PROJECT CONCEPT
TOWN OF GROTTOES
MILLER RUN CHANNEL IMPROVEMENTS

Location Description
38.2646001, -78.8206415
Miller Run flowing from the east under Cary Street northwest through Town to Dogwood Avenue (**Figure 1**).

Project Purpose
Address flooding along Miller Run.

Additional Information Needed
- Presence and locations of utilities and easements
- Channel conditions along full corridor

Background
The Town of Grottoes experiences periodic flooding along the eastern portion of the Miller Run corridor, between Dogwood Avenue and Cary Street, which impacts residences and roadways throughout the area. The channel flow is intermittent, with sections running dry. During a site visit (6/26/2026), the channel was noted to be flowing in the upstream reaches and dry by approximately Aspen Avenue. This was presumably due to a lower groundwater table and/or increased infiltration along the channel length. Discrete sections of bank erosion were noted along the channel, one of which had riprap reinforcement previously installed (**Figure 2**). Debris jams were also noted in multiple locations, obstructing the channel and culverts throughout the reach (**Figure 3**, **Figure 4**). These debris jams may be responsible for increased levels of flooding by restricting flow and additionally may worsen bank erosion where flow is diverted around the debris.

The stream flows through multiple sets of culverts throughout Grottoes, increasing the potential that debris jams form and obstruct these structures. Any work done surrounding these culverts or roadways would necessitate involvement and coordination with VDOT. Due to the channel running through private properties, designs or construction projects along Miller Run would also likely require easements or cooperation with residents.



Figure 1. Miller Run through the Town of Grottoes, with notable roads and infrastructure marked.



Figure 2. Riprap placement to arrest bank erosion visible at right, unaddressed bank erosion on other side of channel, in the vicinity of Cherry Avenue and 11th Street.



Figure 3. Large debris jam (Town staff visible at left), facing downstream from Cherry Avenue crossing.



Figure 4. 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.

Conceptual Design and Planning-Level Cost Estimate

Phase 1 proposes a full channel assessment to document locations and extent of debris buildup and channel erosion, which will be necessary in developing a plan of action and exploring projects to address flooding. While this assessment would not necessarily incorporate a traditional survey, the approximate extents of debris can be mapped and measurements of the extent of scour, such as the downstream end of the Cary Street culvert (**Figure 4**), would be documented. All culverts are understood to be under VDOT's responsibility and as such assumed adequately sized, but should any culverts be suspected undersized during the channel assessment, measurements of dimension and slope could be obtained in the field and capacity estimated as a preliminary verification. (Depending on the findings from channel assessment activities, detailed survey of topography, culvert invert elevations, etc. may be required to facilitate these efforts.)

Channel erosion rates would be estimated by completing a Bank Erosion Hazard Index (BEHI) assessment and Near Bank Stress (NBS) evaluation along Miller Run, from just upstream of the Cary Street crossing to the Dogwood Avenue crossing. This assessment would analyze and score the banks of Miller Run for susceptibility and rates of erosion based on metrics such as bank height, riparian root depth and density, bank angle, surface protection, bank material, soil stratification, and morphological parameters (planform geometry, slope, etc.). The results from the BEHI and NBS assessments are used to identify areas of excessive bank erosion. Based on the locations and impact of identified debris buildup and the results of the erosion assessment, future work to either address debris directly or in combination with channel modifications (such as establishing a low flow channel and inset floodplain) may be recommended in certain reaches.

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 infrastructure protection. It is recommended that the Town clears the debris jams, focusing on critical areas around culverts or constrictions, to restore capacity and increase efficiency of Miller Run. A maintenance schedule could be adopted to perform regular inspections and complete debris removal when certain conditions are seen.

Phase 2 proposes addressing the known woody debris buildup upstream of the Cary Street culvert, which Town staff noted as a recurring problem that will sometimes partially dislodge and create additional debris jams downstream. Access to the upstream side of the Cary Street culvert could be improved with minor grading to create a 15-foot wide gravel access road from the downhill end of the guardrail northeast approximately 125 feet to the culvert mouth, allowing debris removal via heavy equipment (**Figure 5**). Currently, the topography hinders debris removal, generally requiring equipment able to pull debris straight up to the road surface. This access road would enable Town staff to use more readily available equipment such as an excavator with a thumb attachment. The existence and location of a right of way or easement should be confirmed or acquired to complete construction of the access road.

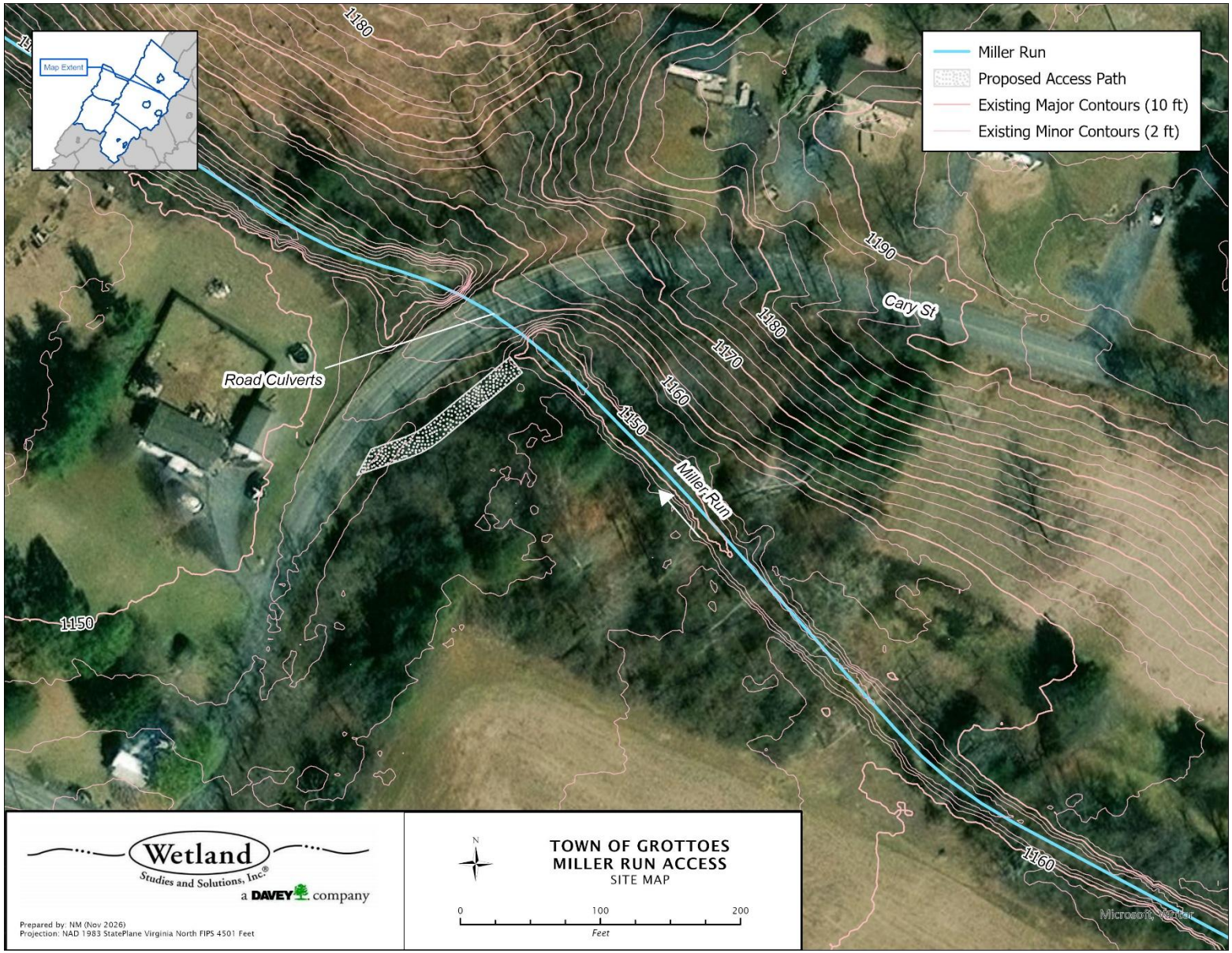

Figure 5. Miller Run crossing with Cary Street with the proposed access path marked.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Phase 1: Stream Assessment					**$32,500**
Stream Assessment					**$25,000**
Stream Channel Condition Assessment	1	LS	$25,000	$25,000	
Phase 1 Contingency (30%)					**$7,500**
Phase 2: Cary Street Culvert Access					**$42,380**
Construction - Cary Street Culvert Access					**$32,600**
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	20	TON	$80	$1,600	
Phase 2 Contingency (30%)					**$9,780**
TOTAL ESTIMATED BUDGET					**$74,880**

Estimation of costs associated with stream assessment are specific to completion of a BEHI and NBS 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 the assessment.

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.
- Watershed (via StreamStats 11/3/2026) is 2.41 square miles from the culvert under Dogwood Avenue.

Recommended Next Steps

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

References

USGS. StreamStats v4.33.0. Accessed online 3 November 2026.