

## **Landslides Shut Down Highway 87 Between Payson and Phoenix**

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A series of landslides occurred along State Route 87 at about mile marker 224 (between the Bush Highway and Route 188) last Friday, March 21, 2008, buckling the southbound lanes and causing the highway to be shut down in both directions over the holiday weekend. The slides occurred on a slope that had been mitigated with various combinations of vertical concrete walls (shotcrete), horizontal bolts, straw wattles, and drainages lined with boulders. No trigger for the slides was immediately apparent, although it is suspected that a combination of groundwater buildup in conjunction with vibrations from passing vehicles may have contributed. AZGS geologists are continuing to assess the landslides.



One of several landslides on the west side of the road. Note the broken shotcrete and straw wattles. The metal fence in the foreground is the median of the highway; the Jersey barriers behind the fence are actually on the shoulder of the southbound lane, and are serving as a buffer against further downslope movement of the landslide material.



The toe of the rotational landslide came up underneath the highway, buckling the southbound lanes to approximately 1 meter in height for a stretch of about 15 meters.



The shovel bucket is sitting on top of the buckled area. Headscarps of landslides are visible on either side of the one that buckled the road. Bulldozers have already obliterated the scarps at the head of the slides on the left.



Slump block headscarps on east side of highway immediately across from the preceding photos.



View down a possible drainage underlying the landslide where the toe caused the road to buckle. Note arcuate headscarp directly across the highway.



Truckloads of debris have been steadily removed since late Friday, and much repair work remains to be done.



Highway State Route 87 with the northbound lanes on the right and landslide on the left (southbound). The base of the landslide appears to be below the freeway here and has moved the road and divider horizontally approximately 0.3 meters to the right.



The landslide that meets southbound SR-87 has buckled the highway and appears to have continually crept over the weekend, pushing the highway up over one meter high and shifting the highway horizontally several tens of centimeters.



The toe of the landslide feature up against the highway pavement. Notice the pavement, gray artificial fill underneath the pavement, and the red clay-rich and moistened sediment underneath the highway fill. The landslide appears to be moving along this clay-rich zone.



Earth movers have removed some of the toe of the landslide on the left. The unmoved sediment continues to move to the left, creating several zones of cracks.



The interior of the landslide shows evidence of shearing in a clayey gravel sediment.



Some of the interior of the landslide is composed of a coarse sand and gravel sediment with minor amounts of red clay.



One of the scarps present near the top of the landslide. Approximately two meters of offset is visible here, as indicated by the matching soil cap on top of the two blocks.



Looking up at two vertical walls of the landslide between two scarps. Note the vegetation on the top of each block separated vertically almost two meters. Also note the purple zone at the top; a clay-rich layer that appears to be strongly deformed, possibly from a previous landslide event.



Looking down from halfway up the road cut where headscarps are present. Much of the slope has been removed and shored up. The blocks of sediment in the foreground are remnants of a soil cap.



Halfway up the roadcut and landslide is the boulder-lined canal, where one scarp has approximately 2 meters of vertical offset, and 1 meter horizontal offset.