

**PRELIMINARY REPORT – BLACKJACK LANE LANDSLIDE
ON GAITHER MOUNTAIN, SW OF HARRISON,
BOONE COUNTY, ARKANSAS**

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Introduction

The site is in the NW ¼ SE ¼ Section 27, Township 18 North, Range 21 West, Boone County. This is located on the US Geological Survey Gaither 7.5-minute topographic map. Blackjack Lane was constructed prior to 1974 and is not shown on the USGS map.

Mr. Paul Sims, brother of Steve Sims, who lives on Blackjack Lane, contacted me by telephone on Monday, November 2nd, concerning problems with the road bed. Once I learned the address and looked up Blackjack Lane on Google earth and printed a map and satellite image of the area, I informed Mr. Sims that I would be visiting the site on November 3rd. I informed Arkansas Geological Survey administrators of the situation and took David Johnston, AGS staff, with me on the trip.

Field Work

We arrived on site on Tuesday morning a few minutes before noon and began field documentation by taking GPS readings and digital images of what was observed. Several “humps” in the roadbed and sets of cracks across the unpaved road were documented with GPS readings. The trend of the cracks and any vertical offsets were also noted. Data is presented in Table 1 at the end of this report as well as photographs taken during the data gathering stage. Shortly we were joined by several local residents, and finally by the County Judge, Mr. Mike Moore, and the County Road Maintenance Supervisor, a Southwest Boone County Water Service official, and Mr. James White, reporter for the Harrison Daily News.

County Information and Oral History

One of the local residents stated that the problem began in a small way about a month ago with the formation of a small ridge in the road bed in the curve where the road turns from the north to the east. Nothing much seemed to happen until the heavy statewide rains on Thursday of last week. Then Friday morning the road appeared to have large humps of rock rising from the west side of the north trending section of the road. On Friday, October 30th, one of the local residents, Mr. Randy Nelson, who is a land surveyor by profession, noticed the problems with the road, he set some pins and has been daily shooting elevations and horizontal control shots on the pins. As of our visit on Tuesday, he had recorded minimal vertical displacement, but 4 feet of horizontal displacement in a southeasterly direction by Tuesday afternoon.

The first real problem most of the local residents had with the situation was when they awoke with no water. We did not get the date this first occurred, but it was after the Thursday rains. The County was notified and by Tuesday had visited the site 3 times to repair the water line, which is on the east side of Blackjack Lane. The waterline

continues to be pulled apart with the movement of surface materials. Approximately 1500 feet of Blackjack Lane is affected along with about 300 feet of Ridge Court Road from where it junctions with Blackjack Lane. Tuesday morning local telephone service lineman arrived and raised the suspended telephone line because it was hitting the top of school buses that service the area. Two telephone/power poles are present along the affected stretch of Blackjack Lane. Both have been examined by Mr. Nelson and are out of plumb, leaning some degree to the northwest (tops tipping to the NW).

General Field Observations

Aside from taking GPS points and photographically recording cracks in the road, what was observed both to the northwest above the road and southeast below the road was striking. Large isolated blocks of quartzose sandstone, some exhibiting marked cross-bedding are set in a jumbled manner within a sandy soil colluvium. The general area was rough to walk across, being hummocky, and was dissected by small intermittent streams, some of which were flowing water from the recent rains. Trees appeared generally vertical but we did not walk off the road during this visit. No rock outcrops along the roads or in the immediate vicinity of the affected roads are present.

General Questions from the Local Residents and County Judge

- *What caused this landslide to happen?* With only limited and very preliminary observations, it was suggested that it was related to the locally heavy rains over the entire month of October, and the most recent movement being caused by lubrication of the colluvium/rock contact. No connection is inferred at this time to any of the recent small earthquakes that have been recorded in north Arkansas.
- *How long will it continue to move?* As long as it remains unstable and has adequate lubrication on the glide surface to slide down slope. No time frame can be given. It was suggested that any road construction at this time was unadvisable, at least until the movement appears to have ceased. And then principally fill should be added to smooth out the humps, not excavation of the existing roadbed.
- *How far downslope might it move?* No exact answer was available for this question when it was asked, but since gravity is the principal force causing the movement, it may continue down slope until gravity can no longer overcome the frictional force required for the mass to move. The frictional force becomes less with more lubricant and is greater as the ground dries out. At this time it does appear any houses further down in the valley will be affected. The one house being immediately threatened by creep of the slide is some 150 feet southeast of the toe and across a small drainage. Most likely the threat to this house is low.
- *What can be done about the water service?* So long as the slide is displaying significant movement, horizontally or vertically, underground waterlines that cross the slide area will be periodically pulled apart. A temporary fix until the motion ceases would be to run an above ground water line parallel to the road above where it is presently buried. This would prevent the creep stress from pulling the line apart, but will be a problem when freezing temperatures occur.
- *Why is the road humping up?* From the existing survey data, it does not appear the road is humping up, but instead that large rocks buried in the road are moving

- slower than the finer grained sandy soil surrounding them. Everything is moving to the southeast. The end result makes it look like the rocks are moving upwards.
- *Is Mr. Paul Hinkson's home in danger?* After visiting his home, finding no signs of ground disturbance, and examining the position of his home relative to the position of the old landslide (see Appendix 3), it appears his home is in no danger.

Office Data and Conclusions

On Wednesday, November 4, both the AGS geologic worksheets and Google Earth imagery were examined to see what could be learned. The site is situated on a steep Fayetteville Shale slope immediately southwest of a sandstone bluff on AR Highway 43. The sandstones exposed on the west side of the highway are mapped as the Prairie Grove Member of the Hale Formation. The ridge-capping sandstone is the source of the large blocks of sandstone that litter the hill slope on the east side of Gaither Mountain. Weathering of thinner sandstones down slope, such as the Wedington, and the Fayetteville shale produced the finer grained soils that these blocks are set within. Sandstone blocks and soils compose the surface colluvium.

Google Earth imagery (January 11, 2006) displays both the existing road system and a markedly different ground and vegetation pattern within the area investigated. This area of hummocky ground on the image represents an old landslide. The area was outlined on the accompanying GE imagery and the roads labeled (Appendix 3, Google earth imagery plot). The old landslide outline was transferred to the Gaither topographic map (Appendix 3, Topographic map plot), and it was determined that the old slide is approximately 20 acres. Blackjack Lane trends north-south across the old landslide and Ridge Court trends east-west across the west edge of the landslide. It is undetermined as of this date whether the entire old landslide or only a portion of it is moving.

The colluvium composing the slide material is underlain by the Fayetteville Shale, which lies essentially horizontal in the area. Mr. Nelson stated that his water well had some 200 feet of black shale before it encountered water-bearing formation. Although no cross-sections or outcrops within the area of disturbance reveal the underlying material, it appears that a clay-based soil formed on the Fayetteville, before the deposition of the colluvium. This clay, along with the Fayetteville shale itself, acts as an aquiclude, preventing water from seeping into the formation. So the fine-grained soils of the colluvium, during periods of unusually high rainfall, along with the upper surface of the clay, become periodically saturated. Due to the existence of a previous glide plane from the old landslide, the scenario was set for reactivation of the old landslide or a portion of it to occur. It appears that this is what has happened to cause the present situation. To see a general diagram of landslides and their terminology, see Appendix 4 (*source*: USGS Fact Sheet 2004-3072 – Landslide Types and Processes).

The plan is to revisit the site in December to continue to monitor and examine the landslide's activity. Other staff geologists also plan to visit the area to examine the

local stratigraphy. Mr. Nelson plans to periodically email his results from continuing survey monitoring of the road.

Appendix 1 – Images and field notes.

Image 1



West edge scarp crossing Ridge Court Road. Down drop of slide to right (north) of 18 inches initially. Now looks more like 24 inches. Latitude: 36.128134, Longitude: -93.20113.

Image 2



View looking east down slope from west scarp line on Ridge Court Road. Note hummocky nature of road below scarp due to colluvium creep.

Image 3



“Hump” and crack in road near Pin #3 on Blackjack Lane. Tensional crack trends N80°E and is down dropped ~1 inch to the south. Latitude: 36.18156, Longitude: -93.19998.

Image 4



Set of 6 sub-parallel tension cracks trending N130°W in Blackjack Lane. Latitude: 36.18256, Longitude: -93.19981.

Image 5



Sub-parallel tension cracks, slight down slope offset to the southeast, trending N130°W, near crest of rise, northeast edge of slide area, Blackjack Lane. Latitude 36.18281, Longitude: -93.19977.

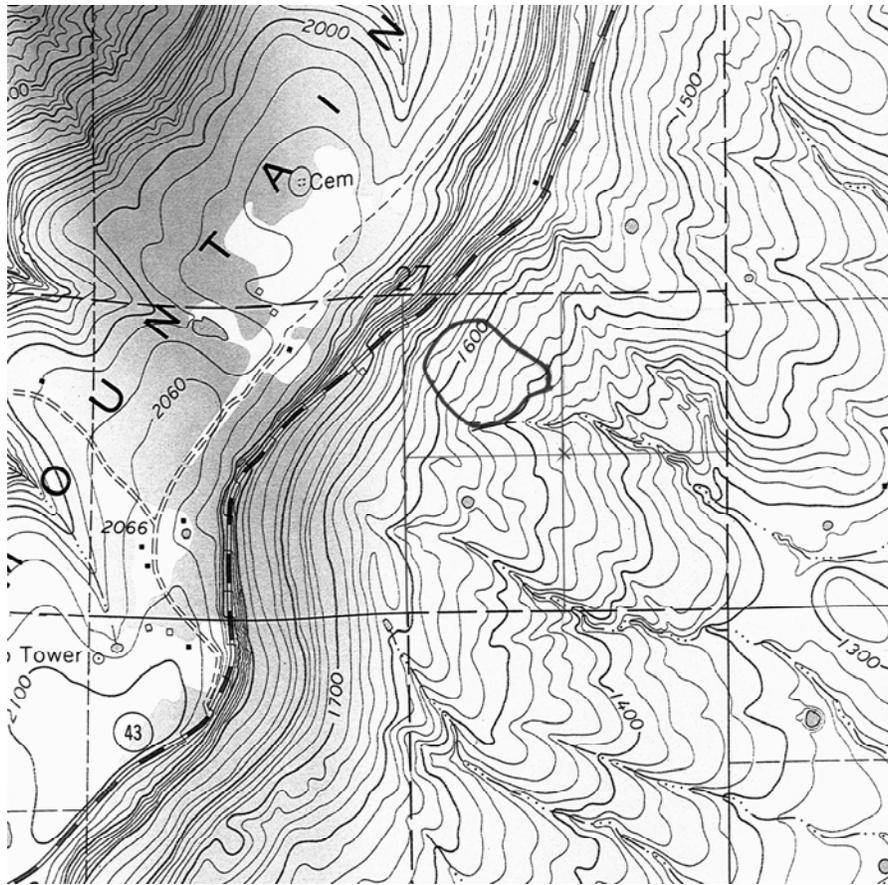
Appendix 2 – Table of field data.

<u>Road Location</u>	<u>GPS Coordinates</u>	<u>Comments</u>
1. Ridge Court	36.18134, -93.20113	Backfilled scarp, drop 18” 2 pictures
2. Blackjack Lane	36.18101, -93.19990	Southeast toe of slide
3. Blackjack Lane	36.18106, -93.19989	Tension crack trending N20°W
4. Blackjack Lane	36.18149, -93.19998	“Hump” in roadway west side
5. Blackjack Lane	36.18156, -93.19989	“Hump” in roadway west side, tension crack trending N80°W, 1 picture, #3 survey pin.
6. Blackjack Lane	36.18182, -93.19987	Complex set of tension cracks trending N40°-50°W
7. Blackjack Lane	36.18203, -93.19982	“Hump” in roadway west side
8. Blackjack Lane	36.18221, -93.19984	Tension crack trending N120°W, open 2 inches
9. Blackjack Lane	36.18256, -93.19981	6 sub-parallel tension cracks trending N130°W, 1 picture
10. Blackjack Lane	36.18281, -93.19977	Sub-parallel tension cracks trending N130°W, 1 picture

Appendix 3 – Satellite Imagery and Topographic Map



Google earth image – Outline of old landslide is drawn and headwall area and toe of landslide are labeled, along with roads. North is to the top.



Topographic map – Plot of position of old landslide on USGS Gaither 7.5-minute topographic map. North is to the top.

Appendix 4 – General Landslide Morphology and Terminology

