PROPOSAL TO INSTALL GROUNDWATER MONITORING WELLS AND A SURFACE WATER GAGING STATION, SNODGRASS MOUNTAIN EXPANSION AREA, GRAND MESA-UNCOMPAHGRE-GUNNISON NATIONAL FOREST (CRESTED BUTTE MOUNTAIN RESORT PERMIT AREA)

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Justification of the Proposed Action

The draft report "Snodgrass Mountain Geologic Hazards and Assessment of Potential Effects of Ski Area Development on Slope Stability" (Sept. 22, 2006) identifies the most hazardous areas on Snodgrass Mountain as Geologic Hazard Units (GHUs) 1-5, located at the base of Snodgrass Mountain. The most critical impact of the proposed ski area development by Crested Butte Mountain Resort (CBMR) is anticipated to be increased surface and subsurface moisture in these 5 GHUs, arising from a combination of trail clearing and snowmaking.

In addition, all 3 previous geologic hazard reports for Snodgrass Mountain have recommended that detailed slope stability studies be performed before facilities are designed and constructed on the mountain.

Accordingly, CBMR and GEO-HAZ need to collect baseline surface water and groundwater data on the mountain, in order to: (1) establish the pre-development surface water and groundwater regimes on Snodgrass Mountain, (2) estimate the post-development surface water and groundwater regimes on Snodgrass Mountain, (3) use the pre- and post-development groundwater regimes to analyze slope stability before and after development, and (4) use the results of the stability analysis to pinpoint placement of trails, snowmaking, lifts, and roads in the proposed action.

Slope stability will be assessed for GHUs 1-5 using computer slope stability analysis of 4 geologic/hydrologic cross-sections, as shown in Figure 1.

Previous Hydrologic Work

In October 1994, Resource Consultants and Engineers (RCE) drilled 5 wells and installed 3 open-pipe piezometers in the East Slide on Snodgrass Mountain (GHUs 5A, 5B). Water levels in these 3 piezometers were measured 18 times between October 14, 1994 and October 30, 1995. We propose to install water level data loggers in these 3 piezometers in late October 2006, to record hourly water-level measurements throughout the Winter of 2006 and Spring of 2007, and continuously after that.

No further surface water or groundwater data have been measured in the Snodgrass area.

Description of Proposed Monitoring Well Program (Drilling, Installation, Data Collection)

We propose to drill an additional 16 monitoring wells in the Snodgrass area in October, 2006. These wells will be drilled by D.A. Smith Drilling of Grand Junction, CO, the same drilling company that drilled the 3 piezometer wells in 1994. Smith Drilling will use the same Acker track-mounted drill rig that they used in 1994, and which is shown in Figures 2-9.

Access to the Drill Sites and Ground Disturbance

The Acker rig will walk itself to the drillhole sites, as it did in 1994, so no road construction is necessary. In 1994 the Acker rig needed some assistance in climbing up some of the steeper slopes in the upper East Slide (GHU 5A). This assistance was provided by a Caterpillar D3 bulldozer pulling the rig up the slope (see Figs 2-9). Although CBMR no longer owns the D3, they do have a D5 that could be used for this purpose, if it becomes necessary on steep slopes. However, on steep slopes there may be more track slippage, which could lead to a track of disturbed earth running down the local fall line.

The steepest band of slopes in the project area lies at the lower boundaries of the Middle Slide Complex (GHU 3) and the Lower West Slide (GHU 1B). This slope band is about 200 feet high (between 9600 and 9800 ft elevations), and effectively divides our project area into upper and lower zones. To avoid having to traverse this slope band with the drill rig, we are proposing to access the upper and lower zones with different routes. Drillholes 1-9 in the upper zone will be accessed by driving the equipment up the existing primitive road that ascends to the top of Snodgrass Mountain (orange dotted line on Fig. 1). Once the equipment reaches the upslope end of the Chicken Bone area (GHU 6), it will leave the road and travel downhill across the natural slopes to access drillholes 1-9. The exact path will stay in the grassy openings unless those areas are wetlands. In that case, the rig will thread its way through the shortest forested patch to attain the next grassy opening. As shown in Figs. 2-9, the Acker rig can thread a path between trees if it has to cross forested patches. Upon completion of those holes, it will return along the same path to Chicken Bone, and back out on the primitive road.

Drillholes 10-16 lie downslope of the steep slope band, and thus will be accessed from the south (yellow dotted line on Fig. 1). This route will begin at the stables on Gothic Road, and traverse across CBMR-owned land in the proposed area of North Village. From that point, the route goes to the saddle at the head of the Slump Block/ Lower earthflow, and then down the Lower Earthflow. Upon completion of drillholes 10-16, the equipment will retrace its route back to the stables and Gothic Road.

By use of this access scheme, we hope that the Acker rig will be able to walk itself to the 16 drill sites without requiring the assistance of the D5 cat. The one location where we will probably need the D5, however, is drillhole 7, which lies on the West Facet.

These two tracked vehicles will be the only pieces of heavy equipment that will travel to the drillhole sites. As seen in Figs. 2-9, the track that these pieces of equipment make across the native ground surface is a twin-track of compressed and flattened vegetation.

In addition, the drillers will need to drive back-and-forth to the drill sites at the beginning and end of each work day, to transport themselves, and to bring in additional diesel fuel to the drill rig. This transportation can be accomplished by use of an ATV and trailer (if ground is bare) or snow-cat (in case of a light snow covering).

Drilling Activities and Disturbance at the Drill Site

The Acker rig drill is a hollow-stem auger rig that advances a 6" diameter hole without the use of a circulating fluid. Therefore, there is no need for a mud pit at the drill site, nor for a water truck to reach each drill site. The Acker rig is self-leveling with the use of adjustable jack legs; therefore, no drill pad needs to be cut or scraped with equipment (Figs. 2-9). The drill rig levels itself on the natural ground surface.

All drillhole cuttings are brought up by the exterior auger flights and moved by shovel to a stockpile area around the periphery of the drill rig. After the drillhole is completed and the 2" PVC piezometer pipe is installed, all cuttings are pushed back into the drillhole to set the PVC pipe. If a small excess of cuttings is present after backfilling the hole, it can be spread around on the native ground surface, or left in a small pile. These cuttings are anticipated to be Mancos Shale, based on the experience from the 1994 drilling.

We would like the PVC piezometer casing to stick up 12-18 inches above the ground surface, to make it easy to locate the wells and to prevent material from falling into the casing.

Periodic Data Collection

The piezometers will be instrumented with data loggers which fit entirely within the 2" PVC casing. The dataloggers will be secured beneath a locking cap. The initial data collection period will be from October of 2006 to May of 2007, when the snow depth becomes small enough to permit foot access to the piezometer site. At that time, the 7 months of data will be downloaded to a laptop computer and new batteries will be installed in the unit. The data will probably be downloaded next at the end of the summer (September), to collect the next 3-4 months of data. All trips to collect the data can be done by a person walking on foot, although that person may use a mountain bike on the mountain bike path to facilitate access to piezometers 1-9.

Description of Proposed Stream Gaging Program (Installation, Data Collection)

We propose to install a prefabricated Parshall flume and datalogger where the axial drainage exits Forest Land at the southern boundary of the permit area (Fig. 1). The purpose of this stream gage is to measure the volume of runoff from the proposed Snodgrass expansion area. The flume will be transported to the site using either the D5 cat or a snow cat, using the same route that the Acker drill rig used to reach drillsites 10 and 13. This flume installation is planned to be permanent and to operate throughout the life of the Snodgrass ski area operation. As such, it will monitor all the stream flow coming off the mountain and be able to document any changes due to trail clearing or snowmaking.

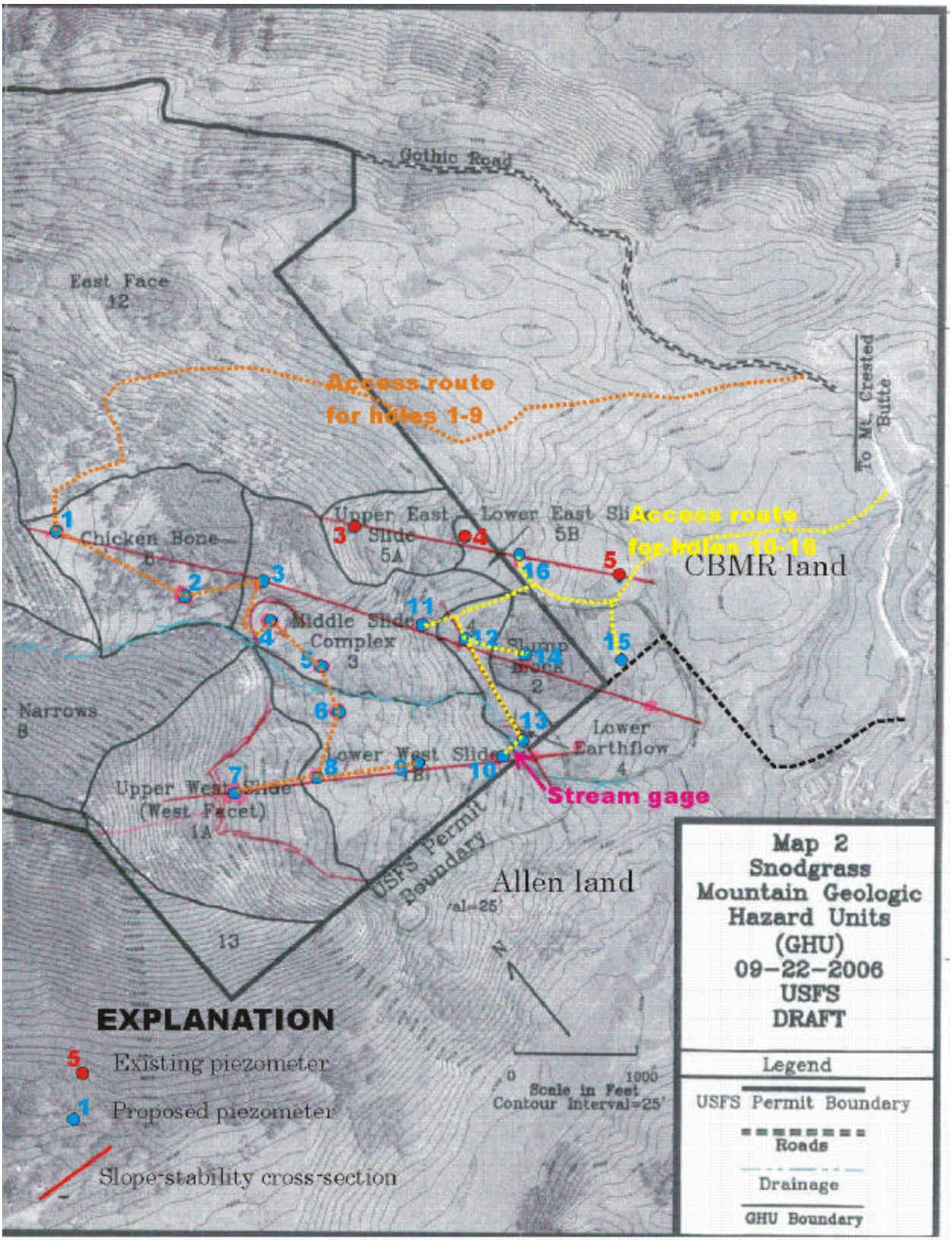

Figure 1. Location map of proposed monitoring wells, stream gage, access routes, and stability cross-sections. Base map is from the USFS draft geologic hazards report on Snodgrass (Sept. 22, 2006), part of Map 2.

Fig. 2. Acker rig on flatbed.

Fig. 3. Acker rig drilling hole #5 in 1994, at toe of East Slide. Note equipment's tracks in grass at right center.

Fig. 4. D3 cat pulling Acker rig, 1994.

Fig. 5. Acker rig and D3 cat on native ground.

Fig. 6. Acker rig propelling itself at the top of the East Slide.

Fig. 7. D3 cat pulling Acker rig through a grove of aspens.

Fig. 8. Acker rig set up and drilling.

Fig. 9. Shoveling cuttings away from auger hole.