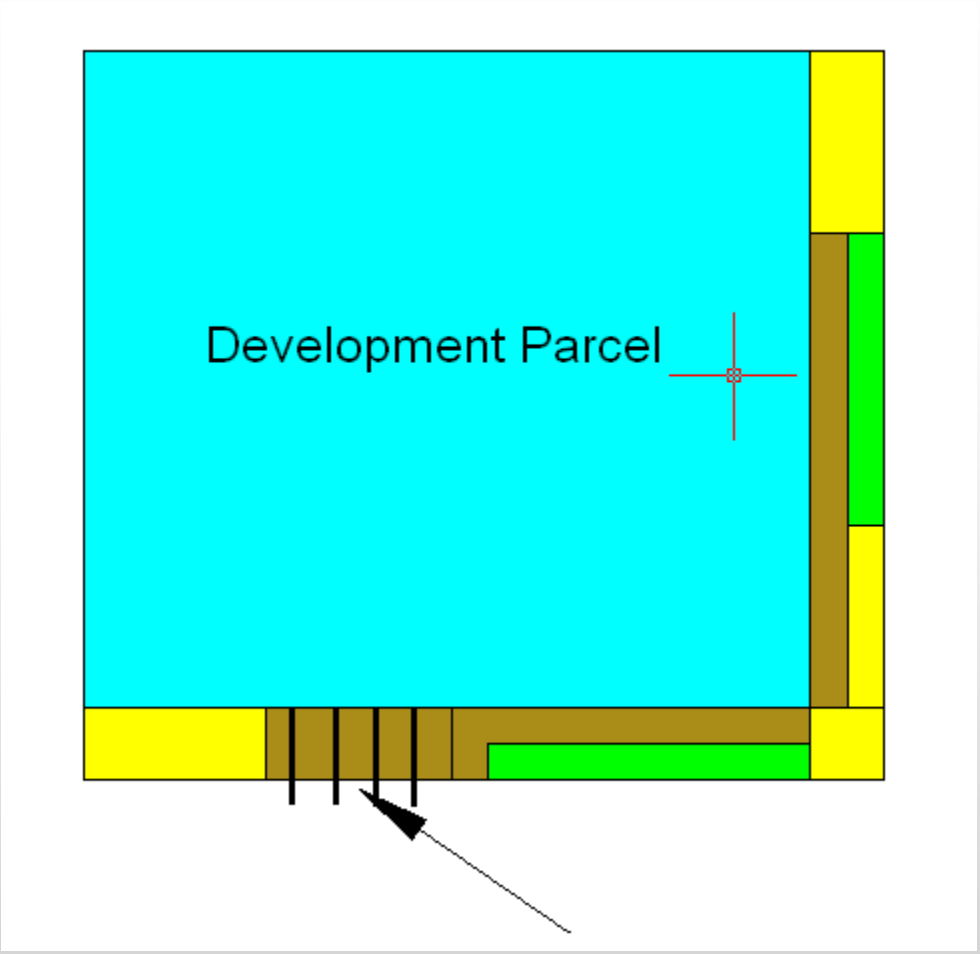
Design Example: Limitations

- Building Exit and 5’-Wide Sidewalk



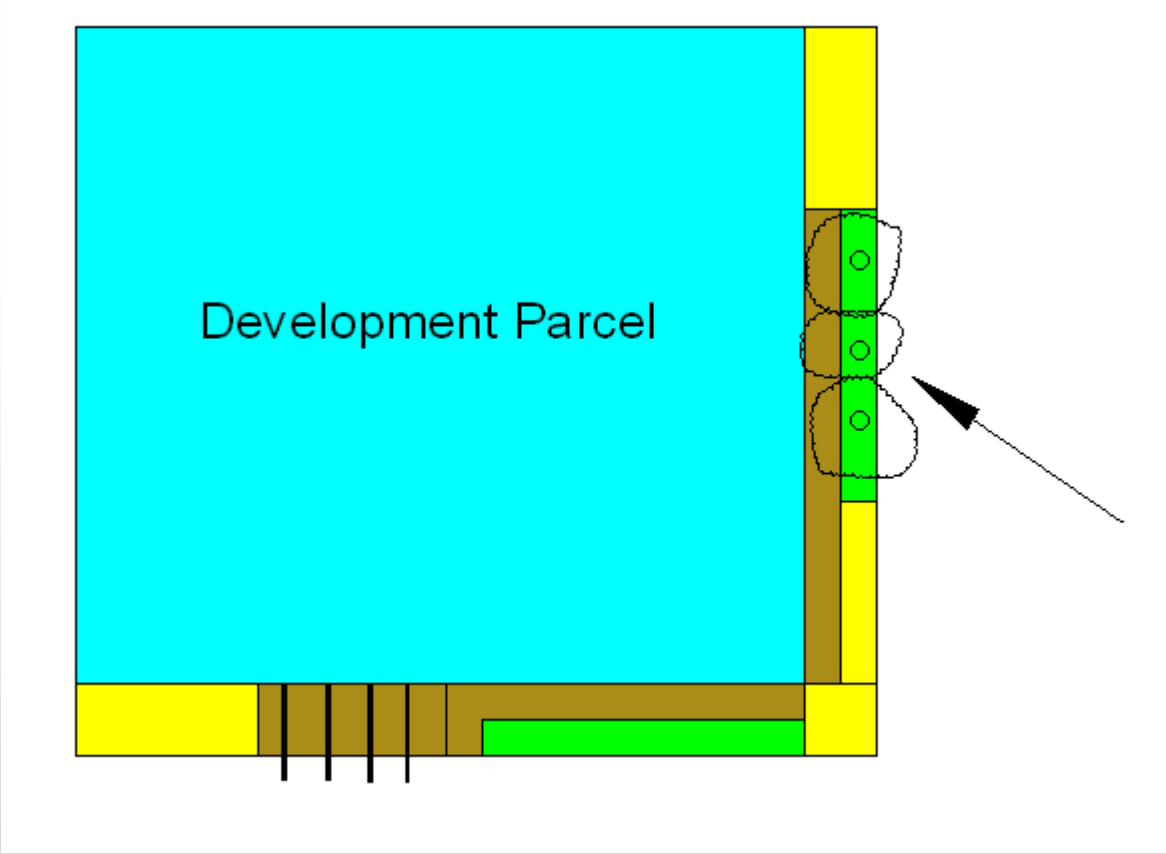
Design Example: Limitations

- Utilities



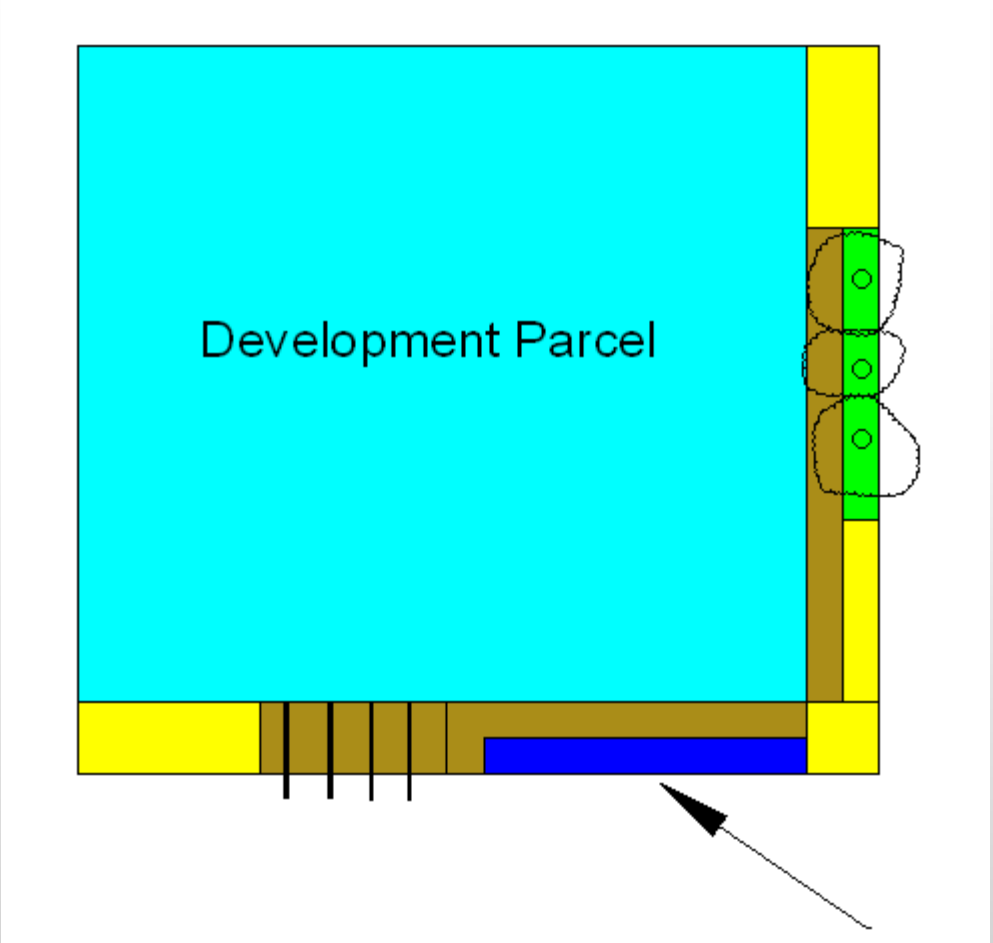
Design Example: Limitations

- Existing Trees



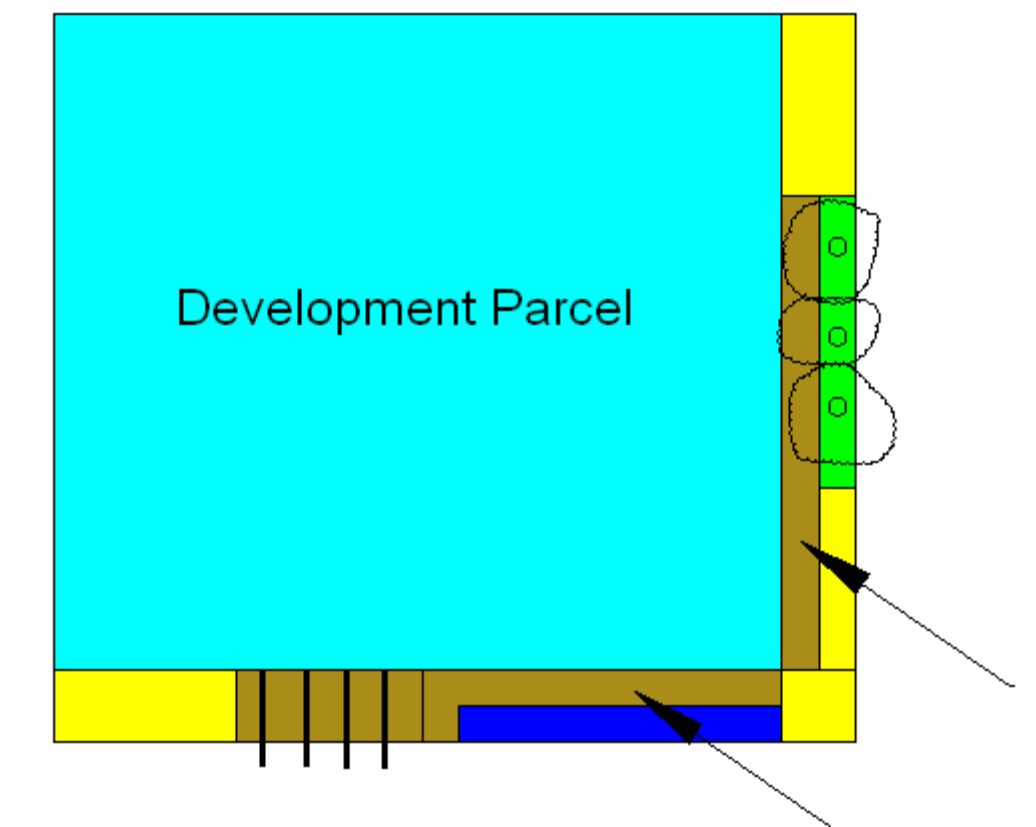
Design Example: BMPs

- Bioretention



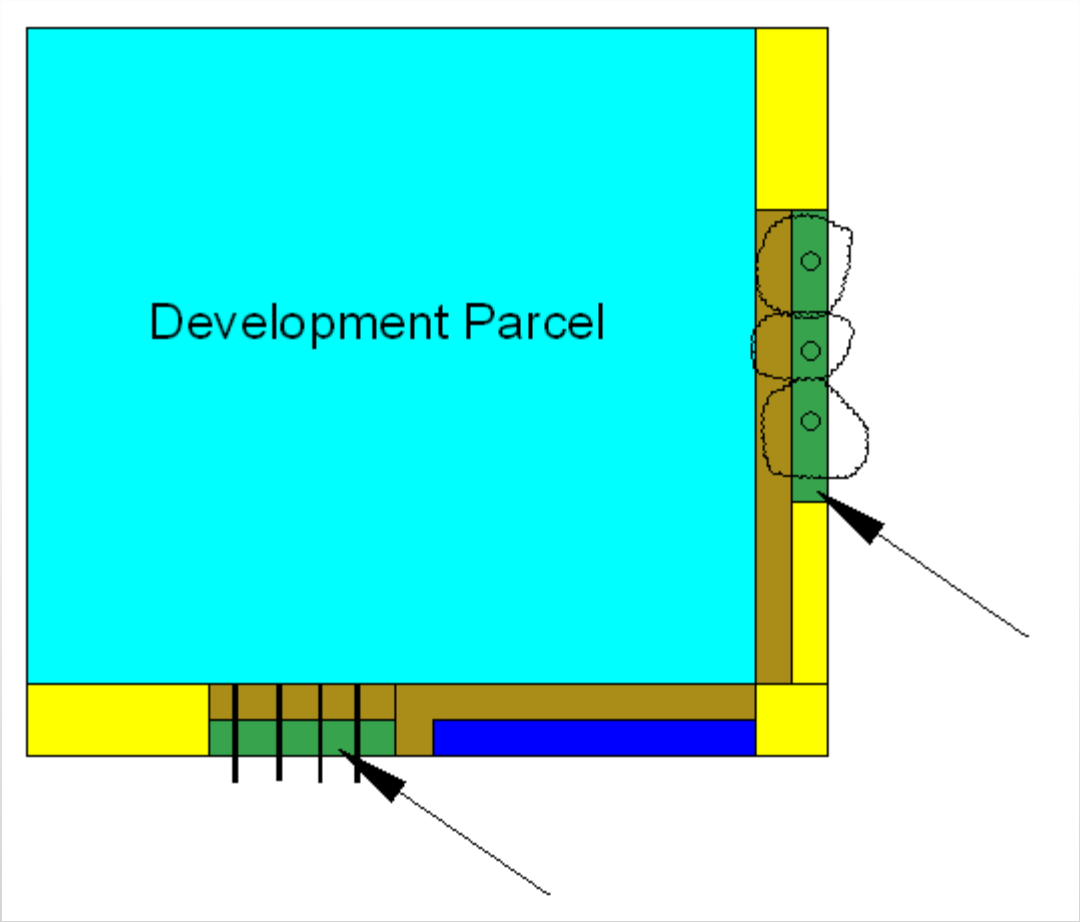
Design Example: BMPs

- Permeable Pavement considered, but trees and utilities limit space available, and much of remaining sidewalk drains to bioretention area.



Design Example: BMPs

- Reduce Impervious Cover



Design Example: Results

- Recalculate SWRv for Reduced Impervious Cover:
- SWRv = 1.2 in x (0.95 x 84% + 0.25 x 16%) x 2000 ft^2 x 7.48/12
- SWRv = 1,254 gallons

- Poor infiltration rate on site
- Sufficient head available for underdrain connections.

Design Example: Results

- SWRv Achieved:
- 3 existing trees x 20 ft^3 x 7.48 = 449 gallons
- 220 ft^2 bioretention area (with shallow ponding) provides 823 gallons of storage
  - 823 gallons x 0.6 = 494 gallons
- SWRv Achieved = 943 gallons

- Required SWRv not met, but MEP process followed.