



Localized Flooding Mitigation Policy for Infill Lot Development

Land Use Policy Committee

Matthew Hansen, P.E.

Chief, Residential Infill Development Branch

Dept. of Land Development Services (LDS), Site Development and Inspections Division

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Discussion Points

- Overview of flooding (stormwater quantity) and single-family detached (SFD) homes with Infill Lot Grading (INF) Plans
- Proposed drainage policy regarding INF Plans (“Localized Flooding Mitigation” Policy”)
- Proposed Simplified Design Tools
- Next Steps



Stormwater Quantity and INFs

- Staff and elected leaders increasingly aware of localized flooding issues
- Flooding and channel degradation are widespread
- July 8, 2019, storm highlighted importance of better stormwater runoff management
- INF projects proposing increased stormwater flows are scrutinized for downstream impacts on a case-by-case basis



Overwhelmed Drainage – Dead Run Drive, 7/8/2019



Costs of Unmanaged Stormwater Runoff

Degraded channels and capacity issues require repairs

- Tucker Avenue Upgrades – Est. \$9.2M
- Sunset Hills Drainage Improvements - \$11M
- Hayfield Road Conveyance - \$9.7M
- Stream restoration - \$1,350 per linear foot



Channel Degradation – Little Pimmit Run



County's Current Stormwater Regulations

- Chapter 124 - Stormwater Management Ordinance (SWMO)
- Chapter 118 – Chesapeake Bay Preservation Ordinance (CBPO)
- Article 2-600 – Zoning Ordinance
- Chapter 104 – Erosion and Sediment Control Ordinance
- Public Facilities Manual



Channel Degradation – Dead Run at Georgetown Pike



Stormwater Regulations for INFs

- For SFD Projects (land disturbance > 2,500 square feet), the SWMO detention requirements apply to Infill Lot grading Plans:
 - All projects discharging concentrated flow (124-4-4.B & C)
 - Projects without concentrated flow but with known downstream issues (124-4-4.E)
- SWMO § 124-1-7.3.b provides exemption categories for INFs
 - Exemptions carried from CBPO when SWMO was adopted, with additional exemptions added by the Board
 - Includes lots < 18% or 2,500 square feet impervious area, and lots < 0.5 acre adding < 500 square feet impervious area

=> Approximately one-third of Infill Lot Grading Plans are exempt from the SWMO
- SWMO-exempt projects are required to provide detention based on different authorities on a case-by-case basis



Localized Flooding Mitigation Policy Development

- Goals developed in collaboration with a core group of local engineering firms
- Extensive collaboration between Department of Public Works and Environmental Services (DPWES) and LDS
- Outreach:
 - Frequent INF plan submitters
 - Engineers & Surveyors Institute
 - Northern Virginia Building Industry Association
 - Northern Virginia Soil and Water Conservation District



Backlick Run Tributary at Deer Ridge



Localized Flooding Mitigation Policy

- Policy will:
 - Acknowledge known drainage issues
 - Reiterate SWMO requires detention when downstream issues exist
 - Reaffirm detention requirement for drainage to inadequate systems in all cases
 - Provide compliance tools
 - Template detention facility designs
 - Calculation spreadsheets
- DPWES & LDS have collaborated to prepare an upcoming Technical Bulletin



Private Drive Damaged by Flooding



Localized Flooding Mitigation Policy Compliance Tool

- Example: template design & calculations sheet for detention
- “plug and play” calculations
- Benefits:
 - Minimizes future flooding
 - Standard methods speed design and review
 - Standard facilities speed installation and inspection
 - Maintainability was a primary design consideration

CONSTRUCTION NOTE FOR UPD FACILITIES:
ALL UPD SYSTEM CONSTRUCTION MUST CONFORM WHERE APPLICABLE, TO THE CURRENT VDOT ROAD AND BRIDGE SPECIFICATIONS, FPM, AND MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS, WITH THE MOST STRINGENT CRITERIA GOVERNING FOR ANY PARTICULAR REQUIREMENT.

CONVEYANCE PIPE SIZE REQUIREMENTS (BASED ON SQ. FT. OF DRAINAGE AREA (DA))

PIPE DIA.	PIPE-TO-PIPE	PIPE-TO-WALL
24"	14"	12"
30"	18"	18"
36"	22"	18"
48"	30"	24"
60"	36"	30"
72"	42"	36"
90"	54"	48"

CONVEYANCE PIPE SIZE REQUIREMENTS (BASED ON SQ. FT. OF DRAINAGE AREA (DA))

PIPE DIA.	MAX. DA	PIPE DIA.	MAX. DA
4"	700	4"	2,500
6"	2,000	6"	8,000
8"	4,500	8"	15,000
10"	8,000	10"	25,000
12"	13,000	12"	25,000
15"	25,000	15"	0.5% PIPE SLOPE

CERTIFICATION OF NO CHANGE:
I HEREBY CERTIFY THAT NO CHANGES HAVE BEEN MADE TO, OR ARE PROPOSED FOR, THE UPGRADED DESIGN SHEET NOTES, SPECIFICATIONS OR DETAILS AND NO CHANGES HAVE BEEN MADE TO, OR ARE PROPOSED FOR, THE DESIGN CALCULATIONS GENERATED FOR THIS PROJECT BY THE UPD STANDARD DESIGN CALCULATIONS SPREADSHEET.

TYPICAL UPD GENERALIZED PLANVIEW

DOUBLE MANIFOLD SYSTEM
N.T.S.

SINGLE PIPELINE CONFIGURATIONS
N.T.S.

UPD STORAGE PIPE DETENTION (UPD) FACILITIES FOR INFILL LOTS: DESIGN DATA

UPD Facility ID	Drainage Area Source	Facility Configuration	Pipe Material	Pipe Dia. (in)	# Pipe Rows	Orifice Dia. (in)	A	B	C
UPD-100	Roof Only	Double Manifold	HDPE	4	1.5	250.00	245.25	244.00	
UPD-200	Other IA Only	Double Manifold	PP	4	1.2	245.00	243.55	243.00	

UPD FACILITY PRETREATMENT PRACTICES

UPD Facility ID	For Roof Gutters	For Downspouts	For Inflow Pipelines	OUTLET PROTECTION	MIN UPD GRIND COVER (FT)
UPD-100	Leaf Screen	In-line Leaf Strainer/Separator		Exist. Imperv. Surface	2.0
UPD-200			Debris Trap	Exist. Area with Conveyance	2.2

UNDERGROUND PIPE DETENTION (UPD) FOR INFILL LOTS: DESIGN QUANTITIES TABLE

A separate stand-alone design & Design Quantities Table is required for each lot.

Enter the requested design data in the yellow cells below:

Net additional impervious area created by proposed project: **6000** sq. ft.

For UPD(s) proposed on this sheet:

Total **grate** impervious area drained to UPD(s) (not < 600 sq. ft.): **4000** sq. ft.

onsite pervious area and all offsite areas **MUST NOT** drain into UPD facilities

% of equivalent net impervious area to be drained to UPD(s): **67** %

Total required stormwater volume to be detained by UPD(s): **853** cu. ft.

Number of individual UPD(s) proposed: **2**

Provide the total contributing **grate** impervious area, the pipe diameter and material, and the typical row length (RL) for each proposed UPD facility, below, to obtain the required # of equal-length pipe rows and other design quantities. NOTE: (min. allowed contributing onsite pervious area to a UPD facility is 600 sq. ft. & max. is 25,000 sq. ft.) with no pervious area allowed - offsite flows must be bypassed.

Data table #1 (below) **MUST** be used 1st for entering the individual UPD design data, and #2 (used 2nd). And following this order may lead to unconservative "remaining" quantities.

#1 UPD-100 (enter plan number for UPD)

Contributing **onsite** impervious area = **2500** sq. ft.

impervious area must not be less than 600 sq. ft.: **ok**

pervious and offsite area prohibited **ok**

UPD Facility Pipe Diameter, and Pipe Material: polyethylene (HDPE), polypropylene (PP), or aluminum (CAP) **30** in.

Required UPD facility stormwater storage capacity = **533** cu. ft.

Minimum total length of required UPD facility pipe = **109** ft.

Approx. equiv. pipe-length for 90° corner connections = **4** ft.

Approx. equiv. pipe-length for tee-connections = **5** ft.

Length (RL) of typical UPD facility pipe row = **18** ft.

Number of typical Pipe Rows required for UPD facility = **4**

Total length of proposed UPD facility equiv. pipe = **110** ft.

proposed pipe length must not be less than required **ok**

This facility has excess capacity for future imperv. area = **0** sq. ft.

Remaining **grate** imperv. area to be captured by UPD(s) = **1500** sq. ft.

10-yr predevelopment Q = allowable facility discharge = **0.12** cfs

Design head for control-orifice calc. = pipe diameter = **2.5** ft.

Square (or round) Q-control orifice dimension for allow. Q = **1.5** in.

Design Q-control Orifice dimension (min. = 1.0 inch) = **1.5** in.

#2 UPD-200 (enter plan number for UPD)

Contributing **onsite** impervious area = **1500** sq. ft.

impervious area must not be less than 600 sq. ft.: **ok**

pervious and offsite area prohibited **ok**

UPD Facility Pipe Diameter, and Pipe Material: polyethylene (HDPE), polypropylene (PP), or aluminum (CAP) **24** in.

Required UPD facility stormwater storage capacity = **320** cu. ft.

Minimum total length of required UPD facility pipe = **102** ft.

Approx. equiv. pipe-length for 90° corner connections = **3** ft.

Approx. equiv. pipe-length for tee-connections = **4** ft.

Length (RL) of typical UPD facility pipe row = **18** ft.

Number of typical Pipe Rows required for UPD facility = **4**

Total length of proposed UPD facility equiv. pipe = **162** ft.

proposed pipe length must not be less than required **ok**

The facilities have excess capacity for future imperv. area = **0** sq. ft.

Remaining **grate** imperv. area to be captured by UPD(s) = **0** sq. ft.

10-yr predevelopment Q = allowable facility discharge = **0.07** cfs

Design head for control-orifice calc. = pipe diameter = **2.0** ft.

Square (or round) Q-control orifice dimension for allow. Q = **1.2** in.

Design Q-control Orifice dimension (min. = 1.0 inch) = **1.2** in.

DRAINAGE MAP(S) AND ADDITIONAL CALCULATIONS/NOTES



Committee Input Requested

Support from the Committee regarding:

- Localized Flooding Mitigation Policy
 - Issue technical Bulletin with Implementation Tools
- Evaluation of potential SWMO amendment so that all INF projects are regulated in a consistent manner

