PROJECT IDENTIFICATION

TOWN OF GROTTOES

CHERRY AVENUE ROADSIDE DITCH SAFETY (10TH TO 12TH STREETS)

Location Description

38.269619, -78.822676

Ditch lines along Cherry Avenue from approximately 10th through 12th Street.

Project Issue

Stormwater infrastructure causing safety hazard – very deep ditches (3+ feet) along Cherry Avenue causing safety concern for drivers given the relatively narrow shoulder.

Project Purpose

Address flooding and safety issues along Cherry Avenue.

Identified Constraints

a. Probability of land acquisition and/or easements necessary
b. Existing infrastructure, utilities, and buildings

Additional Information Needed

a. Presence of utilities, easements
b. Stormwater infrastructure survey and characterization

Project Proposal and Planning-Level Cost Estimate

This set of ditches is significantly deeper than others in the area appearing to capture similar drainage areas. It appears that, given the very flat topography, depth was added to convey flow along Cherry Avenue from as far south as 7th Street north to Miller Run. The depth is necessary for positive flow rather than capacity. Re-routing portions of the drainage area across Cherry Avenue to join existing conveyances along Dogwood Avenue and then partially filling approximately 1,200 feet of ditchline along Cherry Avenue from 8th Street to Miller Run to appropriate depths could still adequately convey stormwater without the hazardously deep ditches. Any conveyance re-design will require a more thorough study and survey of the current infrastructure to determine if the target conveyances have adequate capacity to handle added drainage area east of Cherry Avenue. Re-routing flow from Cherry Avenue northwest towards Dogwood Avenue would require roadwork to install new culvert crossings.



Figure 1. Ditch depth greater than 3 feet along eastern side of Cherry Avenue facing south from Miller Run culvert.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Survey and Design					**$35,500**
Access and Erosion/Sediment Control					**$51,400**
Construction - Cherry Avenue Drainage Update					**$74,720**
Mobilization	1	LS	$2,200	$2,200	
Partial Ditch Fill	350	CY	$35	$12,250	
Grading	0.25	AC	$7,000	$1,750	
Culvert Pipe	250	LF	$190	$47,500	
Added Ditch Excavation	50	LF	$30	$1,500	
Permanent Seeding	12	LB	$10	$120	
Erosion Control Matting	1200	SY	$2	$2,400	
Pavement Patching	100	SQ YD	$70	$7,000	
Contingency (30%)					**$48,486**
TOTAL ESTIMATED BUDGET					**$210,106**

The table above presents estimated costs for the existing conditions survey, design, and construction of modifications to the stormwater system along Cherry Avenue to route portions of the drainage across Cherry Avenue rather than parallel and subsequently filling portions of the ditch line to remove hazardous drops.

Possible Alternatives and Additional Considerations

Portions of the ditch network could be evaluated for conversion to a bioretention with an underdrain system, depending on the relative elevations and contributing areas. The project may benefit from separating the stormwater study from the full drainage update design to allow flexibility in final design, which could open up additional funding opportunities (e.g. CFPF funding rate greater for nature-based projects).

Rather than raising the ditches and rerouting the flow, converting some of the open ditches to enclosed pipes could be an alternative, though that is anticipated to be a more expensive alternative.

TMDL/MS4 Considerations

Miller Run is part of a TMDL Implementation Plan to reduce sediment, phosphorus, and *E. coli* in the South River. Depending on the kind of project and its impact on these pollutants of concern, additional funding sources may be available to implement projects because of this approved Implementation Plan.

Assumptions

The culverts crossing Cherry Avenue at 8th street are assumed to be functional. Cost estimate assumes adding culverts under Cherry Avenue at 9th and 10th Streets and replacement of a culvert at 11th Street, as well as two driveway culverts along the approx. 1,200 ft of ditchline to be raised. Ditches receiving the re-routed drainage assumed to be adequate. The roadways of concern are understood to be maintained by the Town rather than VDOT.

Recommended Next Steps

Evaluate prioritization and funding options.

References

ECI. 2009. Bacteria and Benthic Total Maximum Daily Load Development for South River. https://www.deq.virginia.gov/home/showdocument?id=11162&t=637692104885470000.

VA DCR. 2010. South River and Christians Creek Water Quality Improvement Plan. https://www.deq.virginia.gov/home/showdocument?id=19282.

PROJECT IDENTIFICATION
TOWN OF GROTTOES
DOGWOOD AVENUE TRAIL EROSION

Location Description
38.272736, -78.823266
Length of pedestrian trail running parallel to Dogwood Avenue beginning at 14th Street

Project Issue
Advancing bank erosion of channel is encroaching on pedestrian walking trail running between the channel and Dogwood Avenue.

Project Purpose
Address channel erosion and protect infrastructure.

Identified Constraints
a. Existing infrastructure, utilities, and buildings

Additional Information Needed
a. Presence of utilities, easements
b. Site survey and characterization

Project Proposal and Planning-Level Cost Estimate
An asphalt trail along Dogwood Avenue from 20th Street to 14th Street connects the overall sidewalk network from the town park (John E. Painter Park) to the library on 6th Street and all the way to Grand Caverns Park and Pool. The small Miller Run stream crosses Dogwood Avenue at 14th Street and flows parallel to the trail and Dogwood Avenue (**Figure 1**). The channel is artificially straightened, trapezoidal, grass-lined, and regularly mown. Erosion along the channel threatens the adjacent trail in multiple locations, most imminently in the vicinity of 17th Street (**Figure 2**).

An assessment of channel geometry, slope, and anticipated low-flow and channel-forming (bankfull) flow rates will inform whether channel geometry modifications are warranted. Based on the conditions seen during a site visit (6/26/2026), WSSI staff feel that a vegetative approach could greatly improve long-term stability while also protecting important infrastructure. Plantings could also provide shade for the walking path as vegetation matures. The approximately 1,900 ft channel length from 14th Street to 20th Street could be planted with native riparian vegetation, maintaining an unplanted width to serve as a low-flow channel while vegetation establishes within

an approximately 30-ft average width riparian area centered on the current channel. The most severe bank erosion (approximately 300 ft) near 17th Street could be reinforced with stone toe.

A long-term maintenance plan should be developed to guide Town staff in what areas require mowing (or more importantly, should not be mowed). This plan should also outline an invasive species monitoring and treatment plan. Public awareness and cooperation will be important to foster a sense of ownership and understanding of the benefits of the proposed native vegetation for channel stability and habitat creation.



Figure 1. Trail near Dogwood Avenue (at right) and 14th Street intersection, facing northeast, with channel at left, walking trail at center, and Dogwood Avenue at right.



Figure 2. Steep, eroding bank immediately adjacent to walking trail (Town vehicle on trail) in the vicinity of 17th Street. Channel approximately 4-5 ft deep at this location. Photo taken facing northeast.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Survey and Design					**$70,000**
Construction Administration and Oversight					**$25,000**
Access and ESC					**$46,700**
Construction					**$80,000**
Stakeout and As-Built	1	LS	$36,000	$36,000	
Mobilization	1	LS	$20,000	$20,000	
Excavation	50	CY	$50	$2,500	
Grading	1	AC	$9,000	$9,000	
Stone Toe Stabilization	125	TN	$100	$12,500	
Planting					**$134,200**

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Native Seed and Natural Fiber Matting	500	SY	$12	$6,000	
Riparian Buffer Seed and Straw	5000	SY	$3	$15,000	
Live Stakes	3800	EA	$10	$38,000	
Tubelings	9400	EA	$8	$75,200	
Contingency (30%)					**$106,770**
TOTAL ESTIMATED BUDGET					**$462,670**

The table above presents estimated costs for the existing conditions survey, design, and construction of a stone toe reinforcement to arrest erosion in the most severe location and the installation of native riparian vegetation.

Possible Alternatives and Additional Considerations

Some cost savings could be attained by performing site assessments on this reach concurrently with the proposed Miller Run channel assessment work.

TMDL/MS4 Considerations

Miller Run is part of a TMDL Implementation Plan to reduce sediment, phosphorus, and *E. coli* in the South River. Depending on the kind of project and its impact on these pollutants of concern, additional funding sources may be available to implement projects because of this approved Implementation Plan.

Assumptions

The channel is assumed to not require any grade control structures due to the overall low slope (estimated less than 1%). Streambank and riparian plantings are assumed for the full 1,900 feet of channel from 14th Street to 20th Street, with 300 feet of stone toe installation. The roadways of concern are understood to be maintained by the Town rather than VDOT.

Recommended Next Steps

Evaluate prioritization and funding options.

References

ECI. 2009. Bacteria and Benthic Total Maximum Daily Load Development for South River. https://www.deq.virginia.gov/home/showdocument?id=11162&t=637692104885470000.

USGS. StreamStats v4.33.0. Accessed online 8 October 2026

VA DCR. 2010. South River and Christians Creek Water Quality Improvement Plan. https://www.deq.virginia.gov/home/showdocument?id=19282.

PROJECT IDENTIFICATION
TOWN OF GROTTOES
GRAND CAVERNS AND SOUTH RIVER ROAD

Location Description
38.259139, -78.832049
Entrance to Grand Caverns park area and intersection with South River Road.

Project Issue
Riverine flooding – flooding occurs in Grand Caverns park area and South River Road during major events.

Project Purpose
Assess flooding and safety issues in the Grand Caverns park area.

Identified Constraints
a. Infrastructure
b. VDOT involvement (Grand Cavern Road bridge over South River)

Additional Information Needed
a. Presence of utilities, easements
b. Site survey and characterization

Project Proposal and Planning-Level Cost Estimate
The entirety of the Grand Caverns park is within the FEMA Special Flood Hazard Area (SFHA) (1% annual chance flood) and a regulatory floodway is identified just downstream of the Grand Cavern Road bridge (**Figure 1**). Several flow paths run along the park, crossing under Grand Cavern Road via bridges or culverts, which are activated during high flows. Some smaller flood events could be routed through these existing channels by purposefully expanding those channels as alternative flow paths. The level of their impact and which floods would activate them would need to be assessed through a hydrology and hydraulics (H&H) study. A berm runs along the edge of the park on the downstream side of the bridge (**Figure 2**), though there is a gap in the berm where it is closest to the bridge. Its effectiveness and utility should be evaluated in the H&H study to determine if it may be beneficial to either complete or remove the berm (**Figure 2**). Given the size of the South River watershed at Grottoes (approximately 222 square miles), the most effective flood impact measures may be related to early warning systems and evacuation protocols and floodproofing of structures in the floodplain.

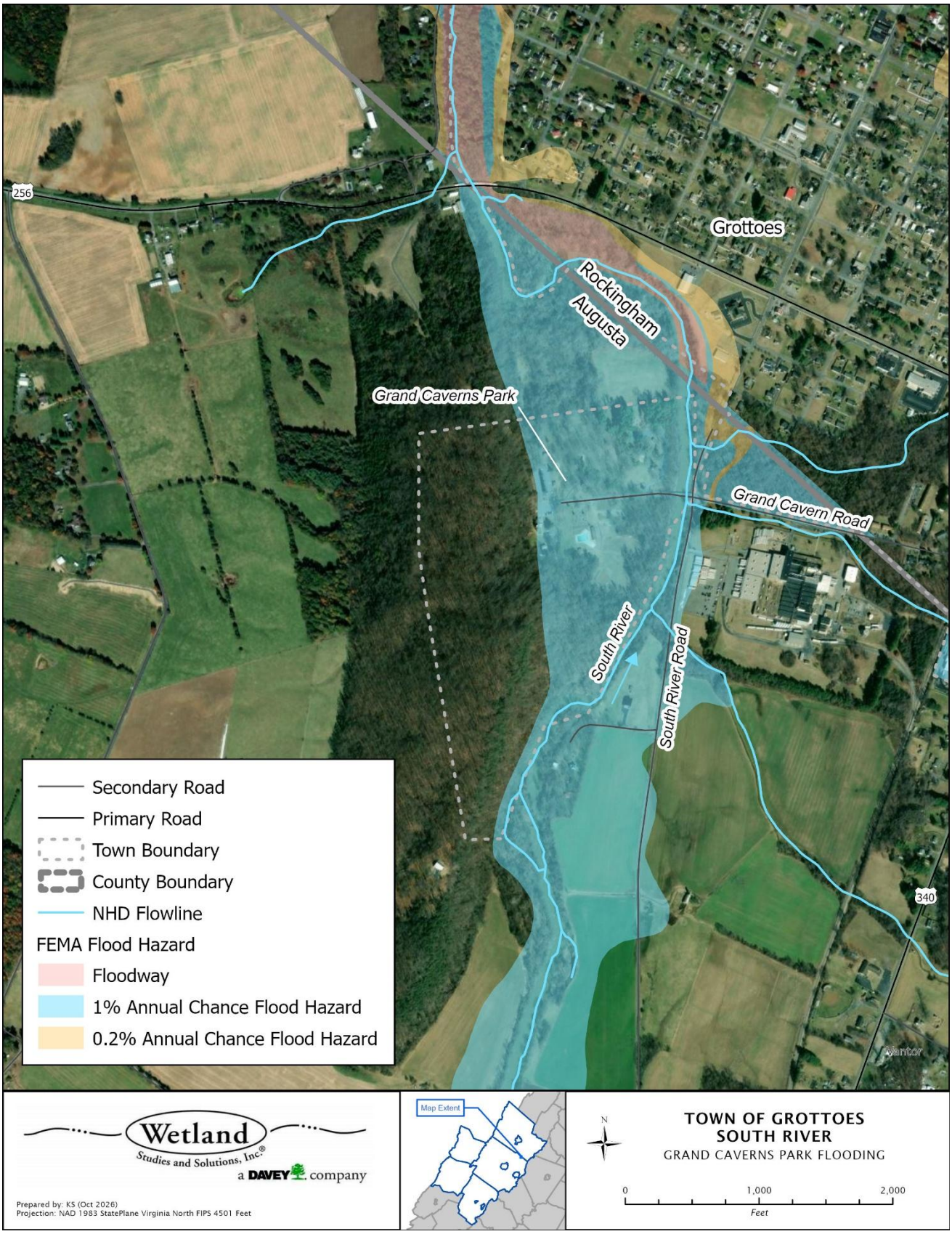

Figure 1. Map of FEMA flood hazard areas along Grand Cavern Road and South River Road.



Figure 2. Walking trail along South River (at right) at Grand Caverns park, berm (2-3 ft high) between parking area at left and walking trail.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Flood Impact Study					**$75,000**
Existing Conditions Survey	1	LS	$35,000	$35,000	
H&H Study	1	LS	$40,000	$40,000	
Contingency (30%)					**$22,500**
TOTAL ESTIMATED BUDGET					**$97,500**

Estimation of costs associated with construction-phase efforts will require additional study and scoping.

Possible Alternatives and Additional Considerations

Depending on the results of the H&H study, a re-design of the Grand Cavern Road bridge and/or portions of South River Road may be warranted, though the expense of reworking this infrastructure will likely be high.

Significant savings could be realized by combining a flood impact study at this location with a flood study at the nearby Holly Avenue/3rd Street/Weyers Cave Road location.

TMDL/MS4 Considerations

An approved TMDL Implementation Plan to reduce sediment, phosphorus, and *E. coli* has been developed for the South River. Depending on the kind of project and its impact on these pollutants of concern, additional funding sources may be available to implement projects because of this approved Implementation Plan.

Assumptions

The South River drainage area is approximated at 222 square miles (via StreamStats 10/8/2026).

Recommended Next Steps

Evaluate prioritization and funding options for survey and study.

References

ECI. 2009. Bacteria and Benthic Total Maximum Daily Load Development for South River. https://www.deq.virginia.gov/home/showdocument?id=11162&t=637692104885470000.

USGS. StreamStats v4.33.0. Accessed online 8 October 2026

VA DCR. 2010. South River and Christians Creek Water Quality Improvement Plan. https://www.deq.virginia.gov/home/showdocument?id=19282.

PROJECT IDENTIFICATION
TOWN OF GROTTOES
HOLLY AVENUE AND THIRD STREET FLOODING

Location Description
38.265671, -78.835339
Adjacent to the intersection of Holly Avenue and 3rd Street.

Project Issue
Riverine flooding – flooding reported on Holly Avenue, 3rd Street, and Bingham Road during major events.

Project Purpose
Assess flooding and safety issues in the Holly Avenue/3rd Street intersection area.

Identified Constraints
a. Infrastructure
b. VDOT involvement

Additional Information Needed
a. Presence of utilities, easements
b. Site survey and characterization

Project Proposal and Planning-Level Cost Estimate
The FEMA Flood Hazard Area mapping in the vicinity of the Holly Avenue and 3rd Street intersection includes regulatory floodway in addition to the Special Flood Hazard Area (SFHA) (1% annual chance flood) polygon (**Figure 1**). However, the 3rd Street/Weyers Cave Road bridge appears to be at the upper bound of a previous flood study that mapped the regulatory floodway and appears to be cut off at approximately the county boundary. Town staff noted that while the report of flooding in this area was submitted by a VDOT stakeholder, it was not an observed issue from the Town itself. The level of flooding and extent of impacts in this area would need to be assessed through a hydrology and hydraulics (H&H) study. The interaction of riverine flooding and stormwater infrastructure from the town at this intersection may be a contributing factor, but full mapping of the stormwater system is not yet complete.

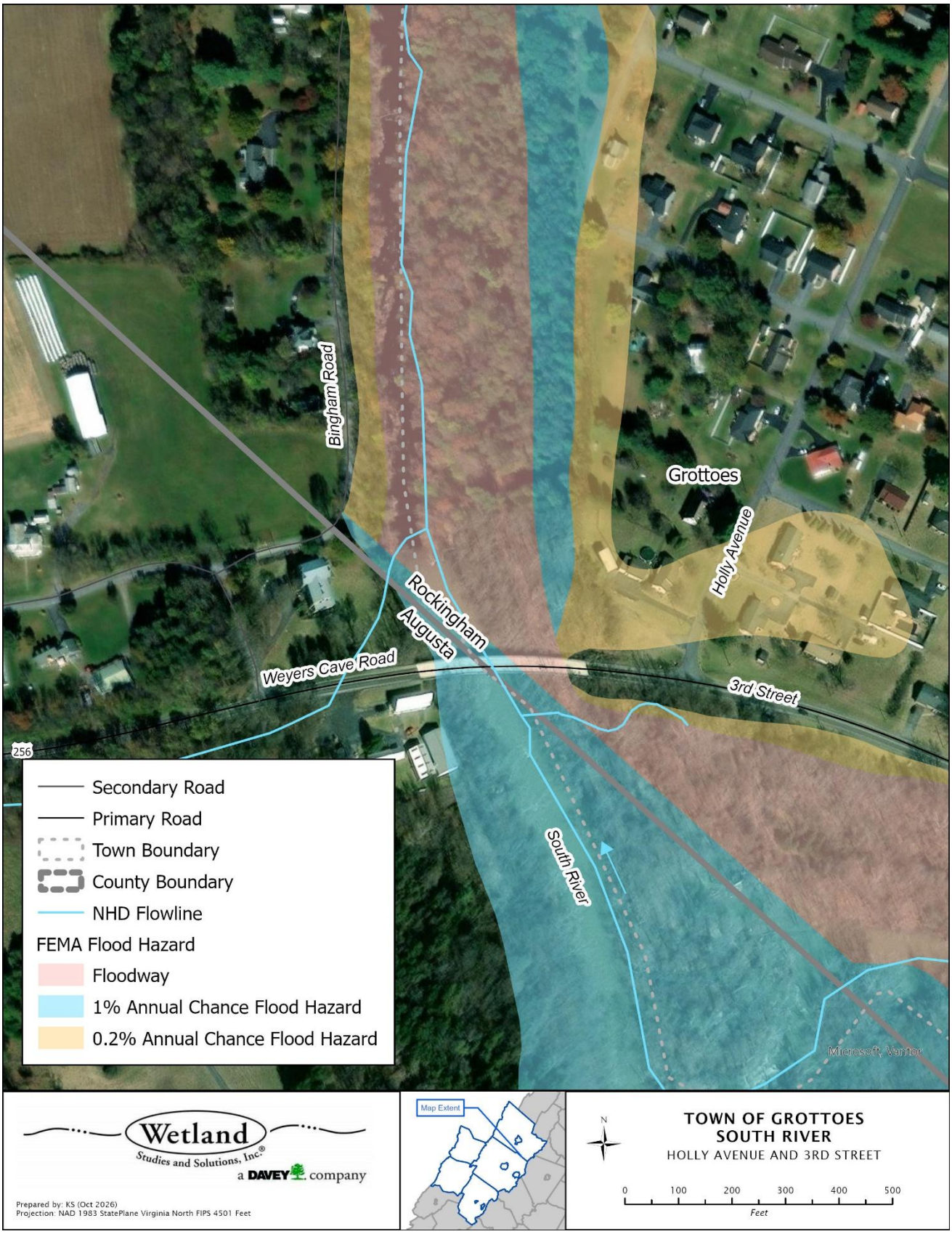

Figure 1. Map of FEMA flood hazard areas along the South River at 3rd Street/Weyers Cave Road.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Flood Impact Study					**$75,000**
Existing Conditions Survey	1	LS	$35,000	$35,000	
H&H Study	1	LS	$40,000	$40,000	
Contingency (30%)					**$22,500**
TOTAL ESTIMATED BUDGET					**$97,500**

Estimation of costs associated with construction-phase efforts will require additional study and scoping.

Possible Alternatives and Additional Considerations

The lack of complete mapping of the stormwater system will ideally be addressed prior to or as a part of this assessment.

Significant savings could be realized by combining a flood impact study at this location with a flood study at the nearby Grand Caverns location.

TMDL/MS4 Considerations

An approved TMDL Implementation Plan to reduce sediment, phosphorus, and *E. coli* has been developed for the South River. Depending on the kind of project and its impact on these pollutants of concern, additional funding sources may be available to implement projects because of this approved Implementation Plan.

Assumptions

The South River drainage area is approximated at 222 square miles (via StreamStats 10/8/2026).

Recommended Next Steps

Document and map the existing stormwater infrastructure in the area. Evaluate prioritization and funding options for survey and study.

References

ECI. 2009. Bacteria and Benthic Total Maximum Daily Load Development for South River. https://www.deq.virginia.gov/home/showdocument?id=11162&t=637692104885470000.

USGS. StreamStats v4.33.0. Accessed online 8 October 2026

VA DCR. 2010. South River and Christians Creek Water Quality Improvement Plan. https://www.deq.virginia.gov/home/showdocument?id=19282.

PROJECT IDENTIFICATION
TOWN OF GROTTOES
MILLER RUN CHANNEL IMPROVEMENTS

Location Description
38.2646001,-78.8206415
Miller Run flowing from the east under Cary Street through Town to Dogwood Avenue.

Project Issue
Flooding along stream corridor due to ponding and poor drainage impacting residences and roadways. Debris jams noted in multiple locations along corridor as well as intermittent erosion.

Project Purpose
Address flooding along Miller Run.

Identified Constraints
a. Probability of land acquisition and/or easements necessary
b. Infrastructure
c. VDOT involvement potential regarding roadway crossing at US Route 340

Additional Information Needed
a. Presence of utilities, easements
b. Channel conditions along full corridor

Project Proposal and Planning-Level Cost Estimate
A full channel assessment to document locations and extent of debris buildup and channel erosion will be necessary as a first step in developing a plan of action. The channel is intermittent, and on a site visit (6/26/2026) was noted to be flowing in the upstream reaches but running dry by approximately Aspen Avenue, presumably due to lower groundwater table and increased infiltration along the channel length. Discrete sections of bank erosion were noted along the channel, one of which had a riprap reinforcement previously installed (**Figure 1**). Several large debris buildups have developed along the channel (**Figure 2**) which could be causing increased flooding and may be causing bank erosion where flows are diverted around the debris. While some amount of woody debris is expected and ecologically beneficial in a natural channel, that must be balanced in an urban environment with an appropriate amount of maintenance to ensure consistent conveyance and protection of infrastructure.



Figure 1. Riprap placement to deter bank erosion visible at right, unaddressed bank erosion on other side of channel, in the vicinity of Cherry Avenue and 11th Street.



Figure 2. Large debris jam (Town staff visible at left), facing downstream from Cherry Avenue crossing.



Figure 3. At left, large debris jam on upstream side of box culverts under Cary Street (partially obscured at left, wingwall in foreground). At right, downstream side of the box culverts with visible scour and undercutting.

The Cary Street culvert was noted as a recurring debris jam featuring both small and large woody debris that will often partially dislodge and create a debris jam elsewhere further downstream. Access to the upstream side of the Cary Street culvert could be improved with minor grading to create a gravel access road from the downhill end of the guardrail northeast approximately 125 feet to the culvert mouth, allowing regular debris removal via heavy equipment. Significant woody debris buildup on the upstream side of the Cary Street crossing was noted, as well as erosion on the downstream side which should be evaluated as part of the channel condition assessment (**Figure 3**).

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Stream Assessment					**$35,000**
Stream Channel Condition Assessment	1	LS	$35,000	$35,000	
Construction - Cary Street Culvert Access					**$33,700**
Erosion and Sediment Control	1	LS	$300	$300	
Mobilization	1	LS	$2,000	$2,000	
Clearing	0.1	AC	$35,000	$3,500	
Excavation	300	CY	$30	$9,000	
Excess Material Load & Haul Offsite	300	CY	$55	$16,500	
Crusher Run Stone	30	TON	$80	$2,400	
Contingency (30%)					**$20,610**
TOTAL ESTIMATED BUDGET					**$89,310**

Estimation of costs associated with stream assessment are specific to completion of a BEHI assessment and mapping of locations along with a preliminary documentation of possible improvements. Design of any future stream channel work would be a separate task guided by the results of this preliminary assessment.

Possible Alternatives and Additional Considerations

Following a channel assessment, it may be determined that the channel is adequately stable and only requires removal of some of the more detrimental debris jams. Noting the very trapezoidal shape of the channel bottom, periodic bank erosion, and scour noted on the downstream side of at least one road crossing (Cary Street, **Figure 3**), it is possible that the channel may warrant restoration work to establish a low-flow channel and inset floodplain benches in some or all reaches. This would both stabilize the channel by improving riparian vegetation and serve to slow higher flows, further reducing their erosive power and allowing more infiltration of stormwater. Given that the channel runs through the back and side yards of many residential properties, construction access and drainage easements will be a significant factor in the feasibility of channel work.

Some woody debris in the channel behind residences had the appearance of being pushed into the channel from backyards. This possibility, as well as the presence of trash in some locations, support an awareness campaign to encourage stewardship of this shared resource. A channel restoration effort to return it to a more natural state may increase the aesthetics of the channel and further encourage active enjoyment rather than the passive neglect many urban channels suffer.

TMDL/MS4 Considerations

Miller Run is part of a TMDL Implementation Plan to reduce sediment, phosphorus, and *E. coli* in the South River. Depending on the kind of project and its impact on these pollutants of concern, additional funding sources may be available to implement projects because of this approved Implementation Plan.

Assumptions

5,500 linear feet of stream from just upstream of Cary Street crossing down to Dogwood Avenue to be evaluated. Stream assessment to include BEHI erosion rate estimates and approximate mapping and documentation of debris jams, etc. The roadways of concern are understood to be maintained by the Town rather than VDOT.

Recommended Next Steps

Coordinate with appropriate landowners regarding Cary Street access work. Evaluate prioritization and funding options.

References

ECI. 2009. Bacteria and Benthic Total Maximum Daily Load Development for South River. https://www.deq.virginia.gov/home/showdocument?id=11162&t=637692104885470000.

VA DCR. 2010. South River and Christians Creek Water Quality Improvement Plan. https://www.deq.virginia.gov/home/showdocument?id=19282.