PROJECT IDENTIFICATION

TOWN OF TIMBERVILLE

C STREET EAST, NORTH FORK SHENANDOAH RIVER CORRIDOR ASSESSMENT

Location Description

38.63739, -78.77219

C Street East, running parallel to the North Fork of the Shenandoah River on the east side of town; residential properties with river-facing rear yards along this corridor (**Figure 1**).

Project Issue

Potential riverine flooding — North Fork Shenandoah overbank flooding during extreme events (1985, 1996) affects yards and at least one lower outbuilding along this corridor, though no confirmed in-home flooding even during the two most significant historical events, per Town staff. Some homes along C Street East are shown in the FEMA floodplain, prompting mortgage-required flood insurance for owners despite no documented structure flooding.

Project Purpose

Document flood conditions along the C Street East corridor and assess whether any actionable structural improvement is warranted; potentially support future Letter of Map Amendment (LOMA) applications for floodplain-mapped properties with no documented structure flooding history.

Identified Constraints

Entire corridor is privately owned with no public ROW for improvements; any intervention requires voluntary property owner participation.

Additional Information Needed

FEMA model

Project Proposal and Planning-Level Cost Estimate

A flood impact study completed on the area will support determining viability of any actionable improvements. Additionally, the work can be used to establish whether a LOMA would be beneficial for the community and lay the groundwork for such an effort.

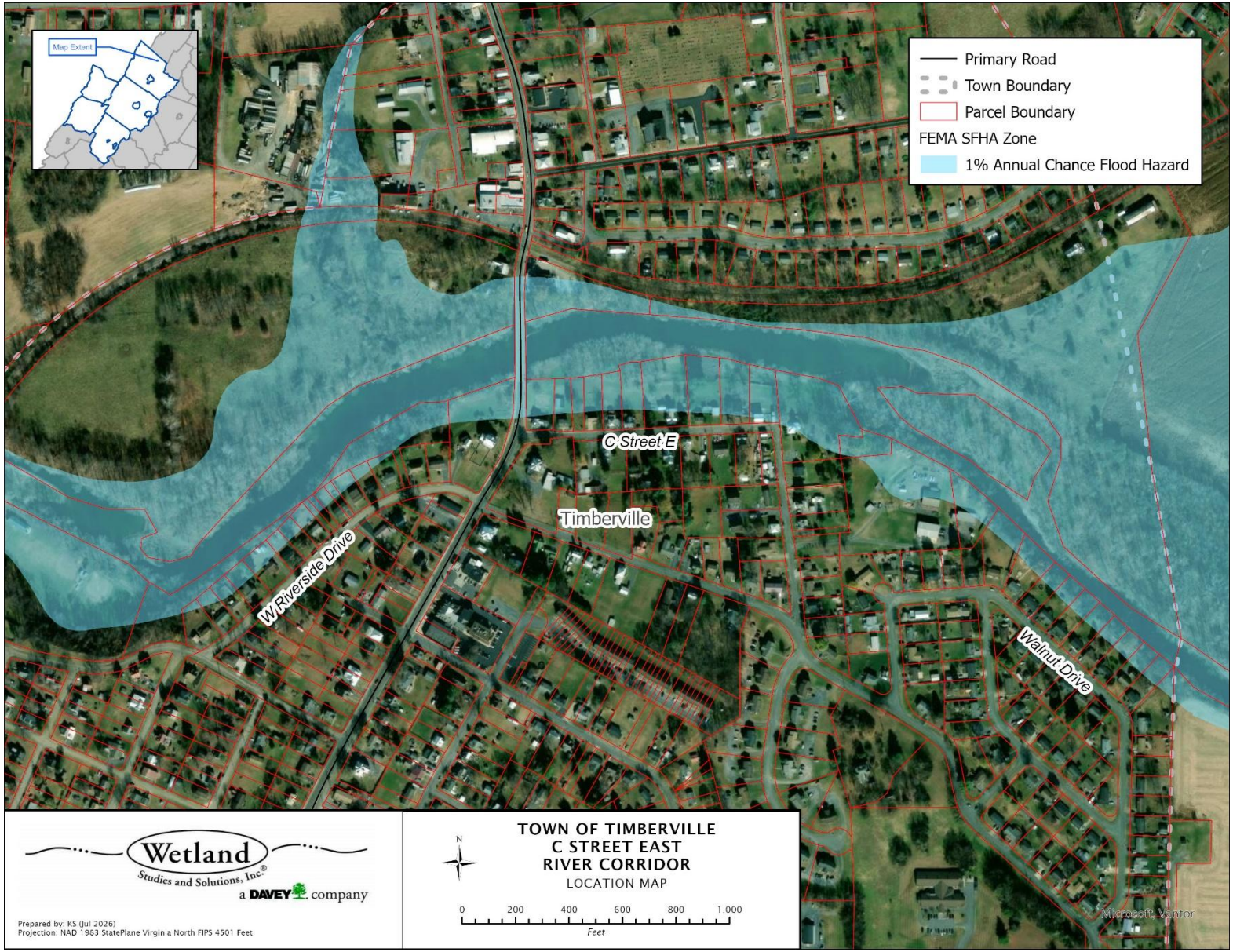

Figure 1. C Street East and North Fork Shenandoah River study corridor.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Flood Impact Study					**$55,000.00**
Existing Conditions Survey	1	LS	$25,000.00	$25,000.00	
H&H Study	1	LS	$30,000.00	$30,000.00	
Contingency (30%)					**$16,500.00**
TOTAL ESTIMATED BUDGET					**$71,500.00**

Possible Alternatives and Additional Considerations

Regional Context

If an effort is being made to establish a LOMA, it should be considered to expand the study area to include parcels on Riverside Drive that may also be sporadically included in insurance requirements.

TMDL/MS4 Considerations

The watershed drains to the North Fork of the Shenandoah River, which has a benthic impairment, but no benthic stressor analysis or TMDL has been completed to positively identify pollutants of concern. Rockingham County became an MS4 permittee in 2025.

Assumptions

Assumed no repetitive loss structures in the study area.

Recommended Next Steps

Evaluate prioritization of this work and pursue funding as appropriate.

References

VADEQ. 2020. Final 2024 305(b)/303(d) Water Quality Assessment Integrated Report. Available at: https://www.deq.virginia.gov/our-programs/water/water-quality/assessments/integrated-report. Accessed 12 October 2026.

PROJECT IDENTIFICATION
TOWN OF TIMBERVILLE
MAPLE AVENUE DRAINAGE DITCH SYSTEM IMPROVEMENTS

Location Description
38.63256, -78.76666
Drainage ditch/swale system originating behind homes on Maple Avenue, running northeast through residential areas, crossing Pine Street, Oak Street, and Walnut Drive, and discharging into the North Fork of the Shenandoah River. The corridor runs through backyards of 1960s-era residential development between Maple Avenue and the river.

Project Issue
Stormwater system capacity – aging drainage ditch system has visibly lost definition and grade from decades of sediment deposition, causing sheet flow into adjacent yards and prolonged standing water. Existing grade drop through the neighborhood is small, preventing Town crews from being able to pursue grading without engineering analysis to ensure adequate drainage and prevent ponding. The upper Maple Avenue section is well-defined and was improved by Town crews previously; the discharge to the river is noted by the Town as well-defined and adequate.

Project Purpose
Restore adequate drainage definition and grade in the middle section of the Maple Avenue ditch corridor to eliminate sheet flow flooding into adjacent yards and reduce prolonged standing water following rain events.

Identified Constraints
a. Homeowner coordination and land acquisition and/or easements necessary
b. Existing infrastructure
c. VDOT involvement

Additional Information Needed
a. Presence of utilities
b. Survey of current drainage infrastructure

Project Proposal and Planning-Level Cost Estimate
The first phase of work will need to be an assessment and survey of current infrastructure and drainage paths (**Figure 1**). Work is anticipated to consist of re-establishing existing/historic drainage paths/ditches, with possible culvert up-sizing in some areas. Culvert replacements as needed for crossing residential driveways will require significant coordination with residents.

Vegetation establishment in drainage paths should be prioritized to prevent erosion and to benefit from the increased infiltration capacity and pollutant treatment capabilities of grassed channels.

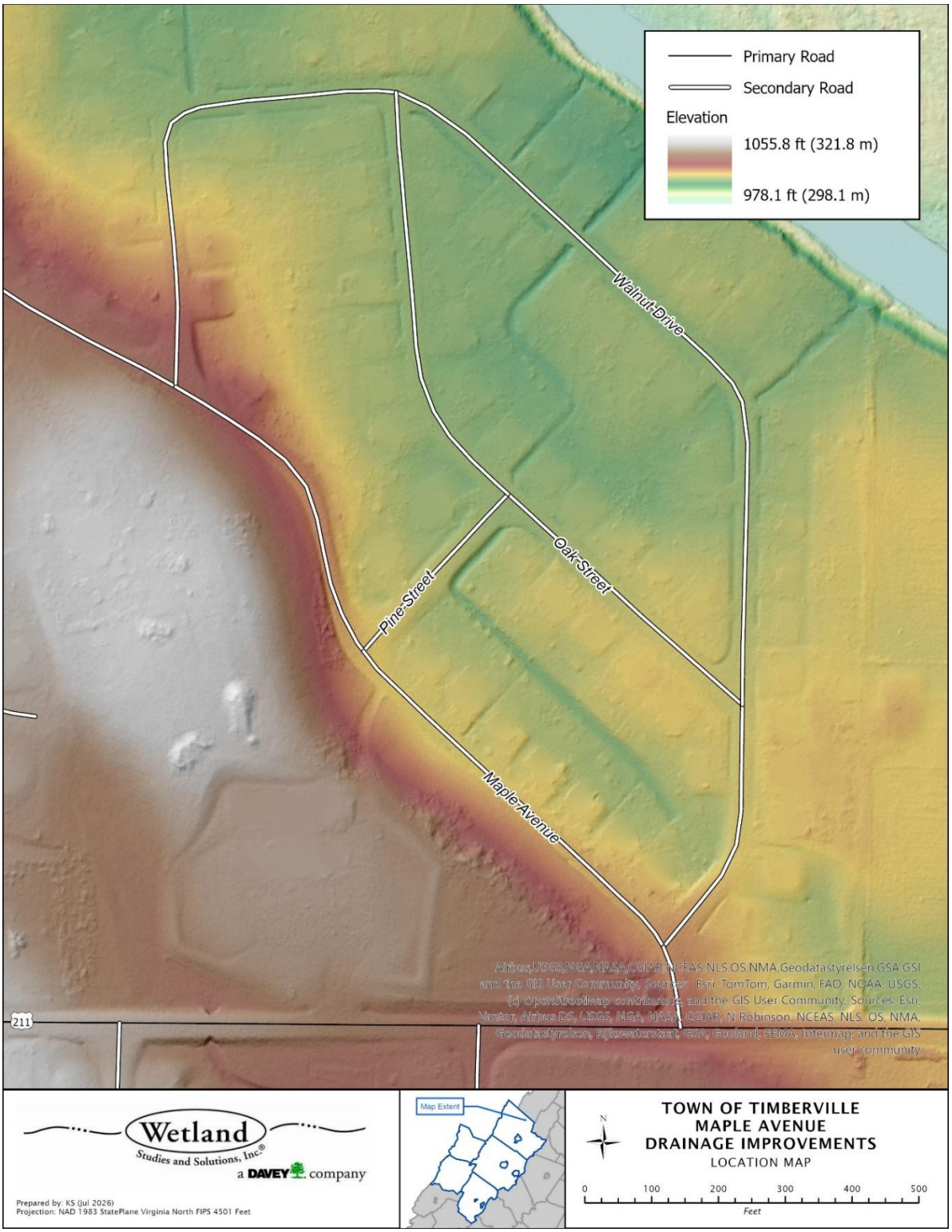

Figure 1. Topography of Maple Avenue – Walnut Drive neighborhood, showing extant ditch lines (ESRI world elevation image services).

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Survey and Design					**$109,000**
Construction Administration and Oversight					**$20,000**
Access and Erosion/Sediment Control					**$82,000**
Construction					**$453,800**
Stakeout	1	LS	$18,000.00	$18,000.00	
As-Built Survey	1	LS	$18,000.00	$18,000.00	
Mobilization	1	LS	$25,000.00	$25,000.00	
Excavation & Hauling	240	CY	$45.00	$10,800.00	
Culvert Pipe	750	LF	$190.00	$142,500.00	
Ditch Excavation	6500	LF	$30.00	$195,000.00	
Permanent Seeding	50	LB	$10.00	$500.00	
Erosion Control Matting	4500	SY	$2.00	$9,000.00	
Pavement Patching	500	SQ YD	$70.00	$35,000.00	
Contingency (30%)					**$199,440**
TOTAL ESTIMATED BUDGET					**$864,240**

The table above presents estimated costs for an existing conditions survey and an H&H study to assess the current condition of the stormwater system and identify constrictions, followed by design and implementation of a ditch revitalization effort in the subdivision to re-establish positive drainage. The ditch revitalization access and ESC incorporates a set-aside for traffic control which may prove less expensive in practice given the low anticipated traffic.

Possible Alternatives and Additional Considerations

If feasible, drainage paths can be evaluated for possible installation of dry swales (featuring engineered soil media and underdrains) to increase infiltration further. However, the added maintenance requirements of a BMP with underdrain feature must be weighed against the capacity of the Town to perform such upkeep. A French drain system has been implemented in another nearby section of neighborhood and could be expanded if that is preferred over an open channel.

Residents in the area can be encouraged to install residential-scale stormwater management practices to enhance the flooding reduction efforts, such as rain gardens (micro-bioretention) and rain barrels. The Shenandoah Valley Soil and Water Conservation District (SVSWCD) administers the Virginia Conservation Assistance Program (VCAP), which can be another source of funding for these sorts of residential projects.

Downstream Impacts

The downstream outfall to the North Fork Shenandoah River is noted by the Town as currently stable. Design work will need to evaluate the long-term stability of this outfall and consider impacts of improved upstream flows on this outfall.

TMDL/MS4 Considerations

The watershed drains to the North Fork of the Shenandoah River, which has a benthic impairment, but no benthic stressor analysis or TMDL has been completed to positively identify pollutants of concern (as of 2026). Rockingham County became an MS4 permittee in 2025.

Assumptions

Existing outfalls from the neighborhood to the river are assumed to be stable conveying the current stormwater load. An estimated 5,000 linear feet of ditches along roadway and an additional 1,500 linear feet of ditches separate from roads are included in cost estimate, along with replacement of 25 driveway culverts.

Recommended Next Steps

Coordinate VDOT involvement as necessary and pursue funding.

References

ESRI World Elevation Services
https://elevation.arcgis.com/arcgis/rest/services/WorldElevation/Terrain/ImageServer
Accessed 7/28/2026

PROJECT IDENTIFICATION

TOWN OF TIMBERVILLE

MEMORIAL PARK RIVER CHANNEL ASSESSMENT AND IMPROVEMENTS

Location Description

38.63596, -78.78047

Memorial Park along the North Fork of the Shenandoah River within the town.

Project Issue

Sediment and river rock accumulation along the near bank at Memorial Park has narrowed the active channel and shifted it toward the far bank over decades. The last formal channel work was Army Corps dredging in the 1980s. Town staff note primary concerns are channel navigability and recreational use rather than active flood risk to structures.

Project Purpose

Assess extent of sediment and gravel accumulation and channel migration at Memorial Park and determine whether a channel restoration project would provide meaningful flood management benefit or primarily serves navigability and recreational purposes.

Identified Constraints

a. Infrastructure (upstream railroad bridge)
b. Work within river channel requires federal and state permitting (USACE, DEQ.)

Additional Information Needed

a. Presence of utilities
b. Erosion/sedimentation extent and rate

Project Proposal and Planning-Level Cost Estimate

While a formal sediment transport analysis has not been completed, based on aerial imagery from 1997 through 2025 it appears that the channel has progressed through a period of active bar migration and has reached what appears to be a stable geomorphology (**Figure 1** through **Figure 8**; river flows from left to right in images). Possibly as a result of the noted dredging completed in the 1980s, a point bar is visible in 1997 aerial imagery forming at the upstream end (left side of image) of the straight reach that flows under the railroad bridge and along the park site (Memorial Park located in bottom right quadrant of images). The point bar is then visibly, steadily migrating downstream from 2000 through 2011, when it reaches its current location downstream of the railroad bridge and adjacent to Memorial Park.

Signage was noted within the park regarding a riparian buffer establishment project that appears to have been abandoned and is now a mown area (**Figure 9**). Re-establishing this buffer area, which is near the bend in the river at the downstream end of the park, would provide added stability to the banks in that area as well as increased ecological value. A study could be completed to assess the sediment transport of the reach in its current geometry to verify its apparent stability, but does not appear necessary at this time. Otherwise, no work is recommended in this area beyond establishing and maintaining a healthy riparian buffer.

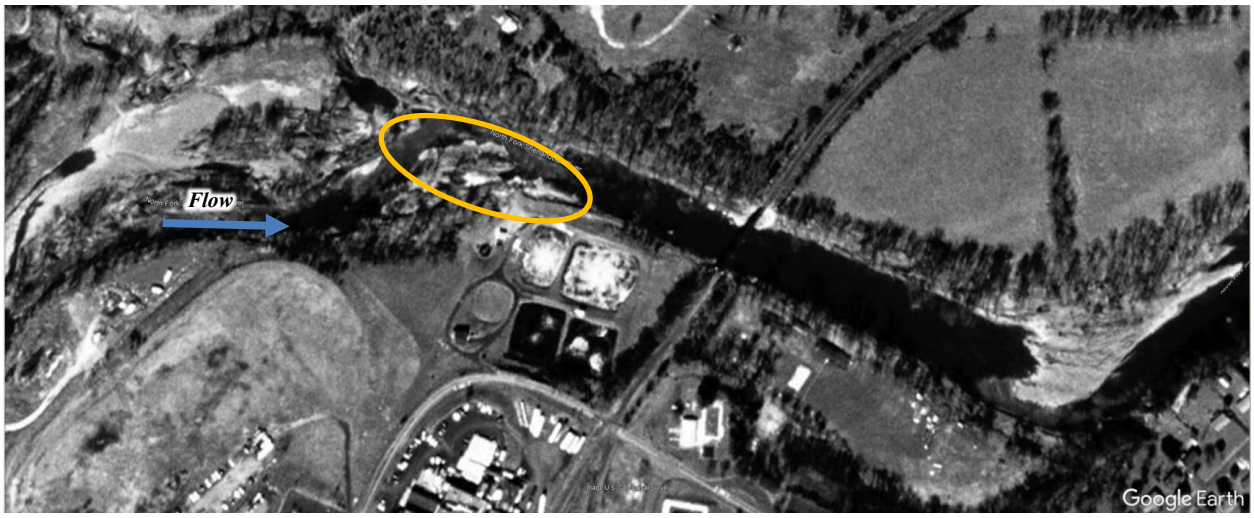

Figure 1. Google Earth imagery of site dated April 1997. Migrating sediment highlighted with ellipse.



Figure 2. Google Earth imagery of site dated March 2000. Migrating sediment highlighted with ellipse.



Figure 3. Google Earth imagery of site dated December 2002. Migrating sediment highlighted with ellipse.



Figure 4. Google Earth imagery of site dated September 2005. Migrating sediment highlighted with ellipse.

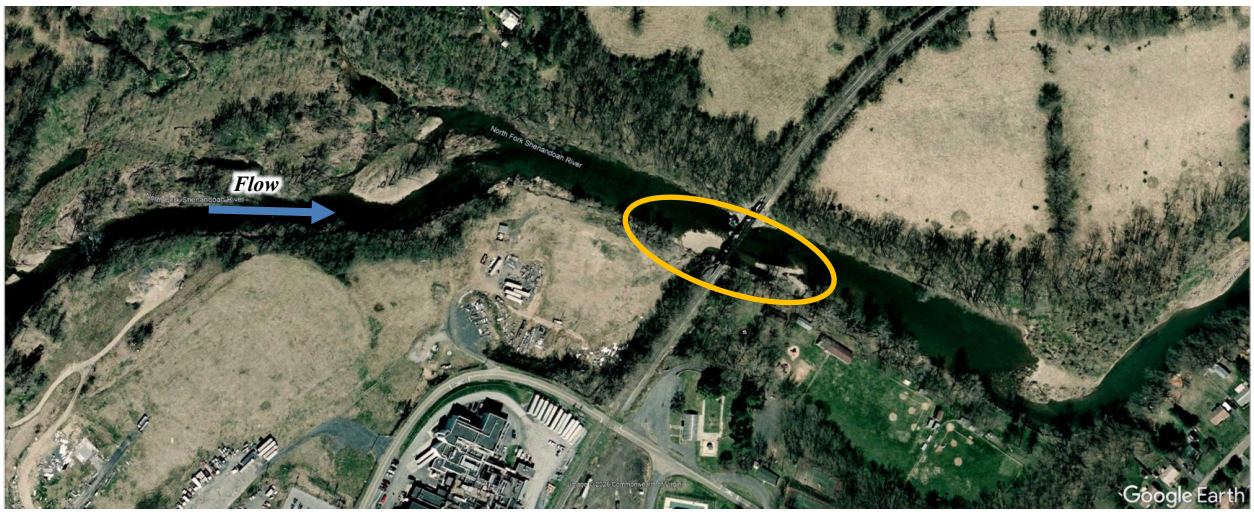

Figure 5. Google Earth imagery of site dated April 2007. Migrating sediment highlighted with ellipse.



Figure 6. Google Earth imagery of site dated October 2008. Migrating sediment highlighted with ellipse.



Figure 7. Google Earth imagery of site dated September 2011. Migrating sediment highlighted with ellipse.



Figure 8. Google Earth imagery of site dated April 2025. Migrating sediment highlighted with ellipse.



Figure 9. Mown riparian buffer toward eastern end of Memorial Park.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Riparian Buffer Re-Establishment					**$2,870**
Riparian Buffer Seed and Straw	330	SY	$3	$990	
Live Stakes	100	EA	$10	$1,000	
Tubelings	110	EA	$8	$880	
Contingency (30%)					**$860**
TOTAL ESTIMATED BUDGET					**$3,730**

Possible Alternatives and Additional Considerations

Assuming the point bar is indeed in a stable configuration, the Town may want to explore an additional reinforced path to the river. There is currently a kayak/canoe slip at the park, but there is significant erosion potential at the current unofficial river access near the railroad bridge.

TMDL/MS4 Considerations

The watershed drains to the North Fork of the Shenandoah River, which has a benthic impairment, but no benthic stressor analysis or TMDL has been completed to positively identify pollutants of concern (as of 2026). Rockingham County became an MS4 permittee in 2025.

Assumptions

100 linear feet of bank for live stakes, 3,000 square feet of riparian planting with tubelings

Recommended Next Steps

Evaluate prioritization of plantings and offset maintenance needs (mowing) and pursue funding as appropriate.

PROJECT IDENTIFICATION
TOWN OF TIMBERVILLE
RESERVOIR LANE/ RILL ROAD DRAINAGE NETWORK

Location Description
38.64705, -78.76868
North side of Timberville off of State Route 42 (North Main Street) around the intersection of Reservoir Lane and Rill Road, north of the Living Waters Senior Care center. Site was approved for a 148-unit mixed residential development site (5 of 148 units built). Drainage flows south/southeast along Park Avenue, crosses Belvedere Street, continues to State Route 42 near Spar Mine Road where VDOT drop inlet collects flow; long culvert conveys drainage across State Route 42 to stream discharge.

Project Issue
Concern for future stormwater drainage capacity — large drainage basin on north side of town currently has limited development. The drainage capacity is described by Town staff as "not horrible" at present, the primary concern is proactive: if the 148-unit development site or a future redevelopment is built out, significantly more impervious surface would be added, potentially overwhelming the existing VDOT infrastructure at the State Route 42 drop inlet.

Project Purpose
Evaluate existing drainage infrastructure at Route 42 and capacity for future development buildout proactively.

Identified Constraints
a. Probability of land acquisition and/or easements necessary
b. Existing infrastructure
c. VDOT jurisdiction over State Route 42 drop inlet and culvert.

Additional Information Needed
a. Presence of utilities
b. Sizing and design for VDOT drainage system of concern
c. Design plans and status of basin

Project Proposal and Planning-Level Cost Estimate
If available, VDOT design information for State Route 42 drainage infrastructure should be evaluated to assess current capacity and any projected land use changes incorporated into the design. Current infrastructure should be evaluated for any blockages. All land disturbing activities greater than one acre (or less than one acre but part of a larger common plan of development greater

than one acre) are subject to the water quantity criteria of 9VAC25-875-600 which requires flood protection of downstream properties of the 10-year 24-hour storm event. However, VDOT's current minimum design standard for primary road culvert capacity is the 25-year storm (4% annual risk).

Any future development in the area should be closely reviewed in the design stage to ensure that Virginia requirements for flood protection are being appropriately met. Rockingham County is the local VESMP (Virginia Erosion and Stormwater Management Program) Authority which would be responsible for reviewing stormwater quality and quantity requirements for permitting future development. Coordination between the Town and County on this review will be important to ensuring future development does not detrimentally impact the stormwater flow through the downstream neighborhoods.

Some of the previously approved development has already been completed, including the installation of a large basin, prior to the developer falling through (**Figure 1**). The stage of completion and design of the stormwater infrastructure should be evaluated to ensure all current design standards are being met if there is concern regarding the status of existing stormwater infrastructure, particularly prior to future development in the same area.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Local Stormwater Study					**$42,000**
Stormwater Infrastructure Survey	1	LS	$12,000	$12,000	
Preliminary Engineering Report	1	LS	$30,000	$30,000	
Contingency (30%)					**$12,600**
TOTAL ESTIMATED BUDGET					**$54,600**



Figure 1. Location of area of concern and layout of drainage network.

Possible Alternatives and Additional Considerations

A regional BMP could be considered for this area if the planned development strategy of residences built under a common plan of development ends up not being the eventual path. Individual residences built separately under separate contractors and permits may not be subject to the state water quantity criteria (9VAC25-875-600) and could cumulatively increase the flood risk downstream. However, the current projected development strategy leaves the responsibility of not increasing downstream flooding associated with the 10-year storm on the developer, relieving the Town of that burden. Additionally, more restrictive stormwater quantity management requirements could be incorporated into the Town Ordinances and zoning requirements.

Regulatory Changes

If a regional BMP is considered, its implementation could support the need to consider regulatory changes regarding future development. A rider or other legal covenant for future development within the contributing watershed to provide for maintenance of a regional BMP should be evaluated. More restrictive stormwater quantity management requirements could also be incorporated into the Town Ordinances. Rockingham County is the local VESMP (Virginia Erosion and Stormwater Management Program) Authority which is responsible for reviewing stormwater quality and quantity requirements for permitting future development, so coordination with Rockingham County will be an important factor in considering regulatory restrictions.

TMDL/MS4 Considerations

The watershed drains to the North Fork of the Shenandoah River, which has a benthic impairment, but no benthic stressor analysis or TMDL has been completed to positively identify pollutants of concern (as of 2026). Rockingham County became an MS4 permittee in 2025.

Assumptions

Stormwater infrastructure mapping will be necessary to evaluate the current conditions and the impacts of future development.

Recommended Next Steps

Review design plans and any as-built information regarding the stormwater basin. Contact VDOT regarding design of State Route 42 drainage infrastructure.

References

VDOT Drainage Manual. 4/1/2002 rev. 7/8/2026 https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/technical-guidance-documents/drainage-manual/

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PROJECT IDENTIFICATION
TOWN OF TIMBERVILLE
ROUTE 211 STORMWATER CONCENTRATION POINT DRAINAGE IMPROVEMENTS

Location Description
38.63114, -78.77348
Route 211 (New Market Road) at the culvert/drainage concentration point between Walmart and Tractor Supply and downstream flooding in Virginia Avenue and Maple Avenue neighborhoods.

Project Issue
Stormwater system capacity – stormwater runoff from an approximately 544-acre watershed funnels north to a single point on Route 211, causing flooding in the Virginia Ave and Maple Ave neighborhoods during significant rain events. The entire south-side growth area is contained within this watershed and any future development in the growth area will directly worsen the problem.

Project Purpose
Manage stormwater from the ~544-acre drainage basin by providing regional-scale attenuation upstream of the State Route 211 concentration point to reduce flooding in the Virginia Ave and Maple Ave residential neighborhoods.

Identified Constraints
Probability of land acquisition and/or easements necessary

Additional Information Needed
Request design parameters/H&H study from VDOT for culvert under State Route 211

Project Proposal and Planning-Level Cost Estimate
This is a two-part project: addressing current and future expansion of stormwater flowing to the State Route 211 culvert, and addressing the downstream outlet of stormwater as it is routed around the Tractor Supply building into the Virginia Avenue community.

Two viable locations have been identified for a regional/community-scale nature-based BMP (e.g. wet pond, constructed wetland, or regional bioretention basin) to attenuate runoff upstream of the State Route 211 crossing (**Figure 1**).

One possible location is the parcel directly east of Walmart and its existing stormwater control basin, and the Town has already been in contact with the property owner (Quail Lane Farm LLC). A second possible location for a regional BMP is to the south, between Plains Elementary School and the American Legion Park. This location would intercept a slightly smaller watershed area

(0.65 vs 0.8 sq mi), but the Town already owns a 3.2 acre parcel currently part of the American Legion Park that could viably be converted, adjacent to the School property. Through signage and intentional design, the BMP could also become a 'learning location' to increase awareness of stormwater impacts and ecology, considering the proximity to the school and park. Incursion onto the American Legion Park property could potentially be offset by acquisition of open space just up the road currently owned by the Timber Hills HOA, which could then be converted into additional park space to benefit the community.

The box culvert under State Route 211 routes water to the north side of State Route 211 and into the Tractor Supply property (**Figure 2**, **Figure 3**), where flow is conveyed around the building in a large swale with periodic stone check dams. Near where flow leaves the property, it is routed through a four-barrel culvert crossing before exiting the Tractor Supply property into a much smaller and less defined channel running between two residences (196 and 220 Virginia Ave) (**Figure 4**, **Figure 5**). Given the size of the box culvert under State Route 211, overall size of the contributing drainage area, and apparent blockage of portions of the culvert conveying the flow under Virginia Avenue, it is not surprising that there have been complaints from residents about flooding in this area. Design of an upstream BMP should be considered in the method proposed to address channel adequacy in this location, as well as adequacy of conveyance further downstream (see 'Additional Considerations' below).

The culvert crossings of State Route 211 are presumably designed to convey VDOT's minimum design standard of a 25-year storm event (4% annual risk) for primary roadways. VDOT's standard sizing for culverts under local streets is the 10-year storm event (10% annual risk). The interplay between these two standards as well as what the design capacity was and the effective capacity currently is along the flow path needs to be evaluated. It appears that the channel between Tractor Supply and Virginia Avenue and the culverts under Virginia Avenue are no longer meeting their design capacity. The culverts should be cleared of accumulated sediment and obscuring vegetation. Design calculations should be completed to determine if the channel as designed would be adequate. Based on the results of the calculations, the channel should either be restored to design dimensions and revegetated or an alternative design developed. There is potentially space to expand the existing open ditch to Virginia Avenue and incorporate an improved grassed swale design to increase infiltration, but the installation of a buried storm drain should also be evaluated given the proximity of the houses, which may limit the ability to increase the capacity of the channel via grading alone. The ultimate design solution is likely a combination of grey and green practices.

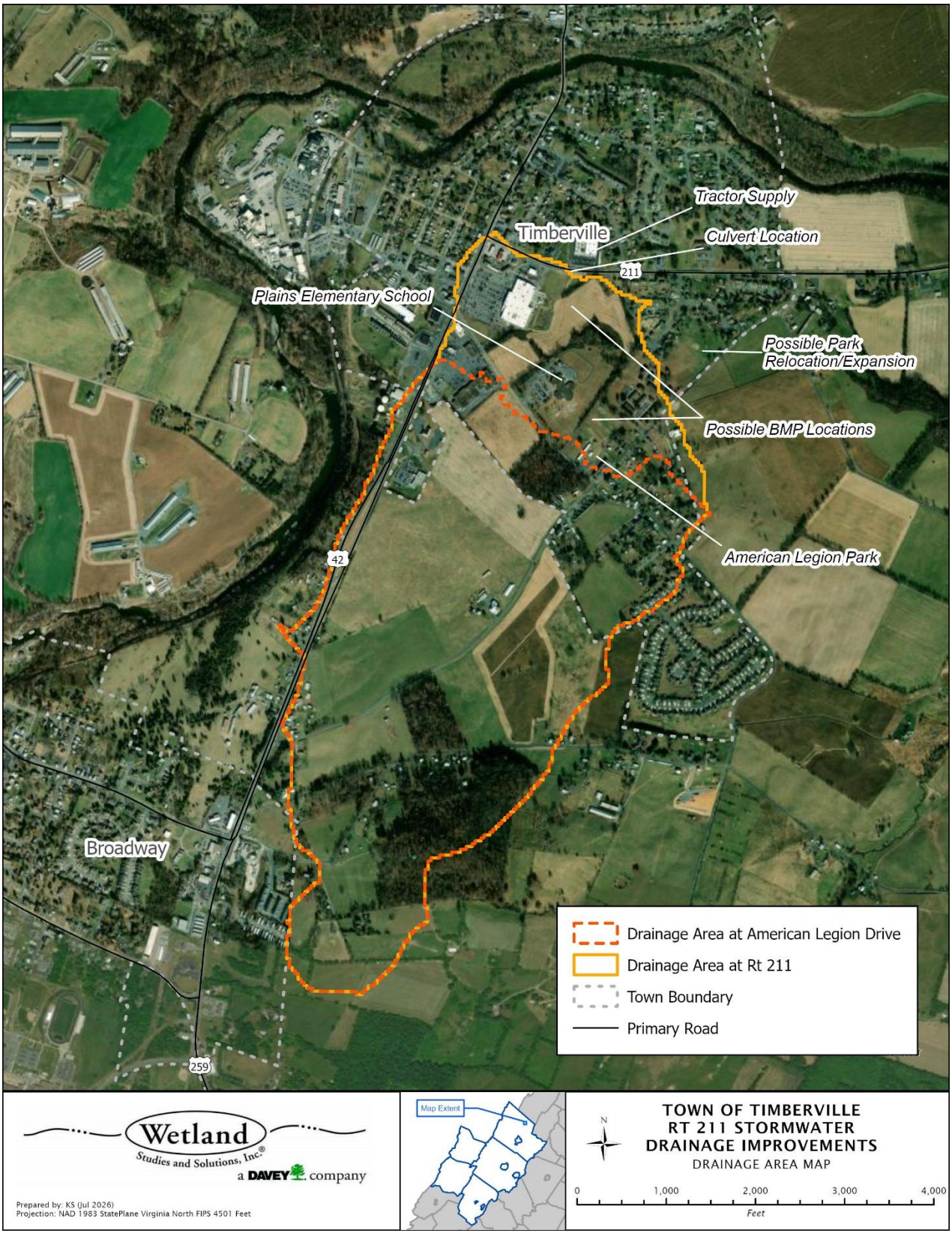

Figure 1. Map of drainage area to culvert conveying flow to north side of State Route 211 and potential BMP locations.



Figure 2. Map of current downstream routing of stormwater existing conveyance channel around Tractor Supply.



Figure 3. Culvert crossing State Route 211 viewed from upstream (left) showing potential location for regional BMP in the foreground and from downstream within Tractor Supply parking lot (right).



Figure 4. Four-barrel culvert crossing (left) in conveyance channel around Tractor Supply and immediate outfall (right) into grass lined channel between adjacent residential properties. Concrete visible in right image is the top of the culvert crossing shown in the left image.



Figure 5. Grassed channel immediately downstream of Tractor Supply outfall (left), facing west from Virginia Avenue and four-barrel culvert under Virginia Avenue (right, again facing west). Four-barrel culverts are almost fully obscured and likely at least partially blocked on the upstream side by bushy vegetation visible in foreground of image at left.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Survey and Design					**$350,000**
Construction Administration and Oversight					**$150,000**
Access and ESC					**$160,000**
Construction - Extended Detention Basin					**$2,598,000**
Stakeout and As-Built	1	LS	$40,000	$40,000	
Mobilization	1	LS	$163,000	$163,000	
Grading, Excavation, and Hauling	40,000	CY	$50	$2,000,000	
Outlet Structure	1	EA	$70,000	$70,000	
Forebay	1	EA	$75,000	$75,000	
Emergency Spillway	1	EA	$50,000	$50,000	
Vegetation Establishment (Woody and Herbaceous)	1	LS	$200,000	$200,000	
Construction - Virginia Avenue Conveyance					**$12,000**
Grassed Channel Re-establishment	400	LF	$30	$12,000	
Contingency (30%)					**$981,000**
TOTAL ESTIMATED BUDGET					**$4,251,000**

The table above presents estimated costs for an existing conditions survey and an H&H study, followed by design and construction of an extended detention basin. Re-establishing the channel geometry of the channel at Virginia Avenue is incorporated and the H&H study should evaluate if the assumed design geometry and culverts are adequate. Re-excavating the channel at Virginia Avenue could be handled prior to the H&H study to rapidly improve the flooding impacts in that area, with the understanding that further study could show that more work for re-sizing may be needed.

Handling of soil material and potential beneficial reuse could significantly reduce the overall project cost. Options for methods to reduce the volume or cost of disposal of excavated material from basin construction should be explored in design, including re-use as earthen baffles to increase residence time and microtopography for enhanced ecological benefit, re-use on nearby farms, etc.

Possible Alternatives and Additional Considerations

A range of potential BMPs could likely be installed, e.g. dry pond, wet pond, constructed wetland, or bioretention basin, and each alternative should be evaluated as part of the design process and perhaps used in concert where added benefits of multiple methods could be realized. Depending on the final design criteria, the BMP could be designed to also serve as a park area with walking paths, benches, and educational signage.

Another feasible alternative to reducing flooding in the Virginia Avenue neighborhood could be piping some or all of the flow currently concentrating at State Route 211 and conveying it directly east along State Route 211 to the downstream channel, avoiding flowing through the loop of drainageway on the north side of State Route 211. The downstream channel south of State Route 211 across from the Timberview Crossing Assisted Living facility (**Figure 2**) appears to have significantly more channel capacity than the channel between Tractor Supply and Virginia Avenue as compared to the size of culverts traversing State Route 211 (**Figure 6**).



Figure 6. Downstream drainage channel south of State Route 211 (at left, wing walls of box culvert visible) as channel flows south then turns east and continues through trees in background (photo taken facing east).

Any future development in the area should be closely reviewed in the design stage to ensure that Virginia requirements for flood protection are being met. Rockingham County is the local VESMP (Virginia Erosion and Stormwater Management Program) Authority which would be responsible for reviewing stormwater quality and quantity requirements for permitting future development. Coordination between the Town and County on this review will be important to ensuring future development does not detrimentally impact the stormwater flow through the downstream neighborhoods.

Downstream Impacts

Design of a regional BMP and/or any proposed changes to the downstream outlet handling flow leaving the Tractor Supply property will need to be assessed in conjunction with evaluation of the downstream crossing where flow is conveyed back across State Route 211 near the Timberview Crossing Assisted Living facility to the east (**Figure 2**).

Regulatory Changes

The watershed draining to this proposed BMP is considered the primary growth area for the Town, supporting the need to consider regulatory changes regarding future development. A rider or other legal covenant for future development within the contributing watershed to provide for maintenance of the BMP should be evaluated. More restrictive stormwater quantity management requirements could also be incorporated into the Town Ordinances. A significant part of the drainage area is outside of the Town boundary, however, so coordination with Rockingham County will be an important factor in considering regulatory restrictions.

TMDL/MS4 Considerations

The watershed drains to the North Fork of the Shenandoah River, which has a benthic impairment, but no benthic stressor analysis or TMDL has been completed to positively identify pollutants of concern (as of 2026). Rockingham County became an MS4 permittee n 2025.

Assumptions

Watershed (via StreamStats 6/12/2026) is 0.8 square miles (512 ac) south of State Route 211.
Watershed (via StreamStats 7/22/2026) at Plains Elementary is 0.65 square miles (416 ac).

Excavation volumes approximated at a 3 acre footprint and an average of 8 ft excavation depth. Calculations for design in further iterations will refine the volume estimates.
Cost estimate does not include property acquisition.

Recommended Next Steps

Re-establish channel and clear culvert under Virginia Avenue. Evaluate pursuit of design for regional BMP.

References

USGS. StreamStats v4.33.0. Accessed online 1 June 2026.

VDOT Drainage Manual. 4/1/2002 rev. 7/8/2026 https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/technical-guidance-documents/drainage-manual/