

**To:** Logan Perron, District 7 Project Manager  
*CEE*

**From:** Callie Ewald, PE, Senior Geotechnical Engineer

**Date:** July 28<sup>th</sup>, 2025

**Subject:** Danville Bruce Badger Memorial Highway – Slide Memo

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At your request, on Friday, July 18<sup>th</sup>, Megan Messina and I met Keith Gadapee, Danville Road Foreman, at the site of a large landslide on Bruce Badger Memorial Highway in Danville, VT. The slide is located on the western side of the roadway across from a residence located at 2540 Bruce Badger Memorial Hwy. This memo contains our field observations and recommendations for next steps in evaluation of this area.

The crest of the slope is located about 14 feet from the guard rail that runs adjacent to the roadway. According to the available lidar on the ANR Atlas<sup>1</sup>, the slope appears to be about 50 feet in height from the crest of slope down to the Morrill Brook located at the toe of slope. Photo 1 below depicts the slope looking toward the western edge of the slide area. Again, using the ANR Atlas, the width of the slide area appears to be around 90 feet extending in width toward the toe of slope. The material appears to be a glacial till, comprised of silts, sands, and clay with interbedded cobbles and boulders. The top eight to ten feet of slope look to be vertical, causing some undermining of the vegetative mat.

**Photo 1:** Looking west at the toe of slope



At the time of the site visit, the soil on the slope appeared saturated, and water could be seen seeping out of the toe in multiple places. Rivulets could also be seen running vertically down the slope illustrating the presence of surface and subsurface water movement on the slope. A culvert

1. <https://anrmaps.vermont.gov/websites/anra5/>

exists on the western end of the slide and has some localized sloughing near the outlet. The presence of the localized failures illustrates that the till material is prone to weakening and erosion when saturated.

Based on discussions with Keith Gadapee, it is our understanding that the large portion of the slope visible at the toe slid approximately 10 years ago. It is unclear if the cause of that failure was during a heavy rain event, significant toe erosion due to its location on the bend of the brook (Photo 2), or likely a combination of factors. Keith noted that there has not been significant movement of the crest since then, but rather a gradual loss of materials, as the crest remains unstable and undermined.

**Photo 2:** View from crest of slope. Note large amount of material slide into brook.



In terms of an immediate response, it is our understanding that Keith plans to install signs to notify the public of the unstable area. I recommend monitoring the area, specifically the vegetated area above the crest, the guard rail, and the roadway. Additional cracks can sometimes develop behind a scarp, indicating movement and instability of the material near the crest of the slope. The area should be monitored visually weekly and after high rain events for cracking/deformation in the pavement and dipping of the guard rail. Based on the distance from the crest and the very dense material, I would not expect to see any deformation in the roadway in the short term.

While it is difficult to tell how quickly the top of the slope will keep moving toward Bruce Badger Memorial Highway, we do know that it will based on the vertical nature of the top of the slope. Currently, the grade of the slope is steeper than the internal friction of the glacial till, meaning that the top of the slope will continue to migrate until it reaches its natural angle of repose or stability. Additional heavy rain events could also cause more migration of material throughout the slope and toe, which accelerates movement and can alter the geometry of the slope. Based on historical information provided by Keith as well as the presence of till material, we do not expect movement to occur rapidly.

Based on the nature of the failure, presence of water in the slope and a brook at the toe, and the sheer magnitude of the unstable area, we recommend that an engineered design be developed. This should include a survey and a subsurface investigation to characterize the in-situ soils and support the design of a permanent solution. It is likely that a fix involving stone fill would work to stabilize the slope and protect the roadway, and an engineered design will be able to optimize the amount of material required for a key to armor against future instability, as well as determine the grade at which the slope can be reconstructed. The River Management Engineer will also need to be contacted to help determine a proposed toe of slope to utilize in design.

Based on recent experience with landslides of this magnitude and costs for this type of work, I would estimate a cost of around \$75,000 to complete survey, borings, an engineered design and basic design details for plan incorporation.

Please reach out with any questions about the above or if you would like to discuss it in more detail. I can be reached at (802) 595-4589 and via email at [callie.ewald@vermont.gov](mailto:callie.ewald@vermont.gov).

Cc: Keith Gadapee, Danville Road Foreman  
Megan Messina, Geotechnical Engineer

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