

## AVALANCHE ACCIDENT REPORTING FORM

### I. General Information

1. Date: 2/15/87
2. Time of Accident: 1327 mst (time taken by witness)
3. Exact Location: Backcountry between Brighton and Solitude Ski areas near Twin Lakes Reservoir in Big Cottonwood Canyon near Salt Lake City, Utah. The specific slope goes by the local name of "Figure 8 Hill" or "Back Scree". Elevation 9800', Aspect Northeast.

#### 4. Victim(s)

Name Steven VanderVoort      Age 37

Address & Phone 4547 Loren Von Drive, Salt Lake City, Utah

Condition/injuries Death by compressive asphyxiation, as listed on death certificate. No other injuries.

#### 5. Eyewitnesses or other members of party

Name Susan VanderVoort      Age 31

Address & Phone 4547 Loren Von Drive, Salt Lake City, Utah

6. Damage to vehicles, buildings, lifts, etc.      None.

### II. Accident summary

#### 1. Events leading up to accident:

Steven VanderVoort, a Salt Lake City area physician, was an experienced cross country skier and he was teaching his wife Susan about ski touring. Steven and his wife bought a one ride lift ticket from Brighton Ski Area and rode Millicent Lift and left the ski area boundary for the backcountry. They traversed the north side of Millicent Peak and skied the north facing slope of Millicent Peak towards Twin Lakes, stopping on the flats above Twin Lakes. They then made a climbing zig zag trail on the northeast facing slope just to the north of the area which eventually avalanched, (see map). After reaching a bench at about the 10,000' elevation, they skied to the edge of a breakover overlooking Twin Lakes.

#### 2. Accident account

Steven told Susan to wait while he skied the slope. She waited near a rock outcrop near the breakover while Steve skied. After about 4 or 5 turns, she felt the slope collapse and then she saw the slab break out with the crown opening up very near where she was standing. She saw Steve sliding down the slope being carried by the slab, facing downhill, sitting down with his skis out in front of him. Soon he was obscured by the powder cloud and she checked her watch and noticed a time of 1:27 PM.

After the slide came to a rest, she could not see him or any clues. She then descended 2-3 turns to the crown face and jumped 3 feet down to the bed surface and skied down the bed surface (see sketch map). She reached the debris and being a beginning skier, could not ski over the uneven debris and she took her skis off and walked over the debris. She noticed no clues on the surface and she began to probe with her ski poles near the area where she thought he would have ended up. She did not have avalanche probe ski poles. She was probing an area directly below where his ski tracks entered the slab and above and even with the first trees. This area was about 50-100 feet above where he was eventually found.

After probing for several minutes, she thought "this isn't getting me anywhere" and she put her skis on and skied towards the base of Brighton ski area for help. After traveling about 200 meters to Twin Lakes Reservoir, John Dunlea, a Solitude patroller above her on the Solbright trail heard her yelling and radioed for help.

### III. Rescue

#### 1. Time report of accident received: 13:41

From whom: Solitude patroller John Dunlea was skiing Solbright Trail which overlooks the accident site when he heard Susan VanderVoort yelling for help below. He then radioed Solitude Dispatch to report the accident. He then yelled to Susan to return to the accident site and that help was on the way. At the same time an Interconnect guide heard the woman yelling as he was crossing the "Highway To Heaven"--a backcountry crossing between Solitude Ski Area and Grizzly gulch, heading towards Alta Ski Area. He then radioed his supervisor Ray Santa Maria, who was in a vehicle on the road near the base of Brighton Ski Area. Ray then also radioed Solitude dispatch. Wasatch Powderbirds helicopter skiing operation was skiing nearby with clients at the time and the pilot flew by to confirm the location and try to determine if anyone was caught. Communication between Susan and the Solitude patroller confirmed one was buried.

#### 2. Hasty party

Time dispatched: 1:46 Number in party: 3

Time arrived at site: 13:52

Two hasty parties arrived at the same time. Wasatch Powderbirds helicopter skiing guide, Patrick Mullen was skiing nearby with clients when the accident was reported and he left his clients with another guide (Pete Whittaker) on an overlooking ridge and he was dropped off at the accident site and began a beacon search. At the same time Solitude patrollers Mark Watson

and Hamilton Strayer arrived by traversing from Solitude Ski area. All began beacon searches immediately.

3. Followup (main) party

Time dispatched: 1:55 Leader's name: Peter Schory

Number in party: Three from Snowbird via helicopter with a rescue dog.

4. Description of search procedure

13:55 The first column from Brighton departs from the top of Millicent lift.

14:00 Powderbirds helicopter arrived on the site with personnel from Snowbird Ski Area including rescue leader Peter Schory, Dr. Van Austin, patroller Jimmy Collinson and an avalanche dog, Leal.

14:05 The first column from Brighton arrives.

14:05 Witness Susan VanderVoort returned to the scene after climbing up from Twin Lakes Reservoir and told rescuers that there was one person in the slide and he did not have a beacon. (They later found a beacon in the bottom of his pack but it was not turned on presumably because Susan did not have a beacon.) They then called off the beacon search and began an organized probe of likely burial areas based on last seen point and tracks leading into the avalanche and from the description of the witness.

14:11 The Powderbirds then returned to the site with Solitude snow safety director, Jeff Larson, his avalanche dog Gus and patroller Eric Gustavason. This is the second avalanche dog on the scene.

14:15 Second column from Brighton arrives.

14:20 Third column from Brighton arrives with avalanche dog Cody, the third avalanche dog on the scene.

14:24 Powderbirds arrive with more personnel from Snowbird including Liam Fitzgerald, Paul Garsky, Mark Tucker and Gigi Didier.

14:30 Fourth column from Brighton arrives.

14:40 Fifth column from Brighton arrives.

14:40 Powderbirds arrives with team from Alta including Dave McNally, Titus Case and avalanche dog Crystal.

14:50 Victim found with Alta's avalanche dog and Jeff Larson hits victim with probe pole.

14:54 Victim extricated and CPR initiated.

15:35 The victim was flown out by helicopter with Life Flight

15:43. The victim's wife was flown out by Air Med at 15:50

5. Time, location, and position of victim(s) when found:

The victim was found at 14:54 near the bottom of the debris (see sketch map) and on the downhill side of a 20-30" diameter spruce tree. The victim was lying on his right side and back, horizontal, face up and to his right, with his neck flexed a little forward but not enough to obstruct his airway. He was wearing one cross country ski and one leg was flexed at the knee back behind him.

6. Depth of victim: 2-3 feet

Length of time buried: 87 minutes (one hour and 27 minutes)

Condition and injuries: No injuries. Dr. Van Austin estimated the victim had been dead only about 15 minutes.

7. Cause of injury or death: Compressive asphyxiation, as listed on death certificate. No autopsy done.

8. Time rescue was concluded: 16:13

9. Other pertinent information:

IV. Weather and Snowpack Data

1. Weather synopsis :

The 86-87 season began early with 2-3 feet of snow in late September followed by a clear October which metamorphosed all the snow on the north facing slopes into weak temperature gradient snow. Several more feet fell in November followed by a clear December which again metamorphosed the entire season's snowpack into temperature gradient snow on the northwest, north and northeast facing slopes. We referred to this very thick and widespread layer as the December TG layer.

This layer produced very widespread avalanche activity in the first week of January when it was loaded by the weight of several more feet of new snow. Little snow fell for the remainder of January with continued cold temperatures which caused the December TG layer to persist in its weak state. Snow temperatures remained cold on the more northerly facing slopes and combined with an uncharacteristically thin snowpack for the Wasatch, there was little bonding of the December TG layer.

This set the stage for a mid-February snow storm which began, appropriately enough, on Friday the 13th. Between Friday afternoon to Sunday

morning, the day of the accident, from 12-25 inches of new snow was reported from the nearby ski areas of Alta, Snowbird, Solitude and Brighton with densities between 10 and 16 percent water. This added 1.5 to 3.3 inches of additional water weight to the snowpack in a 48 hour period before the accident. In addition, wind instruments at nearby ski areas reported winds from the west to northwest between 20 and 40 mph gusting to 55 during much of the precipitation period which loaded additional weight of snow onto the easterly facing slopes.

Because of this, we at the Utah Avalanche Forecast Center expected to see large and deep avalanches on the slopes with the weak December TG layer remaining--namely steep northwest, north and especially on the northeast facing ones because of the strong redistribution of the new snow by the wind onto lee slopes. Our avalanche forecast that day reflected these concerns. We also suggested that backcountry travelers stay on south facing slopes because the pre-existing snowpack there was quite stable and the skiing was just as good.

Figure 1 shows a seasonal history chart done for the Alta area by the Department of Highways. The snow profile during February shown in figure 2 was also done on February 15th--the day of the accident. This profile is very similar to the one done in the crown area of the fatal avalanche the following day.

## 2. Snowpack structure:

I conducted a detailed crown line profile the following day (2/16/87). About 3 inches of additional snow had fallen since the accident but most of the clues were still visible. I dug a total of 8 snowpits along the crown and the flanks of the slide by digging back at least 2-3 feet from the crown face to eliminate any effects the newly formed crown face would have on the snowpack structure. Figure 2 is a snowpack profile which represents an average of the entire crown. The culprit weak layer was the layer of temperature gradient snow which formed during December. Throughout most of the crown, it broke on the top horizon of the December TG layer and ran on a bed surface of the slightly stronger TG below. I found no evidence that an avalanche breaking on a shallower layer stepped down into the deeper December TG layer; it seemed to fail first on the December TG layer. On the flanks, the slab was much thinner with generally a thinner snowpack and in places, it appeared to have broken on the upper level temperature gradient layer.

As in many crown line profiles, the weak layer still existing above the crown face was fairly strong and was certainly must have been stronger than the weak layer below the crown which avalanched. Therefore, there is no way to know how weak the layer was in the area where the rupture on the basal layer first began. I am assuming that the skier was about 50 feet below the crown when he triggered the slide. This is based on statements by the witness as well as the fact that the snow still existing on and below the bed surface seemed to be the weakest about 50 feet below where his tracks crossed the crown face. Also, the overlying slab was about a meter in thickness and very hard and dense snow (pencil hardness and 40 percent density) and I feel that the slab was rigid enough to have allowed him to get well out into the area which eventually avalanched before it failed.

This appeared to be typical of most depth hoar avalanches in that: first, depth hoar forms most readily on steep northerly facing slopes, and second, there was significant loading of both new snow and wind transported snow onto

the slope within 24-48 hours before the slide (depth hoar is especially sensitive to loading and the instabilities persist through time often for more than a week after loading).

3. Were warnings, restrictions, or closures in effect?

The Utah Avalanche Forecast Center recorded message for the Salt Lake Mountains read "...the places where we would expect you could create a big avalanche are above 8,500', on east, north and west facing slopes steeper than 35 degrees. For this reason we feel there is a high avalanche hazard in these areas...."

Brighton Ski Area has permanent signs at the top of Millicent Lift (where the victim left Brighton Ski Area) which warn the public that they are crossing the ski area boundary, there is no avalanche control beyond that point and that the avalanche hazard was high.

V. Avalanche Data

1. Type of slide : Hard Slab, class IV
2. Dimensions: width: 150m; length: 300m slope distance,
3. Fracture line: depth 80-140 cm average 100 cm  
width 150m
4. Depth of debris: .2-3m
5. Other pertinent information: Debris consisted of well consolidated snow without many hard blocks remaining. The slab was about a meter thick composed of hard dense snow. Since no large fragments of the slab remained in the debris pile, the avalanche must have had a high degree of internal dynamics in order to grind up the hard blocks in the relatively short distance of 300 meters and a vertical fall of only about 120 meters.

VI. Terrain data

1. Elevation: 9990'
2. Aspect: 20-40 deg (NE)
3. Starting zone slope angle in degrees: 38 deg (measured)
4. Vegetative cover : open
5. Shape of path : open

VII. Conclusions and recommendations:

This was a very unfortunate fatality for several reasons: First, as in the vast majority of avalanche fatalities, the victim triggered the slide that killed him. Also, he was an intelligent and experienced backcountry skier and had full access to information indicating the specific avalanche hazard on that particular slope. On that day there was certainly no lack of very good and

relatively safe skiing on south facing slopes and quite dangerous skiing on the more northerly, and especially northeasterly facing steep slopes--precisely the kind of slope he was skiing when he triggered the slide which killed him. This information was available to him via the Utah Avalanche Forecast Center recording that day as well as posted at the top of Millicent Chairlift at Brighton from which he used to gain access to the backcountry.

Second, he was carrying a rescue beacon in his pack and he did not turn it on presumably because his wife did not have a beacon. The examining physician estimated that he lived for over an hour under the snow; rescuers with rescue beacons were on the scene within 18 minutes.

Third, even without the beacon, the avalanche rescue dogs had ample time to locate the victim in time to save his life. Three avalanche dogs were on the scene for 30 to 50 minutes before Alta's dog--the last to arrive-- found the victim within about 10 minutes. All the dog handlers were disappointed in the way the dogs performed. There were reports of dogs fighting, being distracted and generally unmotivated.

One possible explanation of the poor dog performance is that one of the volunteer patrollers arriving from Brighton left his pack on top of the avalanche debris very near the spot where the victim was eventually found. However, the first avalanche dog was on the scene about 30 minutes before the pack was left on the debris. Also, Alta's dog found the victim despite the distraction from the pack left on the debris.

In a post-rescue critique of the avalanche rescue by those involved, they suggested performing more joint avalanche drills where the dogs would have the opportunity to work with each other and hopefully develop a more cooperative working relationship. Also, they are planning a rescue dog clinic with rescue dog personnel from Canada. Also, none of the dog/master teams at the rescue were registered with or certified with the Rocky Mountain Rescue Dogs (RMRD) organization, presumably because of the demanding year round schedule required by RMRD.

The rescue critiques also revealed other problems, for example, organizational problems with volunteer patrollers such as not following orders from persons in charge. Also, the rescuers from Brighton crossed several uncontrolled avalanche tracks and starting areas enroute to the accident site. These paths have been quite active throughout the 86-87 season producing at least four human triggered slides previous to this fatality. These paths are also at the same elevation and aspect as the one which produced the fatal slide minutes before. A much safer and just as quick access existed by descending to the northwest of the top of Millicent lift which would lead the rescuers directly at the toe of the slide debris without traversing these several suspect avalanche tracks and starting areas.

In summary, I have often been amazed by how lucky backcountry travelers are when they trigger avalanches. For example, in the last several seasons, Utah has logged about 60-70 reported human triggered avalanches per season yet only about 3 per season are killed. It seems that avalanches often give backcountry travelers a chance to make a mistake and live to learn from it. However in this case, the victim made two major mistakes: first, poor route selection and second, not having his beacon turned on. Finally with the poor performance by the rescue dogs, it became a case of several unfortunate circumstances being piled upon each other and the sum added up to poor odds for living to learn from the seemingly benevolent avalanches.

Also, the Wasatch Backcountry Rescue group is probably the fastest responding and most qualified volunteer winter rescue group in the country and it was a genuine disappointment not to have a live rescue with this accident.

Bruce Tremper

ch of an avalanche which took the life of Steven Vander Voort  
 1-15-87. There was no evidence of a shallower slab or sluff  
 stepping down into deeper layers. The crown probably broke  
 out 10-20 m above him.

Aspect:  $30^{\circ} - 50^{\circ}$ ; Alpha angle (subtended from toe of slide to crown:)  
 Slope  $36^{\circ} - 38^{\circ}$ ;  $25^{\circ} - 26^{\circ}$

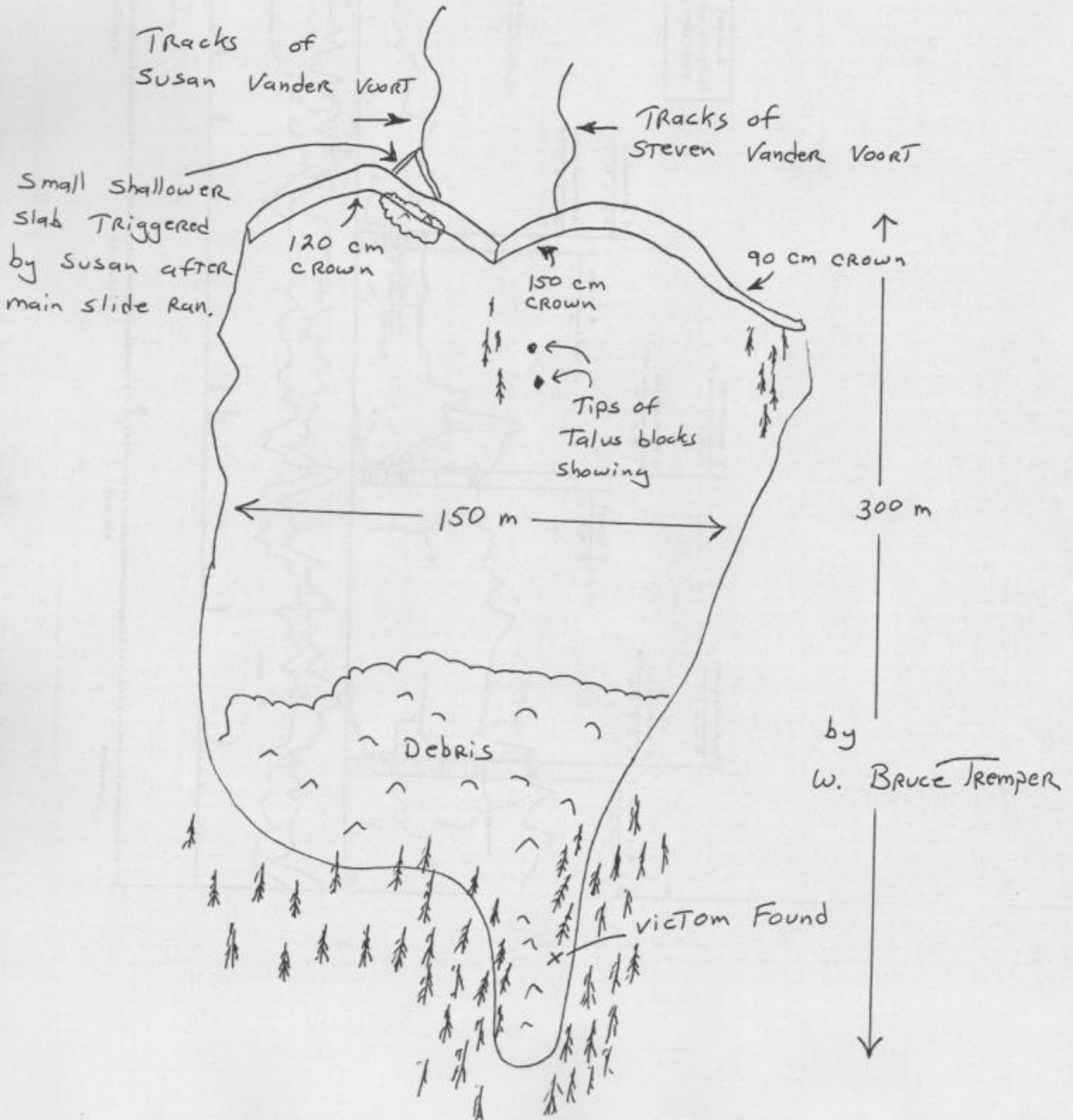
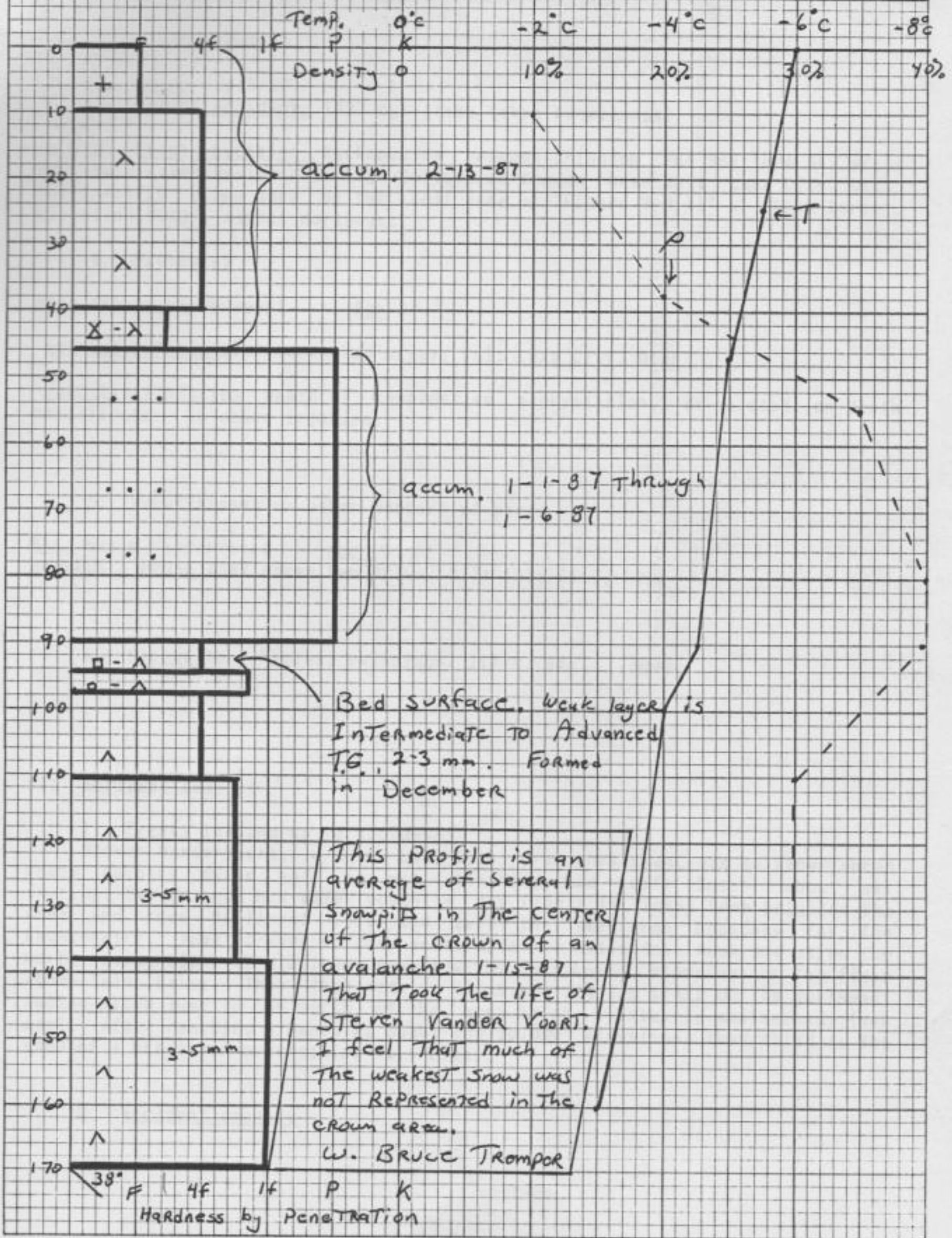




Figure 2

Location: Back Bowls of Brighton. "Figure 8 Hill"  
 Date: 2-16-87 Aspect 40° Crown line profile from  
 Time: 1:00 pm Slope 38° avalanche 2-15-87



SQUARE  
 MADE IN USA

DRAWING PAPER NO. 1280-10-B  
 TRACING PAPER NO. 1227-10-B  
 CROSS SECTION-10X10 TO 1 INCH  
 5TH LINE ACCT'D, 10TH HEAVY