

PETER SCHAERER

Apt.103 -105 West Kings Road
North Vancouver BC; V7N 2L7
Telephone: 604-987-3716
e-mail: pschar@shaw.ca

SNOW AVALANCHE HAZARDS AT JUMBO GLACIER RESORT

Report prepared for:

Oberti Resort Design, a division of Oberto Oberti Architecture and Urban Design Inc. of Vancouver BC.

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OBJECTIVE

On 12 November 2014, Oberto Oberti requested Peter Schaerer to determine whether snow avalanches at the planned resort village in the Jumbo Valley could affect;

- a) the residential areas;
- b) the day lodge north of the resort village.

This report contains the conclusions of an analysis of the avalanche hazard.

DOCUMENTATION

The runout zones of possible maximum avalanches were estimated from information on topographic maps (scales 1:7500 and 1:20,000) that included the locations of the planned village and the day lodge; air photos; oblique photos of the avalanche paths; dynamic and terrain models for avalanche speeds and runout distances. An analysis of avalanche risks of this nature typically would include field observations of terrain features, observations of vegetation damage from avalanches and the consideration of observed avalanches. Unfortunately no observations on the ground could be carried out in November 2014 because snow had covered the area and access, furthermore observations of past avalanches were not available. Because the observational data are incomplete, the conclusions may not be accurate, but they express fairly the hazard to the planned developments.

In 1991, Peter Lev had mapped hazardous avalanche areas in the Jumbo Creek Valley. His map shows well the location of avalanche paths, but maximum avalanches, for example with a 100- to 300-year return period, might run longer distances than are shown on the map.

EAST SIDE OF RESORT VILLAGE

Frequent small avalanches start on the rock face below the mountain ridge. Probably most of them stop on the 26° incline below the rocks, but their impact and load on an instable snowpack on the lower slope could start small and medium size avalanches. Such avalanches

would either stop in the forest or, when running in depressions and ski glades, stop on a gentler slope (incline 20° to 23°) approximately 400 m from the village at the maximum.

WEST SIDE OF RESORT VILLAGE

Numerous avalanches start in a large bowl with irregular terrain at the Jumbo Peak ridge. Small avalanches would stop on low inclines in the bowl, but larger ones appear to move into a channel at the south side of the bowl. The avalanches, in particular those of wet snow, could advance in the channel as far as Jumbo Creek in the valley bottom. The plan of the village shows that no residential buildings are planned in the vicinity of the channel.

The query is whether large avalanche might not be confined in the channel, but would spill to the wide and logged area above the village. The slope incline of this area is too low for avalanches to start there, but avalanches in motion that run over the confining ridge of the channel could advance through a strip of forest and over the logged area. The standing forest contains tracks that could have been made by avalanches, but observations on the ground need to confirm this. Medium size avalanches (size 3 of the Canadian classification) that advance into the logged area would stop about 200 m distance from the village edge, and larger ones could reach the village. As a conclusion now, the absence of wide avalanche tracks in the remaining forest and a low slope incline of the logged area suggest that avalanches have not in the past and probably will not reach the west side of the resort village,

DAY LODGE

The Day Lodge, now under construction, is located 200 m up-valley from the Village. A large avalanche path, named “South Wolverine” on the 1991-map and “Pink Panther” on recent maps, covers the slope west of the Lodge. Avalanches start below the ridge of Jumbo Peak (elevation 2600 m) in deep wind-transported snow. The avalanche track on unconfined terrain has an average incline of 28° which allows avalanches to develop enough speed for reaching and crossing the valley floor. The air photo shows that avalanches have destroyed the forest over a distance of 130 m on the valley floor and probably have run farther into the forest without braking trees. The models of runout distance for an avalanche with an estimated 100-year return period yield a runout distance of 250 m across the level valley floor.

The Lodge location is in the forest and, according to the Google earth photo received, is approximately 20 m from the trim line that avalanches had produced. Oblique photos of the site show large fir trees between the lodge and the open avalanche path. Observations at numerous other avalanche paths however have demonstrated that owing to variations of the starting location, irregular ground surfaces, and previous snow deposits, the avalanche flow directions often are unpredictable and avalanches could break through forest at the side and spread wider in the runout zone than is evident from forest damage. At the Pink Panther avalanche path in question, avalanches might spread because the topographic maps do not show terrain features that might confine them. In conclusion, though no damaging avalanche

has reached the Lodge site, a larger one than had occurred in the past or an avalanche with an irregular flow direction could hit the Lodge.

When the Lodge is built, it will be essential to prevent the formation of large avalanches. This could be achieved by controlling with explosives frequently the formation of instable snow packs in the starting zone. Several explosive devices with permanent equipment on site and remote control are on the market, for example Gazex, Daisybell, Wyssen.

The avalanche control with explosives will require a safety plan and trained, experienced and licensed persons.

CONCLUSIONS

1. Avalanches are not expected to reach the east side of the resort village.
2. Probably no avalanches will reach the west side of the resort village. But because of the uncertainty of large avalanches spilling to the logged slope, it is recommended that, prior to development in this part of the resort, ground observations and avalanche observations be made for further review. Control by explosives might be considered in the bowl above if necessary.
3. No residential buildings should be placed within 50 m of the creek channel south in the west side of the resort village.
4. Avalanche control by explosives must be applied at the Wolverine/Pink Panther avalanche path near the Day Lodge and be supported by trained personnel and a snow safety plan.