UTAH GEOLOGICAL AND MINERAL SURVEY

606 BLACK HAWK WAY
SALT LAKE CITY, UTAH 84108
(801) 581-6831

DONALD T. McMILLAN
Director

SCOTT M. MATHESON
Governor

GORDON E. HARMSTON
Executive Director
Department of Natural Resources

May 29, 1979

MEMORANDUM

TO: Bruce Kaliser, Chief, Urban and Engineering Geology Section

FROM: William Lund, Geologist

SUBJECT: Landslides located along U.S. Highway 6 and State Route 33

On May 10, 1979 a geologic reconnaissance was made of a large landslide located adjacent to U.S. Highway 6 in Utah County, and of several smaller landslides which have developed in roadcuts along State Route 33 in Carbon County. These slides were brought to the attention of the Urban and Engineering Geology Section by Mr. Stirling Davis, UDOT District 4 Supervisor in response to our recently distributed ground crack poster.

The Soldier Creek Landslide

The Soldier Creek landslide is located along U.S. Highway 6 about two and a half miles east of Tucker, Utah in the SW¼ of Sec. 20, T10S, R7E. Soldier Creek is deeply incised into the Wasatch Plateau at this point, and the area is characterized by steep slopes and sparse vegetative cover. The slide appears to include both colluvium and bedrock, but no good exposures of displaced bedrock could be found. The rock unit involved is a gray shale which outcrops on the hillside above the highway. The shale is overlain by a medium- to thick-bedded sandstone which has not as yet been involved in the sliding. The State Geologic Map shows both of these rock units as belonging to either the Garden Gulch or Douglas Creek members of the Green River Formation, but more detailed mapping by Moussa (1969) assigns them to the stratigraphically lower Colton Formation. A large fault, shown on the State Geologic Map as being associated with the Dry Valley graben, has been mapped in the vicinity of the slide, and a second fault also associated with the graben projects into the area but has not actually been mapped north of Soldier Creek. Moussa's map does not show either of these faults, nor does it indicate the presence of any faulting in the immediate vicinity. Undisturbed strata adjacent to the slide area strikes to the northeast and dips 20 degrees to the northwest.

According to Mr. Davis, the slide began to move on February 12, 1979 and continued to be active for a period of approximately three weeks. He further indicated that the movement was too slow to be perceptible to the unaided eye, but that displacements could be clearly observed over a period of time as short as half an hour. A total offset of about 20 feet was recorded by UDOT personnel in a fence line that crossed the slide. Movement of the slide began almost a year after a realignment of U.S. 50 has been completed. In the vicinity of the slide this realignment involved moving the roadway several feet to the south away from the hillside and reshaping the existing roadcut. Little or no material was removed from the roadcut during construction.

The slide covers an area of about three acres and involves portion of three small drainages. Elevations range from approximately 6800 feet at the crest to 6650 feet at the toe. The slide heads in a narrow gully just below the contact between the shale and the overlying sandstone. This contact is marked by a travertine spring which was making an estimated 10 to 15 gallons of water per minute at the time of the reconnaissance. A short distance downslope from the spring the gully widens abruptly into an area of more gentle topography marked by abundant water-loving vegetation and very wet, boggy ground. An examination of stereo airphoto pairs taken in 1976 shows that this boggy area has many of the features of an old landslide indicating that this ground may have moved at some time in the past. Downslope from the bog, the hillside again becomes quite steep.

The scarps bordering the upper portion of the main slide are six to ten feet high but only one or two feet high in the gully. This would seem to indicate that the major slide movement occurred in the old landslide deposits and that any material which moved in the gully did so in response to loss of support from below. The surface of the slide is marked by a generally hummocky appearance and there are numerous transverse cracks, longitudinal faults and minor scarps developed in it. The roadbed of the highway was not involved in the sliding, therefore, the failure plane must daylight at some point above the highway. The toe of the slide did cover a portion of the highway, but this was loose material being pushed along across the surface of the ground in front of the slide, and was easily removed by UDOT maintenance crews.

Water is ponding at the base of many of the scarps located near the top of the slide. This water is coming from the spring near the sandstone-shale contact and is infiltrating into the slide along transverse cracks. Very little water was observed to be flowing from the toe of the slide.

For the present, the landslide appears to have stabilized itself. It has not moved for two and a half months, and this is particularly significant since that period of time corresponds to the Spring melt. The stabilization may be due, at least in part, to the buttressing effect of the toe material which UDOT removed from the roadway and piled at the base and sides of the slide. As long as the failure plane continues to daylight uphill from

the roadbed this slide will represent only an annoying maintenance problem; however, should conditions change and the failure plane move downhill, the highway could suffer severe structural damage.

Slides Along State Route 33

A total of six small landslides, all occurring in roadcuts along State Route 33 within a mile southwest of the Bamberger Monument road junction were inspected during the reconnaissance. None of these slides involve bedrock and only two contain a really significant amount of material. The other four are probably better described as areas of extensive sluffing. State Route 33 climbs the southeast face of a steep northeast trending ridge in the area where the slides occurred. Snow drifts develop near the crest of the ridge during the winter, and in the spring melted water from these drifts saturates the colluvial material on the sides of the ridge. Whenever the combined weight of soil and water exceeds the shear strength of the soil slope failures occur. Many of the soils involved in the slides observed during this reconnaissance were above the liquid limit and almost all were above the plastic limit.

Since none of these slides involve bedrock and their failure planes daylight above the roadway, they should have no effect on the highway other than to produce a semiannual maintenance problem.

William R. Lund

WILLIAM LUND

WL/af