2. LAND-USE RECOMMENDATIONS IN AVALANCHE ZONES

2.1 General

The land-use recommendations of this section consider

(a) The natural and present avalanche condition as shown on avalanche hazard maps (figure 1-1), and

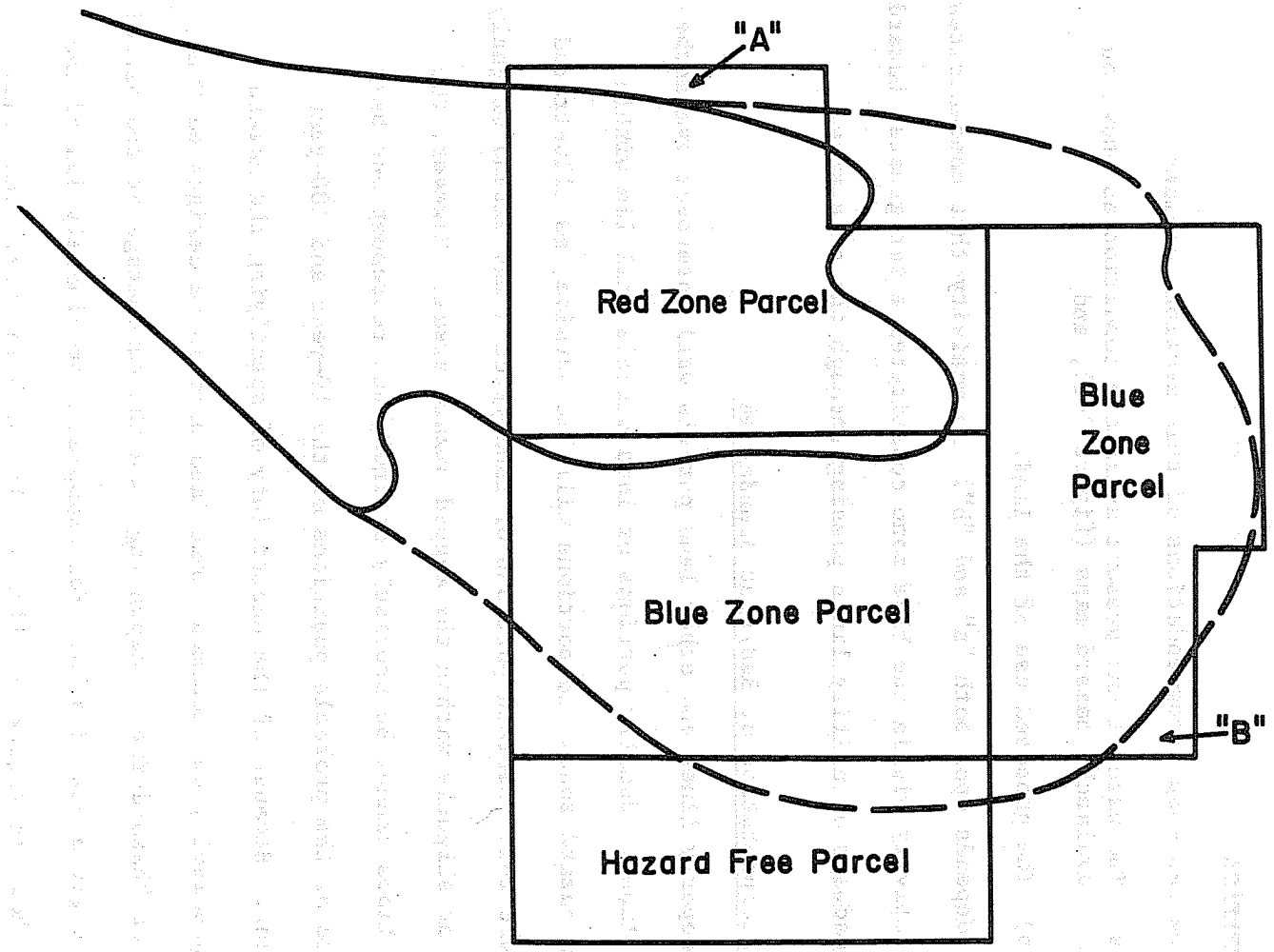
(b) The proposed use of the land.

Hazard depends upon both "a" and "b". An activity that concentrates human activity within the blue zone constitutes a far greater hazard than roadways or utility lines passing through the same area.

2.2 Interpretation of Red/Blue Boundaries

Property lines and other land parcels will intersect avalanche hazard lines. Usually portions of land parcels will lie within certain hazard zones and portions will lie outside, as illustrated in figure 2-1. Certain portions of land parcels may extend slightly beyond or slightly within the mapped hazard areas. However, the hazard lines cannot be precisely defined, but represent our best estimate of the probable positions of the 10-year and 100-year avalanche. Because of the uncertainty of specifying the hazard lines precisely, we recommend that land parcels be designated "red," "blue," or "hazard-free," depending upon the percentage of the parcel within a given hazard area. For example, approximately 85% of one parcel shown in figure 2-1 lies within the blue zone. This land should be considered as falling entirely within the blue zone and

FIGURE 2-1


"A"
Red Zone Parcel
Blue
Zone
Parcel
Blue Zone Parcel
"B"
Hazard Free Parcel

appropriate land use restrictions (discussed in section 7) should apply to the entire land parcel. This procedure would avoid the problems associated with a small apparently hazard-free corner (shown as "A" and "B" in figure 2-1). Experience with the implementation of avalanche zoning plans in Vail, Colorado and Ketchum, Idaho has shown that landowners will propose structures immediately adjacent to a hazard line although such an interpretation often requires a precise interpretation of a hazard line on a flat, featureless land surface. The lower property in figure 2-1 could be considered hazard free with no use restrictions because it lies almost completely outside the hazard boundaries.

2.3 Land-Use in the Red Zone

Buildings and other facilities that concentrate human activity should be excluded from the red zone. Although structural protection for buildings in the red zone is possible in some cases, large avalanches will possess large mass and energy, and avalanches are relatively frequent. Design of protective structures in the red zone is often not practical because avalanche forces will be large. This is discussed more fully in section 6, "Avalanche-Hazard Mitigation." Avalanches may be difficult to stop or deflect in the red zone because of high velocities.

The probability of avalanche encounter with buildings is also very high within the red zone. Assuming an avalanche return period of 10 years and a building life of 30 years, there is a 96% chance that the building will be reached at least once during its lifetime,

and a 65% chance that it will be hit once during a 10-year period. Although not all avalanches in the red zone will be large and destructive, the people one wishes to protect may be outside when the slide occurs.

Access roads may pass through red zones because there exists a much smaller chance of encounter between moving traffic and avalanche. Roads, for example, will be occupied only a fraction of the time. However, the boundaries of avalanches should be clearly posted on all public roads and "no parking" signs should be posted. In areas where avalanches are expected more often than once every two years, road closure, avalanche artillery control, or other safety plans should be developed.

2.4 Land Use in the Blue Zone

Buildings can be permitted in blue zones if they are reinforced for design-avalanche loads. The magnitudes of such loads cannot be specified without final information about building design and position, but loads will usually be much less than those occurring in the red zone. In certain locations, avalanches can be stopped or deflected away from buildings because major avalanches begin to decelerate naturally.

If building permits are issued for construction in the blue zone, design should first be certified by a registered engineer with experience in structural design. The characteristics of the design avalanche used in engineering specifications should be specified by an expert in avalanche force and behavior. This requirement will

transfer responsibility for structural failure away from the government and to the professional responsible for the design.

Roads and utility lines should be permitted without restriction in the blue zone, although we recommend that these facilities be located as far away from the red zone as possible to reduce the probability of encounter with avalanches.