

CASCADE PASSES**AVALANCHE
ATLAS****Part 1****Chinook, Cayuse, White and
Snoqualmie Passes**

Prepared for
Washington State Highway Commission
Department of Highways
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by

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RESEARCH AND SPECIAL ASSIGNMENTS

Cascade Passes Avalanche Atlas

Part I

Chinook, Cayuse, White and Snoqualmie Passes

INTRODUCTION

This present compilation of avalanche paths affecting Washington State highways extends in the same format the information published in 1971 as the North Cascades Highway Avalanche Atlas. Part II, in preparation, will cover Stevens Pass and Tumwater Canyon.

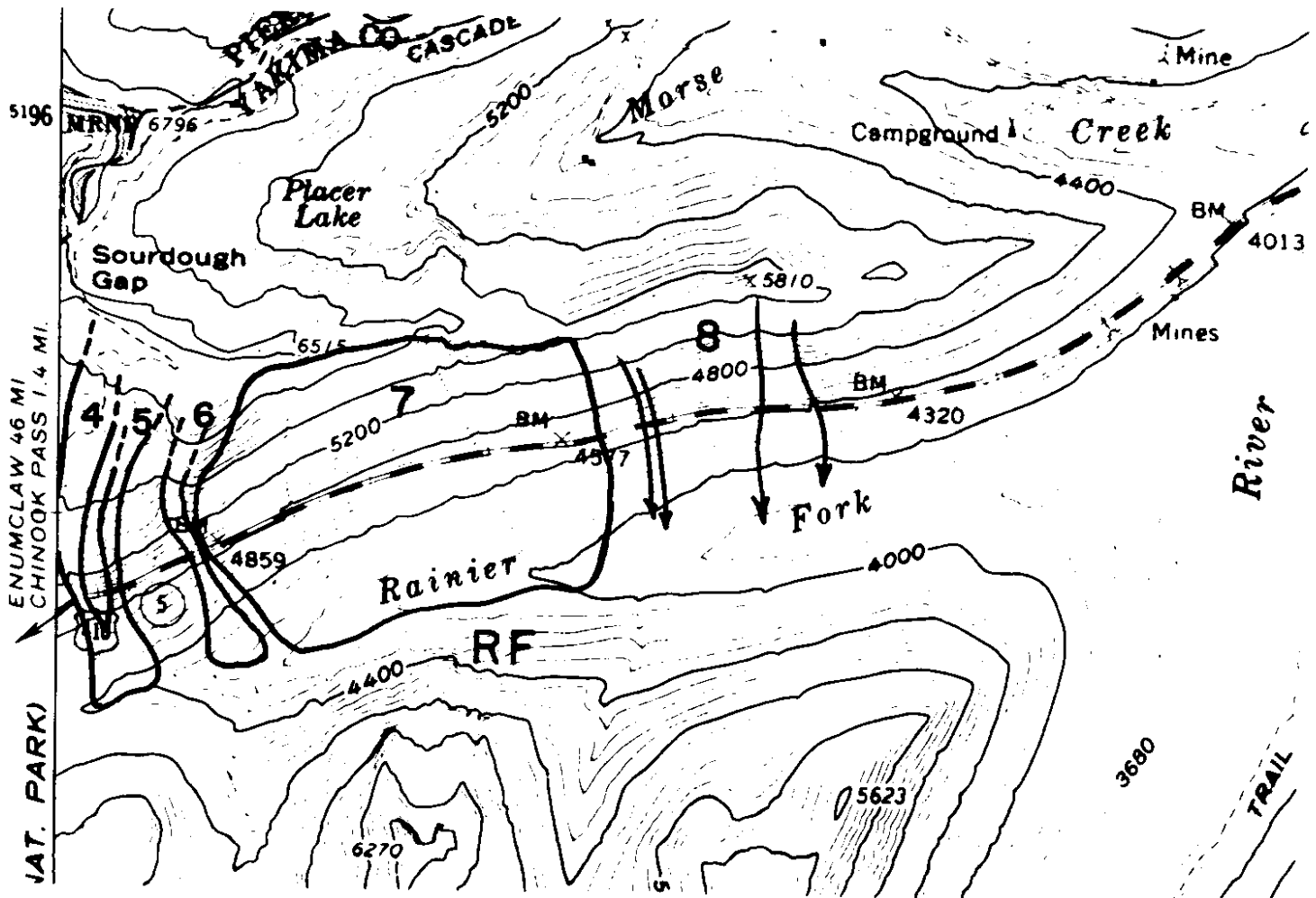
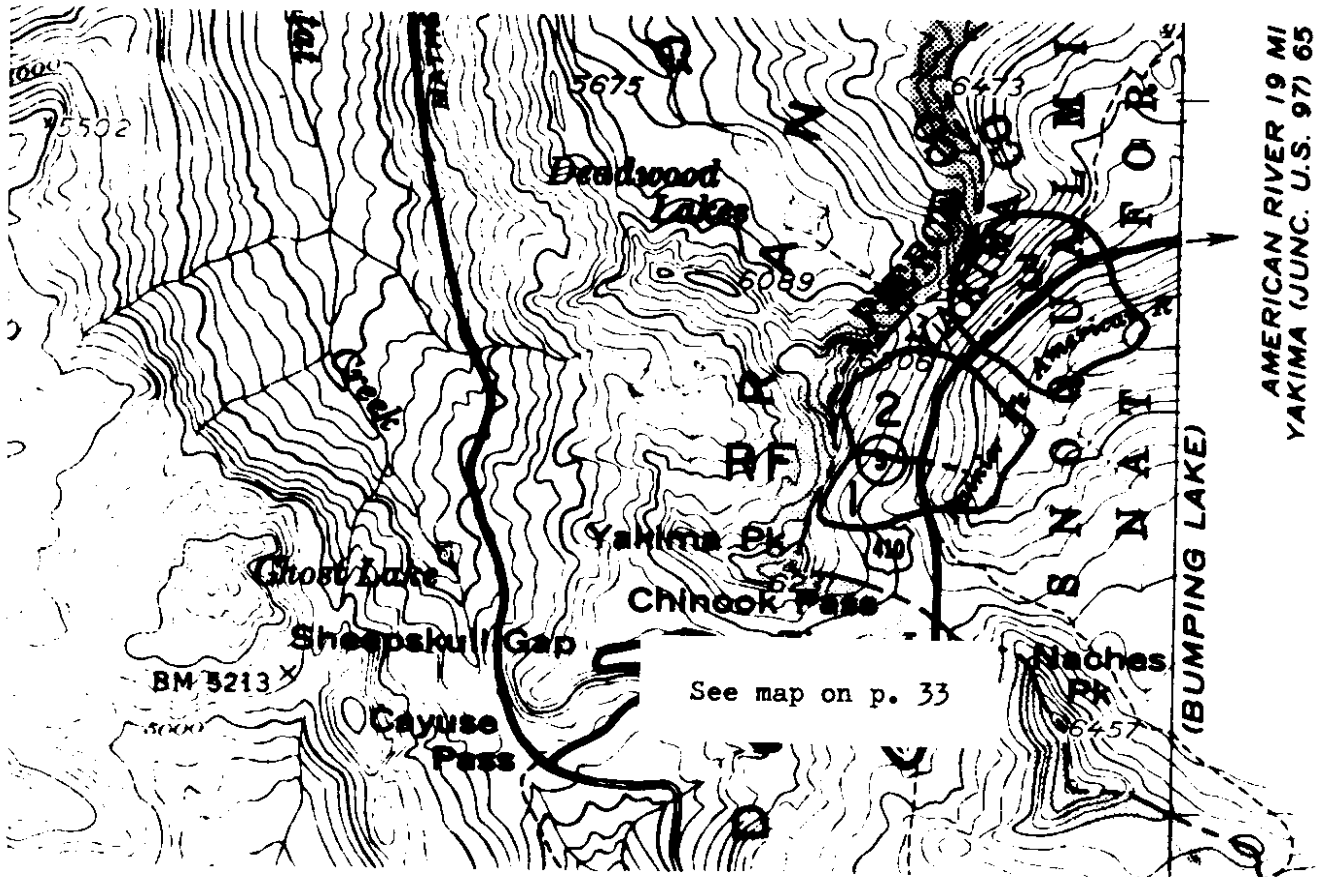
The North Cascades Highway Atlas was prepared on the basis of extensive aerial and ground reconnaissance in a hitherto inaccessible wilderness area where no previous record of avalanche occurrence was available. Compilation for the Cascades Passes has proceeded on the same basis, with the added advantage that all of the areas in question have long been traversed by highways for which considerable historical records exist. It is necessary, though, to note that such a record has proven to be less advantageous than might be expected. In the case of the North Cascades Highway, identification of avalanche paths was based on objective appraisal of terrain and vegetation patterns, leading to an accurate and highly consistent compilation. In the present Cascade Passes Atlas, there are many instances where objective evidence and historical accounts fail to agree. Moreover, the nomenclature, rather than being assigned consistently, has developed ad hoc over the years and varies with individuals and agencies. These conflicts have been resolved in the final editing of this Atlas according to the best available evidence, but in some cases necessarily in an arbitrary fashion.

The Snoqualmie Pass section of this Atlas includes reproductions of sketches prepared by the Department of Highways for use in recording avalanche occurrences. These sketches are included here to illustrate this mode of avalanche recording, since it is a valuable method for systematically accumulating an historical record of avalanche frequency and behavior.

This Atlas has been compiled by several people working in the field. A preliminary survey was made in 1971 by Ray Leonard. Data for Chinook, Cayuse and White Passes were subsequently compiled in 1973 by Norman Wilson and Patti Olson. Data for Snoqualmie Pass were furnished by Al Bennett and others in the Department of Highways. Many persons in the Department maintenance crews furnished historical details and recollections. John Dalle-Molle of the National Park Service was especially helpful with information about Cayuse Pass. Final compilation, editing and field check were by Edward R. LaChapelle.

This Atlas has been prepared under the provisions of Washington State Department of Highways Contract Y-1301 with the University of Washington. Edward R. LaChapelle, Colin B. Brown and Roger J. Evans are Co-Principle Investigators.

Chinook Pass



Cascade Mountain Passes
Avalanche Summary Sheet

Area: Chinook Pass West (U.S. 410)

Name of Path: Windy Point East (WE)

Hazard: High

Map: Chinook Pass 7.5' (Prelim.)

Location: Milepost _____ Station _____ Other just south of Cayuse Pass "Y"

Elevation of starting zone: 5000'

Vertical fall: 400' Length: 600'

Description: Aspect - S Slope L = 37°

The terrain is steep and smooth with low brush and timber patches.
The release zone is rimmed by the upper road. Breadth at road is 250' and
and adjoins the Cayuse Cliffs slide area.

Effect on Highway:

Normal run to Cayuse/Chinook junction. Maximum run down to and
beyond 123 highway. Frequent deposition of snow on the highway
throughout each winter.

History:

Avalanches with each snow, rain and thaw. Infrequent to 123,
frequent to 410.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Chinook Pass West (U.S. 410)

Name of Path: Cayuse Cliff (CC)

Hazard: High

Map: Chinook Pass 7.5' (Prelim.)

Location: Milepost _____ Station _____ Other 1/4 mile east of Cayuse Pass "Y"

Elevation of starting zone: 51-5200'

Vertical fall: 400' Length: 500'

Description: Aspect = S.E. Slope L - 42° overall

There is virtually no vegetation. The path is all rock outcrops with minor gullies and open rock faces. The release zone is immediately below the center switchback of the road. Breadth at road = 1200'.

Effect on Highway:

Normal run is into the lower switchback of U.S. 410 and beyond. Maximum run is into the trees below this lower switchback. At the extreme S.W. end a finger occasionally reaches across S.R. 123. Highly active, no timber debris, and a frequent hazard to the highway. Rocks can come down with spring wet slides.

History:

No mid-winter observations. Spring plowing indicates frequent heavy avalanching each winter to U.S. 410 and occasionally to S.R. 123.



Cascade Mountain Passes
Avalanche Summary Sheet

Area:

Name of Path: Yakima Peak (YP)

Hazard: High

Map: Chinook Pass 7.5' (Prelim.)

Location: Milepost _____ Station _____ Other Chinook Pass west-side switchbacks
(SSW flank of Yakima Peak)

Elevation of starting zone: 6000'

Vertical fall: 1500' max. Length: 3800'

Description: Aspect = SSW Slope L = 30° ave : 35° - 38° in release zones

From the ridge, the terrain is smooth and basically open with a few clumps of trees and transition zones. There are several release zones at the 6000' level beneath Yakima Peak and one rock face between lower and middle switchbacks of the road.

Effect on Highway:

Normal run includes all three legs of U.S. 410. Maximum run of main slide is to beyond S.R. 123 about 4-500'. Under extreme conditions the whole area could slide at once. Avalanching is possible each major storm and thaw. There are also some short chutes just east of YP which run between the upper and middle switchbacks of the highway.

History:

No winter occurrence observations. Vegetation patterns indicate frequent activity - probably oftener than annually.

Cascade Mountain Passes

Avalanche Summary Sheet

Area:

Name of Path: Naches Basin (NB)

Hazard: Low

Map: Chinook Pass 7.5' (Prelim.)

Location: Milepost _____ Station 0.4 miles west of Chinook Pass summit

Elevation of starting zone: 6200'

Vertical fall: 1000' Length: 2000'

Description: Aspect = WNW Slope L = 35° in release zones

The path is essentially an open, grassy basin with islands of trees and one minor knoll in the center. Breadth at highway = 0.1 miles.

Effect on Highway:

Normal run is to the transition zone above the Naches Tarn.
Maximum run is across the Tarn and the highway to the elevation of Tipsoo Lake.

History:

Constant avalanching each winter in upper basin. Avalanches big enough to reach the highway are infrequent. Debris indicate that this slide crossed the highway in the winter of 1972/73.

Cascade Mountain Passes
Avalanche Summary Sheet

Area:

Name of Path: Naches Peak (NP)

Hazard: Moderately high

Map: Chinook Pass 7.5 (Prelim.)

Location: Milepost _____ Station 0.2 miles west of Chinook Pass summit

Elevation of starting zone: 6200'

Vertical fall: 1000' Length: 1500'

Description: Aspect = W Slope L = 27° in middle slope

This slide is a series of fingers with terrain obstacles. It goes across Tipsoo Lake on its western most side and up into trees on the hill by the lake. The slopes are smooth and grassy - divided by lines of timber. Release zones are $30-35^{\circ}$ slopes, open and grassy. Breadth at highway = 0.1 mile.

Effect on Highway:

Normal run is to the highway. Maximum run is across highway and Tipsoo Lake to the knoll on W side of the lake as indicated by vegetation. Occasional ground avalanches are possible. A frequent hazard to highway if it is kept open in the winter.

History:

Vegetation patterns suggest avalanches cross the highway at least annually.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Chinook Pass East (U.S. 410)
Name of Path: Rainier Fork Slide Area (RF)
Hazard: High
Map: Mt. Rainier National Park 1:62,500 and Bumping Lake 15'
Location: Milepost 69.4-74 Other _____
Elevation of starting zone: 5400' to 6200'
Vertical fall: see description Length: see description
Description:

The Rainier Fork Slide Area begins 0.3 miles east of Chinook Pass summit and forms an almost continuous hazard area for the next 4.6 miles as U.S. 410 descends the Rainier Fork Valley. The highway is located well up on the mountainside for this distance and consequently lies in the middle to the lower third of the avalanche paths. Most significant avalanching can deposit snow on the highway, which serves as an effective catchment barrier for the smaller slides. Large avalanches normally run all the way to the valley floor. Both channelled gulley avalanches and wide, open-slope avalanches occur throughout this zone, with the latter predominating. Vegetation in the slide paths is limited to brush and stunted conifers characteristic of frequent and active avalanching. Release zone exposure varies from east to south, with the latter extending over the major portion of the hazard area. Wet spring avalanches are the major source of hazard and can persist as late as May following late-spring snowstorms. If this highway were kept open in the winter, the Rainier Fork area would be a very serious and persistent source of hazard, especially in the spring and would necessitate frequent and sometimes prolonged closures.

Eight distinct avalanche areas are identified within the Rainier Fork hazard zone. These are briefly described below.

RF-1

This is an east-facing basin converging to a narrower outrun zone just above the highway at MP 69.4. There is heavy winter snow accumulation from S-SW storm winds with extensive cornice formation along the ridge crest. RF-1 has a high probability of producing major cold slab avalanches in mid-winter. It is not nearly so active in the spring as the rest of the RF area.

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RF-1



Cascade Mountain Passes

Avalanche Summary Sheet

Name of Path: Rainier Fork Slide Area (RF)

Description continued:

RF-2

MP 69.2 to 70.0. The boundary between RF-1 and RF-2 at the highway is arbitrary; the hazard is continuous. RF-2 has a distinctly different release zone, an open and largely uniform slope falling from the easterly flanks of Point 6306. Winter storm loading also contributes to a high probability of slab avalanching here, but the spring slide cycles are apt to be more vigorous than at RF-1. Both of these paths commonly discharge avalanches which run to the valley floor each winter.

RF-3

MP 70.0 to 70.6. RF-3 is an open-slope avalanche area facing SE on the shoulder of Point 6473. It is separated from RF-2 by a low area where the creek from Deadwood Lakes drains into Rainier Fork. Large avalanches do not occur in this low area, although it is possible for snow running a few hundred feet to reach the highway here. Winter avalanches are much less frequent at RF-3, but spring avalanches are very common.

RF-4

MP 70.65. This is a narrow avalanche path originating in the basin south of Sourdough Gap and falling to the highway along a narrow gulley. It is active in most years with a heavy snow cover, primarily as a spring avalanche.

RF-5

MP 70.75. Similar in characteristics and behavior to RF-4. This avalanche falls in the next stream gulley immediately to the east of RF-4. At the highway, the two are separated by the only place along Rainier Fork where U.S. 410 passes through a short cut.

NOTE: RF-4 lies at the intersection of the two maps depicting this area. The map contours are in poor agreement at this point and the contours on the Mt. Rainier map (1:62,500) poorly depict the terrain. Thus, the location of RF-4 and RF-5 can be shown only approximately.

RF-6

MP 71.05. Another gulley avalanche with similar characteristics to RF-4 and RF-5, although the release zone for RF-6 faces more directly to the south. This is a source of large avalanches which probably fall annually or oftener.



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Cascade Mountain Passes

Avalanche Summary Sheet

Name of Path: Rainier Fork Slide Area (RF)

Description continued:

RF-7

MP 71.1 to 72.5. This essentially is an open-slope avalanche path 1.4 miles wide. There are several shallow gulleys where wet snow activity concentrates, the most prominent one being at MP 72.4. Scrub conifers diminish in number towards the east along RF-7 until the eastern half becomes virtually free of trees, retaining only low brush indicative of frequent and vigorous avalanche activity. This whole area apparently is subjected to extensive wet snow avalanching every spring.

RF-8

MP 72.5 to 73.9. RF-8 is a zone of thick timber stand on the sidehill which represents an abrupt transition from the open, avalanche slopes of RF-7 (the latter may have been created long ago by fire which burned eastward only as far as the present Milepost 72.5). A number of long, narrow avalanche paths originate near the ridge crest and penetrate this timber cover to the highway and on to the valley floor. The most prominent of these paths, marked with arrows on the map, appear to discharge avalanches (usually wet snow) annually or oftener. These paths are located at MP 72.58, 72.6, 72.8, 72.9, 73.2, 73.35, and 73.9. Eastward from these paths from MP 73.9 to the gate at 74.6 there is a zone of uniform young conifers which apparently have grown up since some occasion of timber destruction on this slope. This occasion could have been fire or avalanche. There appears to be little present avalanche activity among these trees, but this must be considered a possible site for a major avalanche.

REF-7



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R



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Chinook Pass East & S. 410)

Name of Path: Gold Hill Area

Hazard: Very low

Map: Bumping Lake 15'

Location: Milepost _____ Station _____ Other _____

Elevation of starting zone: _____

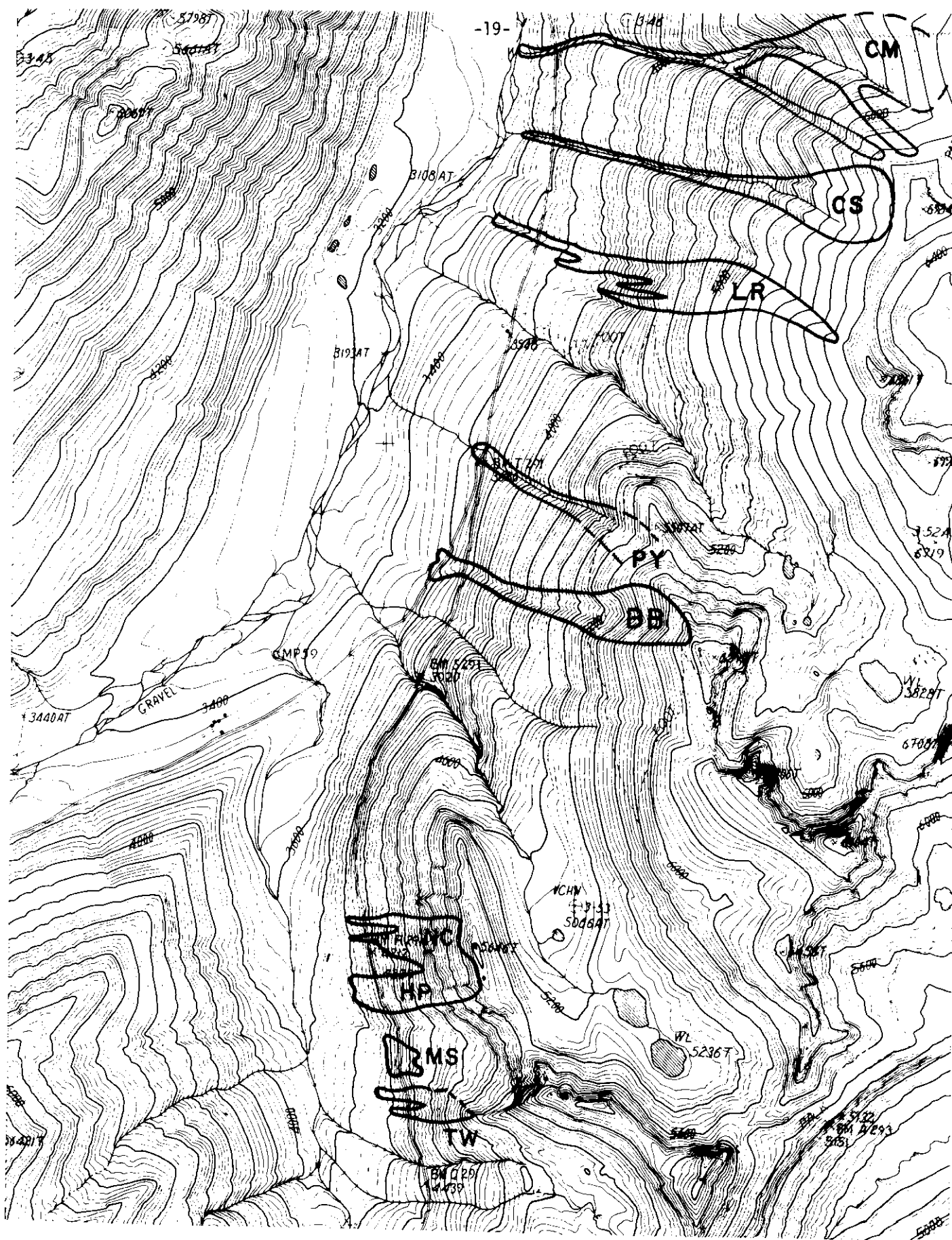
Vertical fall: _____ Length: _____

Description:

There are two major avalanche paths falling from Gold Hill which do not presently affect the highway but which present a possible hazard, albeit a remote one. One of these is at the Lodgepole Campground, the other is at the American River crossing a short distance down-valley from the Lodgepole Campground. Under circumstances of extraordinary snow conditions, it might be possible for an unusually large avalanche to run as far as the highway. This possibility appears to be very small.

History:

Cayuse Pass



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass North (U.S. 410)

Name of Path: Crystal Mountain (CM)

Hazard: Low

Map: Mt. Rainier 1 NE 7.5' (prelim.)

Location: Station 1.0 mi. north of highway maintenance camp

Elevation of starting zone: 6500'

Vertical fall: 3100' Length:

Description:

This path has a complex release zone with three separate sources of avalanching. A very narrow path descends a shallow gulley on the WNW flank of Pt. 6984. It probably does not generate avalanche large enough to reach the highway. Just north of the top of this narrow path another path runs NNW and then curves around in a deeper gulley to join the first path at the 4400' level. The open slopes to the north of this deeper gulley have at some time in the past discharged a major avalanche which established a trimline in the timber running down to the 4200' level. The latter path does not appear to have been active for many years. Below 4200', a very narrow and winding stream bed leads to the highway and the valley floor.

Effect on Highway:

Infrequent, large wet snow avalanches are the only ones apt to reach the highway by descent of the winding gulley. Debris deposition can be narrow but deep, with a high content of timber.

History:

No recent accounts of activity on this path are available.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass North (U.S. 410)

Name of Path: Crystal Mountain South (CS)

Hazard: Low

Map: Mt. Rainier 1 NE 7.5' (prelim.)

Location: Station 0.7 mi. North of highway maintenance camp

Elevation of starting zone: 6800'

Vertical fall: 3700' Length: 1 mi.

Description: Aspect - West

Terrain - relatively smooth in release zone. Young timber in slide track lined by heavy timber with low shrubbery in starting zone. This path has an open release zone near timberline which funnels into a long, narrow and straight gulley. Width at road = 100'.

Effect on Highway:

Normal run - to transition zone above the road at 3500'
Maximum run - to river

An infrequent avalanche which can bring a narrow but deep deposition of snow to the highway usually accompanied by some timber debris.

History:

Has not gone to river for about 50 years, as evidenced by vegetation.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass North (U.S. 410)

Name of Path: Little Richard (LR)

Hazard: Low

Map: Mt. Rainier I NE (prelim.)

Location: Milepost _____ Station 0.4 mi. north of highway maintenance camp

Elevation of starting zone: 6500'

Vertical fall: 3200' Length: _____

Description:

Release zone for this path is a north-facing slope on the NW flank of Point 6861, where deep drift accumulation build up from SW storm winds. The avalanche falls over a broad path to about the 4400' level, where it breaks up into four separate fingers. The northern finger is the largest and this is the one which reaches the highway. Just to the south, a second and smaller finger runs to within about 500' of the highway. The remaining fingers are even smaller and stop higher on the slope among heavy timber.

Just to the south of LR is another avalanche path with three similar fingers reaching to 3800' level. It is possible that an exceptional avalanche on this path might one day cause one of these fingers to break through to the highway.

Effect on Highway:

Infrequent large avalanches, usually laden with timber, can cross the highway and leave a deep debris deposit. There is a possibility that the second finger of LR could also break through the highway under exceptional avalanche conditions.

History:

Highway Department personnel report that this path has not slid "in some time". The National Park Service reports that a major avalanche with timber destruction fell here on 20 Jan. 1972. Timber destruction along the trimlines at highway level confirms that a sizeable avalanche has fallen recently. This path has long been known as an active, if infrequent, generator of large avalanches. Slides are known to have fallen in 1948 and 1957; others may have occurred but are not recorded.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass North (U.S. 410)

Name of Path: Park Y Slide (PY)

Hazard: Moderate

Map: Mt. Rainier 1 NE 7.5' (prelim.)

Location: Milepost _____ Station At junction of Sunrise Road & U.S. 410

Elevation of starting zone: 6000'

Vertical fall: 2300' Length: 0.5 mi.

Description: Aspect - W

The smooth release zone has a broad arrow shape bordered by trees. There are many young trees in the slide path. The path is quite wide and pronounced at the road, 500 ft. There are few signs of timber damage below the "Y".

Effect on Highway:

Will probably reach the road annually. Maximum run would be to ~200 ft. below the lower leg of the "Y".

History:



Cascade Mountain Passes
Avalanche Summary Sheet

Area: Cayuse Pass North (U.S. 410)

Name of Path: Big Bertha (BB)

Hazard: Moderate

Map: Mt. Rainier 1 NE, 7.5' (prelim.)

Location: Milepost _____ Station 0.8 mi. South of highway maintenance camp

Elevation of starting zone: 6600'

Vertical fall: 3300' Length: 1.4 mi.

Description:

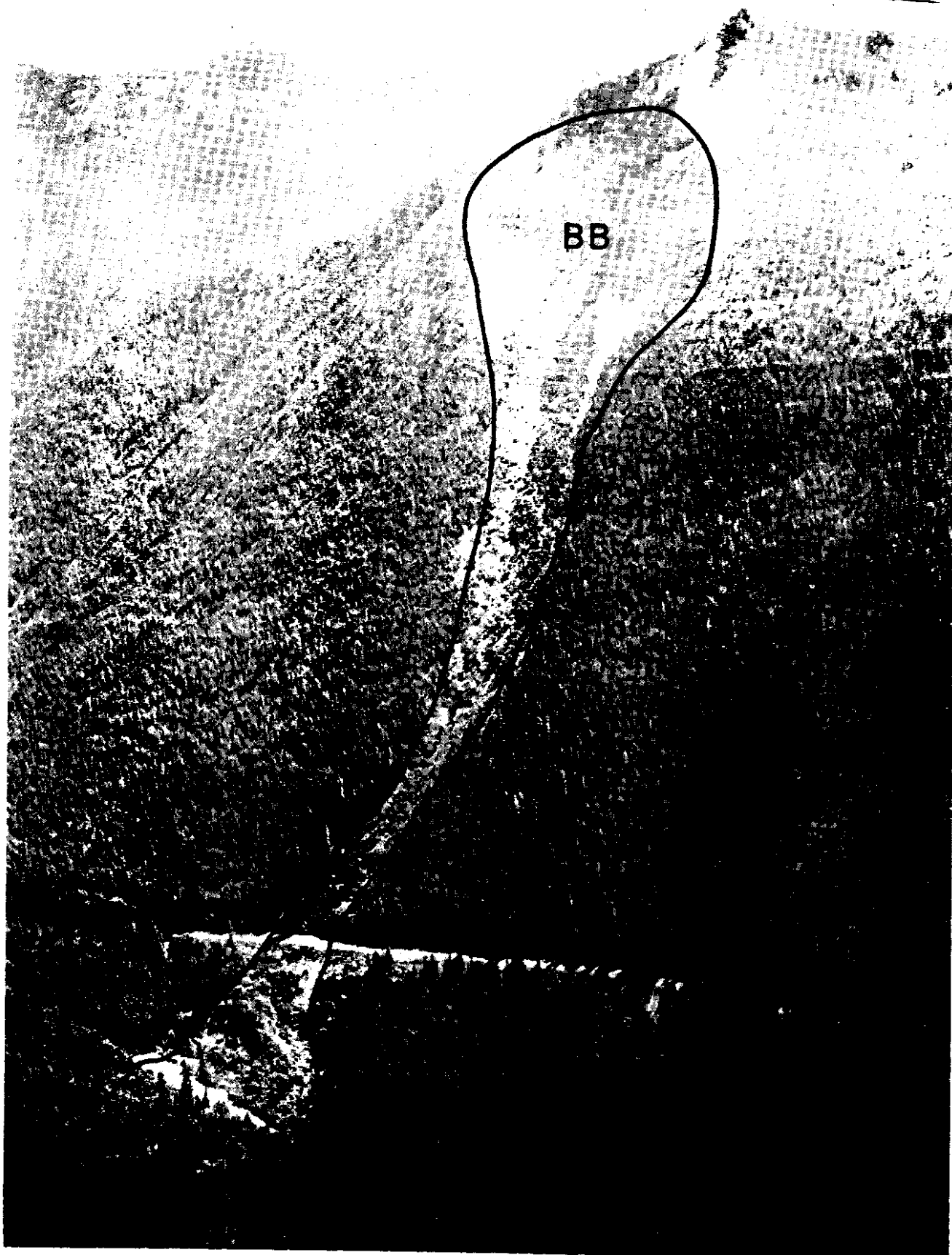
This path originates in a shallow, open basin on the west flank of Point 6525. The principal release zone lies to the lee of the south ridge bounding this basin, where prominent cornices and a deep snow drift accumulate. The path descends a shallow gulley directly to the highway, where it has a width of about 500'. The path fans out to a considerably greater width below the upper leg of the highway and larger slides can cross the lower leg (Sunrise Highway).

Effect on Highway:

Normal run to about 250' below upper road.
Maximum run to well below lower road. Normally some small timber debris but no large trees.

History:

Highway Department personnel report that this path crosses the upper road at least once each year. On Feb. 22, 1956, this path slid twice, depositing debris 13' deep and 1000' wide on the Sunrise Road. A slide crossed both U. S. 410 and the Sunrise road on Feb. 22, 1967. Three elk were found in the debris. Other major avalanches were recorded on Mar. 23, 1967, Jan. 15, 1970 and Dec. 31, 1970.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Path North (U.S. 410)

Name of Path: Newcomer-Hess Point (NC & HP)

Hazard: Moderate to high

Map: Mt. Rainier 1 NE 7.5' (prelim.)

Location: Milepost _____ Station 1.6 to 1.9 mi. south of Park Y

Elevation of starting zone: 5200' - 5400'

Vertical fall: 1000' - 1200' Length: _____

Description:

The release zones lie on a broad, open slope falling from the crest of the ridge north and south of Point 5646. The slope is broken by scattered outcrops of rocks and shallow gulleys. This area was once heavily timbered, but the upper slopes have been denuded by an old burn, which presumably enhanced the avalanching.

Smaller avalanches are probably frequent on the upper, denuded slopes, with scattered fingers running into the timber below. The Hess Point avalanche has established a broad path through the timber to the highway. The Newcomer avalanche has broken two narrow, adjacent paths through the timber.

Effect on Highway:

Dry snow avalanches during heavy precipitation periods normally run to the highway but seldom beyond. Under extreme conditions, new paths could be broken through the timber zone to the highway in this area.

History:

Highway Department personnel report that this area slides frequently in dry snow conditions. The Newcomer avalanche reached the highway for the first time in 1972.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Path North (U.S. 410)

Name of Path: Twin Slides (TW)

Hazard: Moderate to High

Map: Mt. Rainier 1 NE 7.5' (prelim.)

Location: Milepost _____ Station 2.2 mi. South of Park Y _____

Elevation of starting zone: 4800' - 5000'

Vertical fall: 800' Length: _____

Description:

The release zone is located in a shallow cirque with vertical headwall and along the south flank of this cirque where wind-drifted snow accumulates. The middle part of the path embraces an old burn area where several ill-defined gulleys exist. Timber stand here is much sparser than in the Newcomer-Hess Point area just to the north; it probably is largely regeneration following a burn. The path divides into two fingers just above the highway. An unusually large avalanche would probably sweep this whole area, eliminating the small timber island between the fingers.

Just North of TW is a steep road cut where embankment slides occur. This area is called Mudslide (MS).

Effect on Highway:

Frequent hazard from dry snow avalanches during periods of heavy snowfall. Some light timber debris can be expected in the larger slides.

History:

Highway Department personnel report that avalanches are frequent in this area. In 1970 or 1971, a snow plow was hit by an avalanche at Twin Slides which broke the cab window. The driver escaped unharmed.

MS



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Path North (U.S. 410)

Name of Path: Windy Point (WP)

Hazard: High

Map: Mt. Rainier 1 NE 7.5' (prelim.)

Location: Milepost _____ Station 0.15 mi. North of U.S. 410-SR 123 junction

Elevation of starting zone: 5200'

Vertical fall: 500' Length: 700'

Description: Aspect - W to WNW Slope angle = 40°

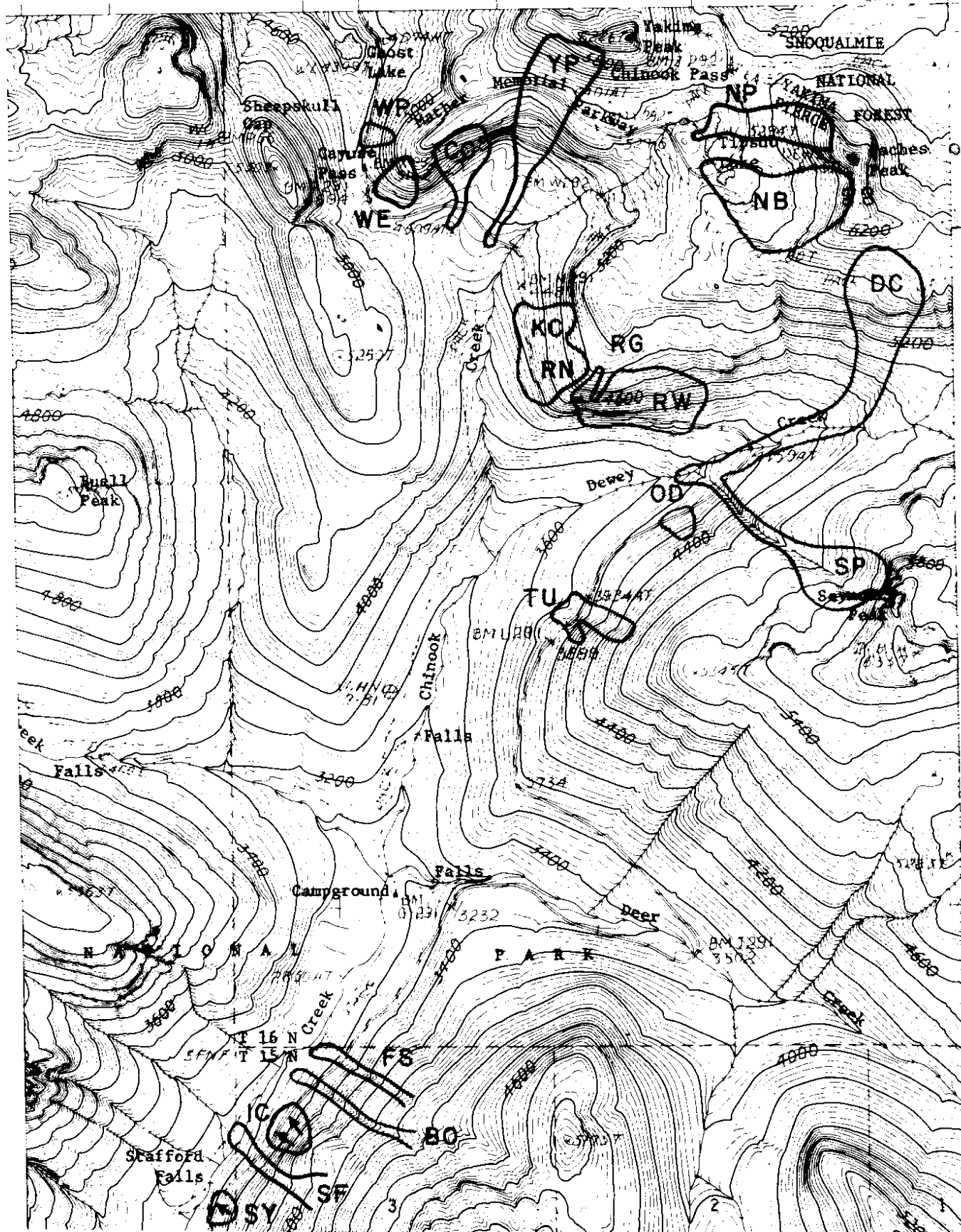
Indistinct release zones drop into steep smooth open timber from about 500' above the road. Breadth at road is 300'.

Effect on Highway:

Normal and maximum runs will both end in the road. Very frequent, this path slides with every major snowfall.

History:

Usually a dry slide, sometimes to 20 ft. deep in the road.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Knob Cut (KC) and Rockwall North (RN)

Hazard: Moderate

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 15.5 Station _____ Other _____

Elevation of starting zone: 5300'

Vertical fall: 400' Length: _____

Description: Aspect WSW, breadth at road - 1600'.

These are two adjacent and contiguous slide areas. Terrain is open timber, open bands of shrubbery, on a gentle slope immediately above the road to a very steep section at mid-elevation of the slide zone.

The release zones are indefinite in the timber, but probably at the steepest point and occasionally on gentler slopes above.

Effect on Highway:

Normal run - to highway.

Maximum run - across road and into timber.

Normally active with each major snowfall.

History:

Each slide occurrence deposits 8-9 ft. of snow on the highway.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Rockwall West Gulley (RG) (The Chute)

Hazard: High

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 15.1 Station _____ Other _____

Elevation of starting zone: 5000'

Vertical fall: 600' Length: _____

Description: Aspect - SSE Slope angle = 40°

Breadth at road = 150'

The terrain is scattered timber on a rocky straight slope.

Effect on Highway:

Normal run - across road

Maximum run - across road and on down about 250' vertical

Highly active, slides with every major snowfall, rain or thaw.

History:

Worst problem on this section of highway. This path is the first to run and can slide up to every hour during a storm.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Rockwall (RW)

Hazard: High

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 14.9 Station _____ Other _____

Elevation of starting zone: 5200' _____

Vertical fall: 500' Length: _____

Description: Aspect - SSW Slope angle = 45°

Breadth at road = 2000 ft.

The terrain is steep and smooth with a number of rocky outcrops (smooth).

Three distinct fingers appear in the timber.

The indistinct release zone is primarily at the rocky outcrops.

Effect on Highway:

Normal run - crosses road with a little debris.

Maximum run - into timber across the road.

History:

Highly active and frequent. Normally runs with every major storm, rain or thaw. This path has a long history of minor accidents and close calls. A highway foreman was partly buried in 1966. Six vehicles and one plow were caught in five separate incidents in 1972.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Dewey Creek (DC)

Hazard: Low

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 14.6 Station _____ Other _____

Elevation of starting zone: 5700'

Vertical fall: 3300' Length: _____

Description: Aspect - S

The terrain is open and sparsely timbered at the starting zone. It is nearly straight in profile until the transition zone at 4500' where the gentle runout zone begins.

Effect on Highway:

Normal run - to creek

Maximum run - to creek, turns west and crosses the road.

History:

Very infrequent. In 1955 a big slide covered the road extensively. The snow was very wet and had a great deal of momentum.

Cascade Mountain Passes
Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Seymour Peak (SP) (Waterfall Slide)

Hazard: High

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 14.45 Station _____ Other _____

Elevation of starting zone: 5700'

Vertical fall: 1300' Length: _____

Description: Aspect - NW Slope angle = 30°

Breadth at road = 80'

The terrain is an open rocky cirque with scree at the upper zone leading to a narrow rocky gully lined by heavy timber.

Effect on Highway:

Normal and maximum run - across road and into timber
A high, frequent hazard to road.

History:

In 1962 a slide carried debris down and across road.

Cascade Mountain Passes
Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Old Dribbly (OD)

Hazard: Moderate

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 14.2 Station _____ Other _____

Elevation of starting zone: around 4700'

Vertical fall: 300' Length: _____

Description: Aspect - NW Slope angle = 27°

Breadth at road = 150' path + 0.1 miles of sluffs (snow "dribbles")

The terrain here is heavy timber with several slide path fingers on a relatively straight slope. There is an indistinct release zone in timber.

Effect on Highway:

Normal run - dumps into road.

Maximum run - across road and for a short distance into the timber beyond.
Infrequent, moderate hazard with sluffs into the road.

History:

No evident destruction, carries little to no debris.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Tunnel Slide (TU)

Hazard: High

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 13.7 Station _____ Other _____

Elevation of starting zone: 5000'

Vertical fall: 700' Length: _____

Description: Aspect - NW Slope angle = 35° up to cliffs and 40° below the road. Breadth at road = 500' + to include the separate sluff area at the tunnel north portal.

The terrain is a smooth slope to the base of cliffs at the top of an open brush area. The ground is smooth again above the cliffs.

There are two potential release zones: 1) base of cliffs, 2) above cliffs, a few hundred feet in the timber.

Effect on Highway:

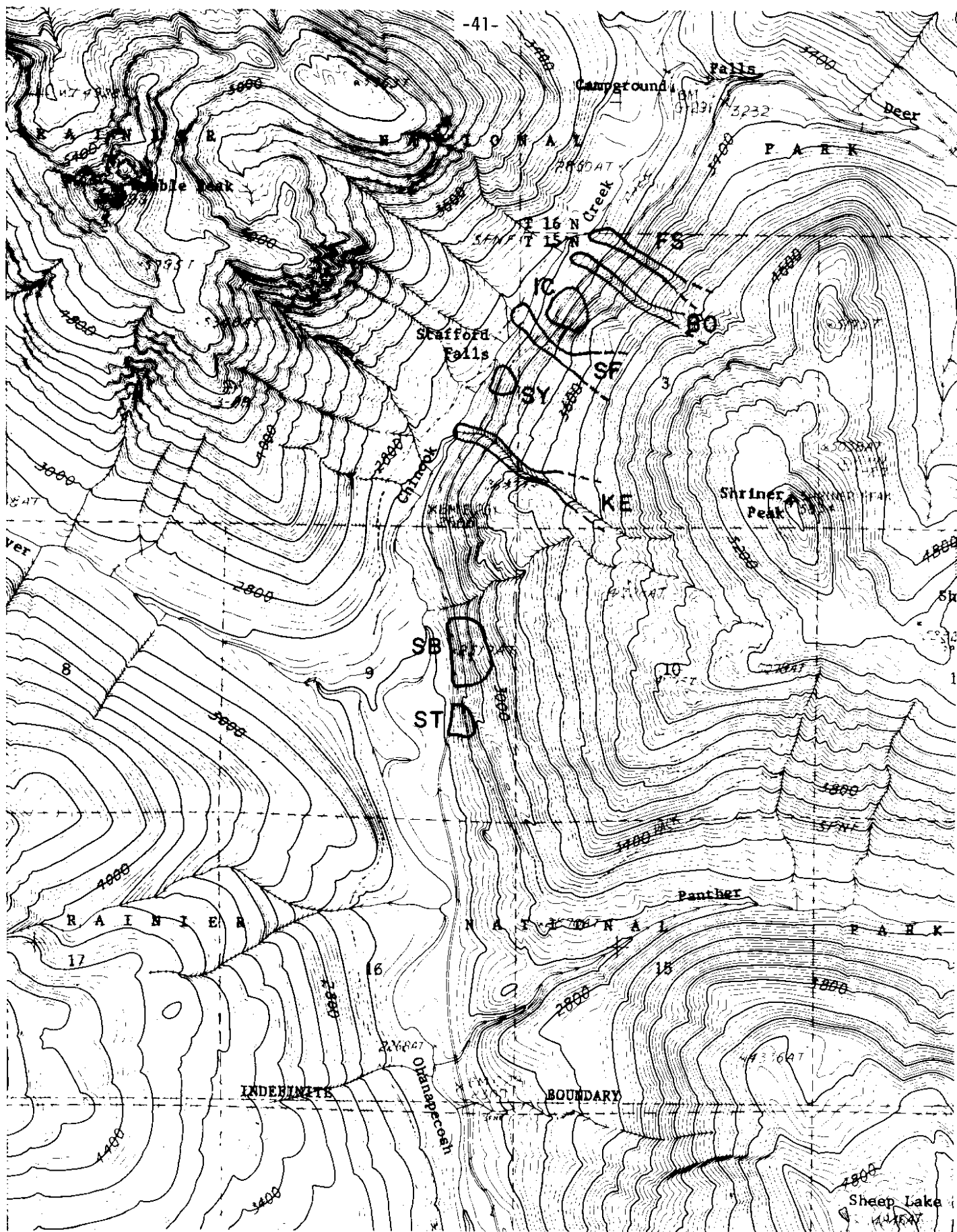
Normal run - to road

Maximum run - down about 150 vertical feet below the road

This slide is highly active and a frequent performer.

History:

Slides every year with only an average snowfall. Always sluffs off tunnel at both ends.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Shriner Peak Slides (see list below)

Hazard: Moderate to occasionally high

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost 10.0-10.7 Other _____

Elevation of starting zone: 4500-5000' (FS, BO, SF, KE): 3000-3200' (IC, SY)

Vertical fall: Up to 2000' (much shorter for IC, SR)

Description: (See map)

There are six separate paths in this area which fall from the WNW flank of Shriner Peak. Four of these paths originate at the 4500-5000' level on the peak and descend as narrow paths running through heavy timber. These four, from north to south, are Falls South (FS), Boulder (BO), Stafford Falls (SF) and Kenney (KE) (NPS nomenclature).

The other two paths, Icicle (IC) and Slippery Rock (SY), originate a short distance above the highway in open areas of cliffs and rock slabs and run to the highway over broader fronts.

Effect on Highway:

The four paths falling from high on Shriner Peak generate occasional avalanches during periods of heavy snowfall or prolonged rain or thaw. They can bring deep snow deposition on the highway, sometimes with appreciable timber debris.

The two short paths run more frequently but usually in less volume. Due to difference in altitude, they may be influenced by different weather and snow conditions than the other four. The two short slides are a more persistent problem for routine maintenance.

History:

The Shriner Peaks have a long record as a problem area for highway maintenance, but specific records of individual slide occurrences are scarce. Stafford Falls (SF) is a new path broken through heavy timber in the winter of 1973/74. It carried a large amount of timber debris onto the highway and beyond to Chinook Creek.

Cascade Mountain Passes
Avalanche Summary Sheet

Area: Cayuse Pass South (SR-123)

Name of Path: Shriner Burn (SB) and Shriner Trail (ST)

Hazard: Moderate

Map: Chinook Pass 7.5' (prelim.)

Location: Milepost _____ Station _____ Other _____

Elevation of starting zone: 5000' _____

Vertical fall: 1800' _____ Length: _____

Description: Aspect NW

The terrain is a heavily timbered straight slope at lower elevations to nearly treeless above timberline.

There are numerous potential release zones.

Many small avalanches originate on a steep cut and scree slope just above the highway.

Effect on Highway:

Occasional small avalanches into the highway especially during prolonged periods of heavy snowfall, or with a thaw or rain.

History:

Occasional nuisance slides.

White Pass

Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass West

Name of Path: Steel Rail Bridge (SR)

Hazard: Low

Map: White Pass 15'

Location: Milepost 144.9 Station _____ Other _____

Elevation of starting zone: 4400'

Vertical fall: 1200' Length: _____

Description: Aspect = SW Slope L = 38-42°

Breadth at road - 200'. (There is a broad bank slide on either side of the bridge.)

The channelled avalanche path runs under the bridge from a release zone at the ridge top. Terrain is rocky, broken and lightly timbered.

Effect on Highway:

Normal run and maximum run will be beneath bridge to timber below. This is primarily a wet snow slide area. In the event of unusual dry snow avalanche conditions, wind blast could damage the bridge and endanger traffic.

History:

Has never hit road.

The adjacent bank slides are a significant hazard. They fill up road to a considerable depth.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass West

Name of Path: Ellis' Slide (ES)

Hazard: High

Map: White Pass 15'

Location: Milepost 146.9 Station _____ Other _____

Elevation of starting zone: 4000'

Vertical fall: 800' Length: 1100'

Description: Aspect S Slope L = 38-40°

Breadth at road - 1000'

This is a large and apparently man-created avalanche. It is a frequent performer running annually or oftener. The terrain is a smooth, very high cutbank with open, loose, sandy soil and no vegetation.

Effect on Highway:

Normal run - to road and beyond, deposition 5-6' deep.

Maximum run - to stream at valley bottom.

There is an old burn just to the E of this path which is a potential avalanche path, but has no history of sliding to the highway.

History:

This slide is named for a highway maintenance man who was once buried by it. The benches in the slope used to reduce slide frequency, but erosion has wiped them away. Usually puts 5-6' snow in the highway but can deposit snow up to 20' deep in a bad year.

ES



Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass West

Name of Path: West Side Cutbanks

Hazard: Moderate

Map: White Pass 15'

Location: Milepost _____ Station _____ Other See below

Elevation of starting zone: _____

Vertical fall: _____ Length: _____

Description:

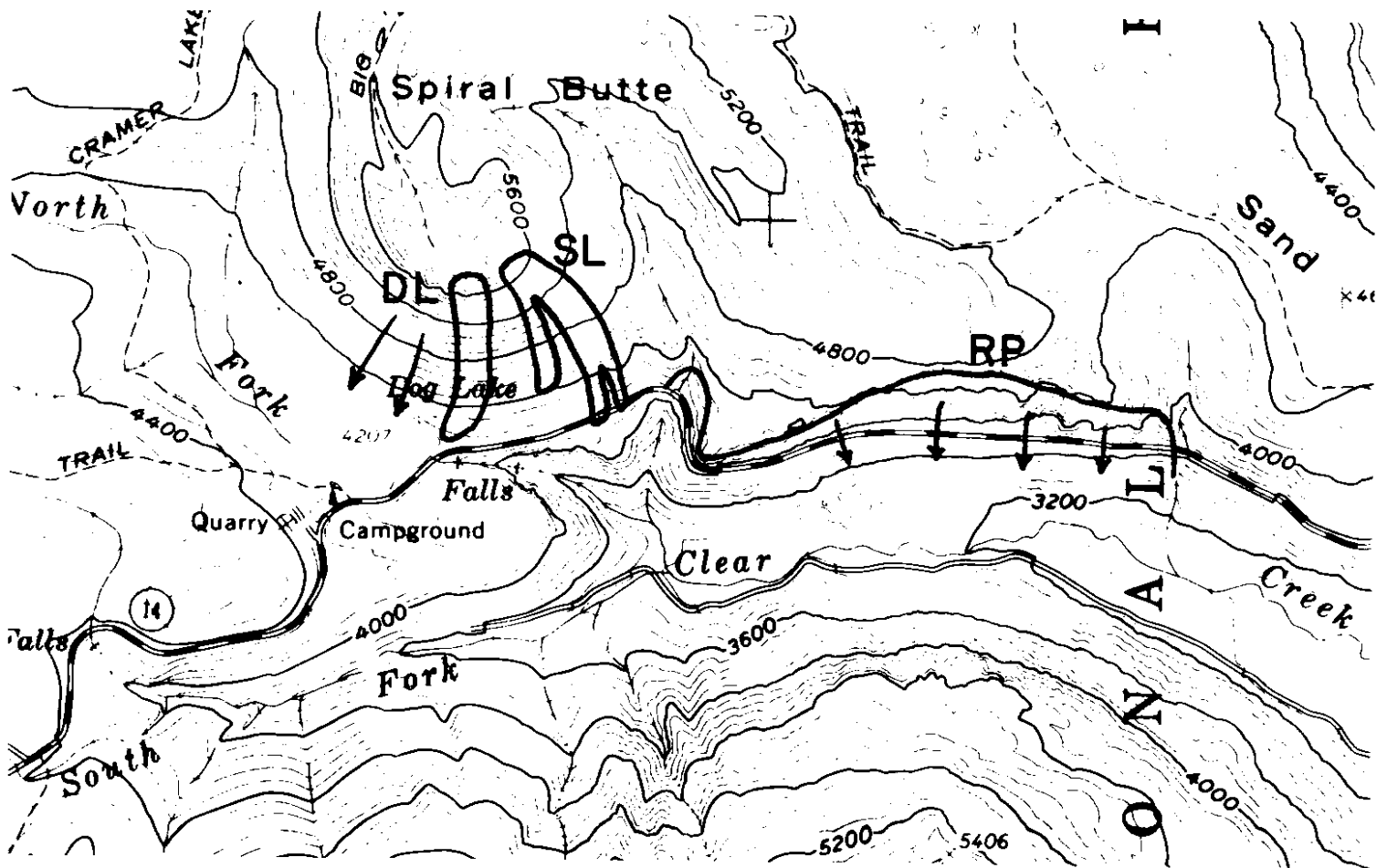
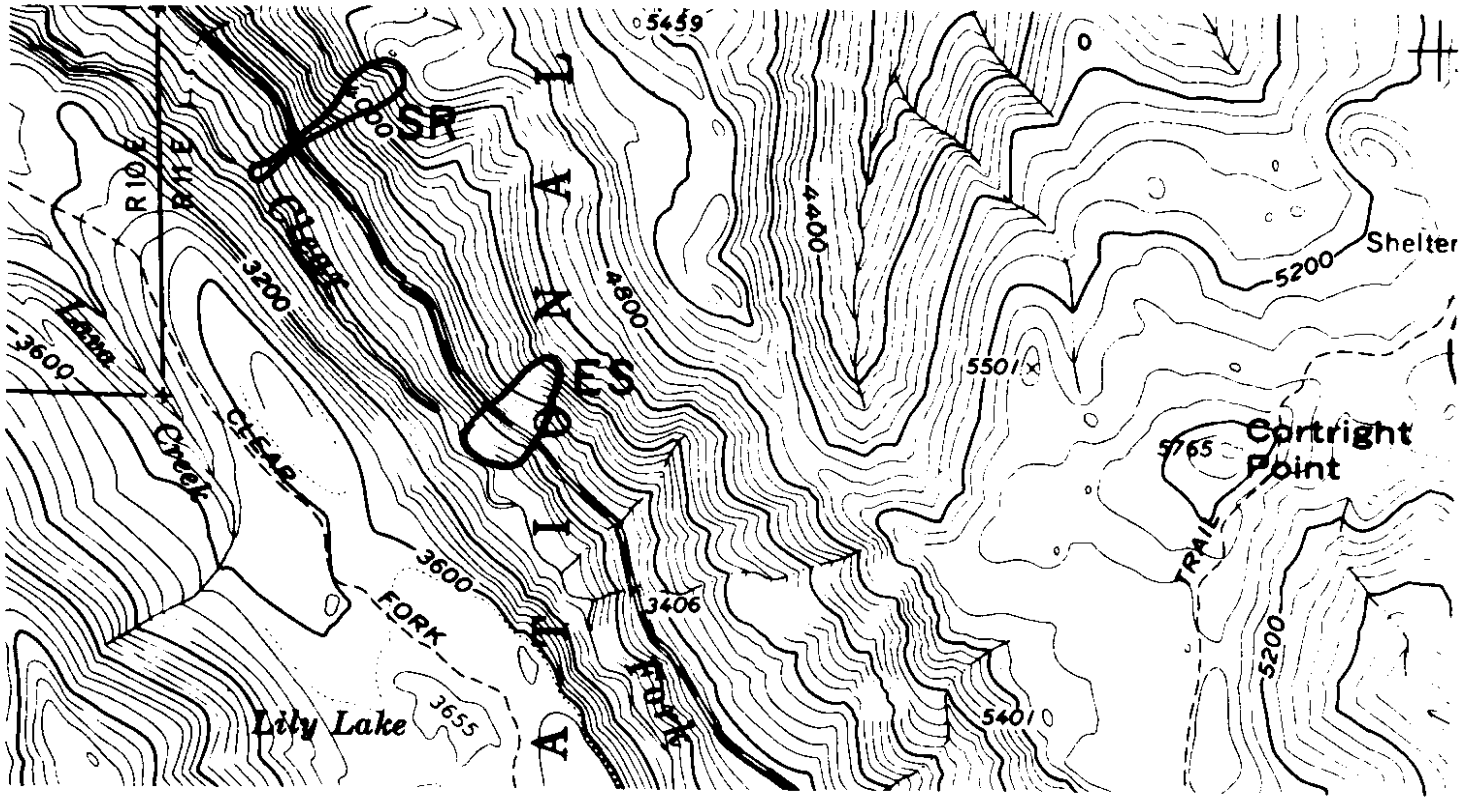
Beginning at Knuppenberg Lake and running west on U.S. 12 approximately to Milepost 142, there are numerous steep cutbanks which can produce sluffs and small avalanches under suitable snow conditions. Some of these, such as the ones by Knuppenberg Lake and at the grader shed, are large enough to deposit deep avalanche snow on the highway during heavy snowfalls at these lower elevations (2600-4000'). In all, there are 26 such sites capable of affecting the highway, but some of these are apt to do so only under extreme conditions.

Effect on Highway:

Frequent sluffing from the more active cutbanks under normal winter snow conditions. Moderate hazard and considerable plowing problems can develop during winters of heavy snowfall at lower elevations.

History:

No data have been furnished.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass East

Name of Path: Dog Lake (DL)

Hazard: Low

Map: White Pass 15'

Location: Milepost 153.8 Station _____ Other Opposite Clear Creek Falls
parking area

Elevation of starting zone: 5600'

Vertical fall: 1400' Length: _____

Description:

This path falls on the mostly open, SSW flank of Spiral Butte. Most of the path runs to the shore of Dog Lake, but about 100' of the eastern edge runs to a bench just above the highway. Normal run is to area of scattered timber at 4800'.

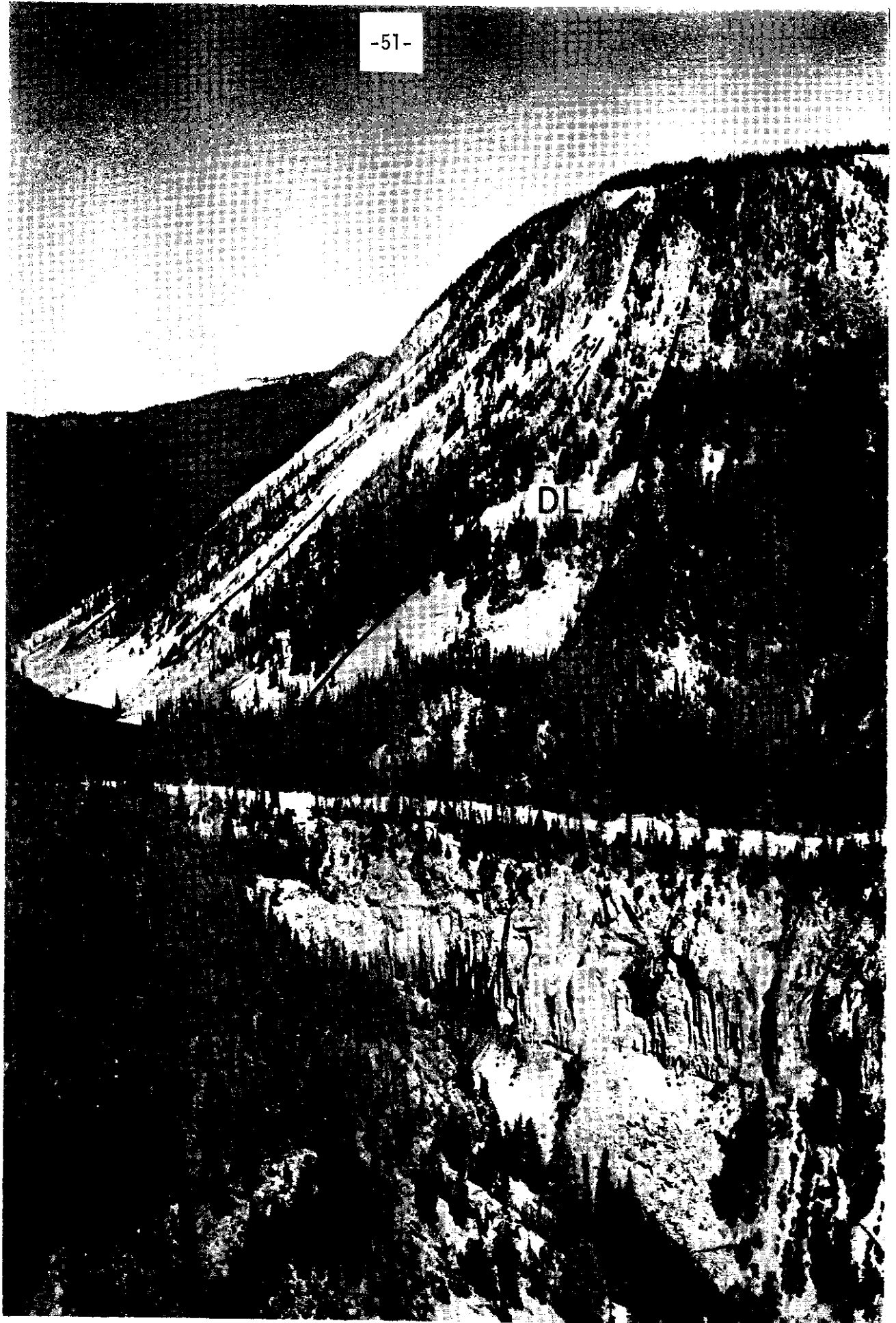
Effect on Highway:

Has not reached the highway yet, but has a good potential to do so under exceptional snow conditions. Such an avalanche would carry heavy timber debris to the highway.

History:

Effects on vegetation indicate this path has run to within 100' of the highway within the past 3-4 years.

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Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass East

Name of Path: Spiral Butte (SL)

Hazard: Moderate (middle path)

Map: White Pass 15'

Location: Milepost 154.0 Station _____ Other _____

Elevation of starting zone: 5600'

Vertical fall: 1400' Length: _____

Description: Aspect: SE Slope L = West, 14° in the runout zone and 36° on hill. Middle, 22° in runout zone; East, 30°

Breadth at road = W - 180' (not to highway), middle 575', E 100'

West - terrain varies at lower end of path due to flattening. The brush thickens toward the highway.

Middle - terrain is open with scattered timber and turns slightly south.

East - terrain is an open slope to 5200' when timber begins. There is a moderate transition zone at 5000' as the slide steepens below that point.

Effect on Highway:

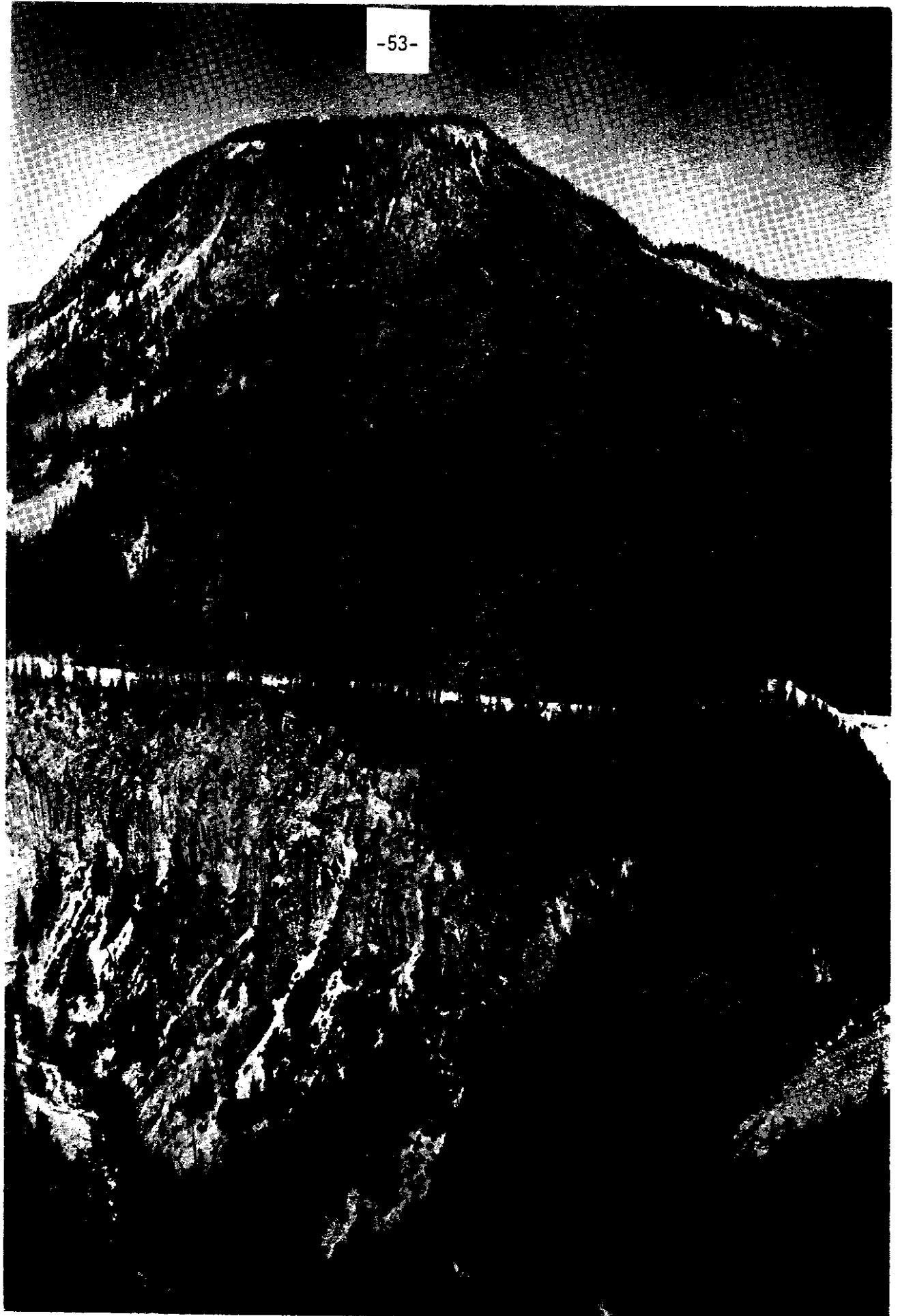
West - Normal run - to 5200'. Maximum run - within the last five years it has been within 300' of the highway and should be watched for more activity in the future.

Middle - Normal run to 5200'. Maximum run to the highway and several hundred feet beyond. Probably will reach highway annually.

East - Normal run - to transition zone at 5000'. Maximum run - to highway.

History:

Some avalanche snow reaches the highway here every year. There have been two major avalanches with a large amount of timber debris in the 21 years prior to 1973/74. In 1973/74 a third such avalanche occurred when the eastern part of the path broke through mature timber to the highway.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass East

Name of Path: Rocky Point Slide area (RP)

Hazard: High

Map: White Pass 15'

Location: Milepost 154.1 to 156.0 Other _____

Elevation of starting zone: 4400 - 4800'

Vertical fall: 400 - 800' Length: _____

Description: Aspect = S (accumulation zones turn E at points because of gullies) Slope L = 39° just W of last rocky outcrop.
 40° at E of big gully on small cutbank.

The terrain is loose, sandy scree slopes with cliffs at upper elevation of the ridge. Groups of conifers at protected locations divide slides into distinct paths. The area east of Rocky Point presents an almost continuous avalanche zone for about 1.5 miles.

Effect on Highway:

Normal run - to road. Maximum run - probably across road (the highway grade has blurred any distinguishing features). Slides frequently originate from release zones at the base of the cliffs and from various accumulation zones above cliffs. Active during winter snowfalls and especially in the spring. Gabions built to catch rockfall afford the highway some protection from small slides.

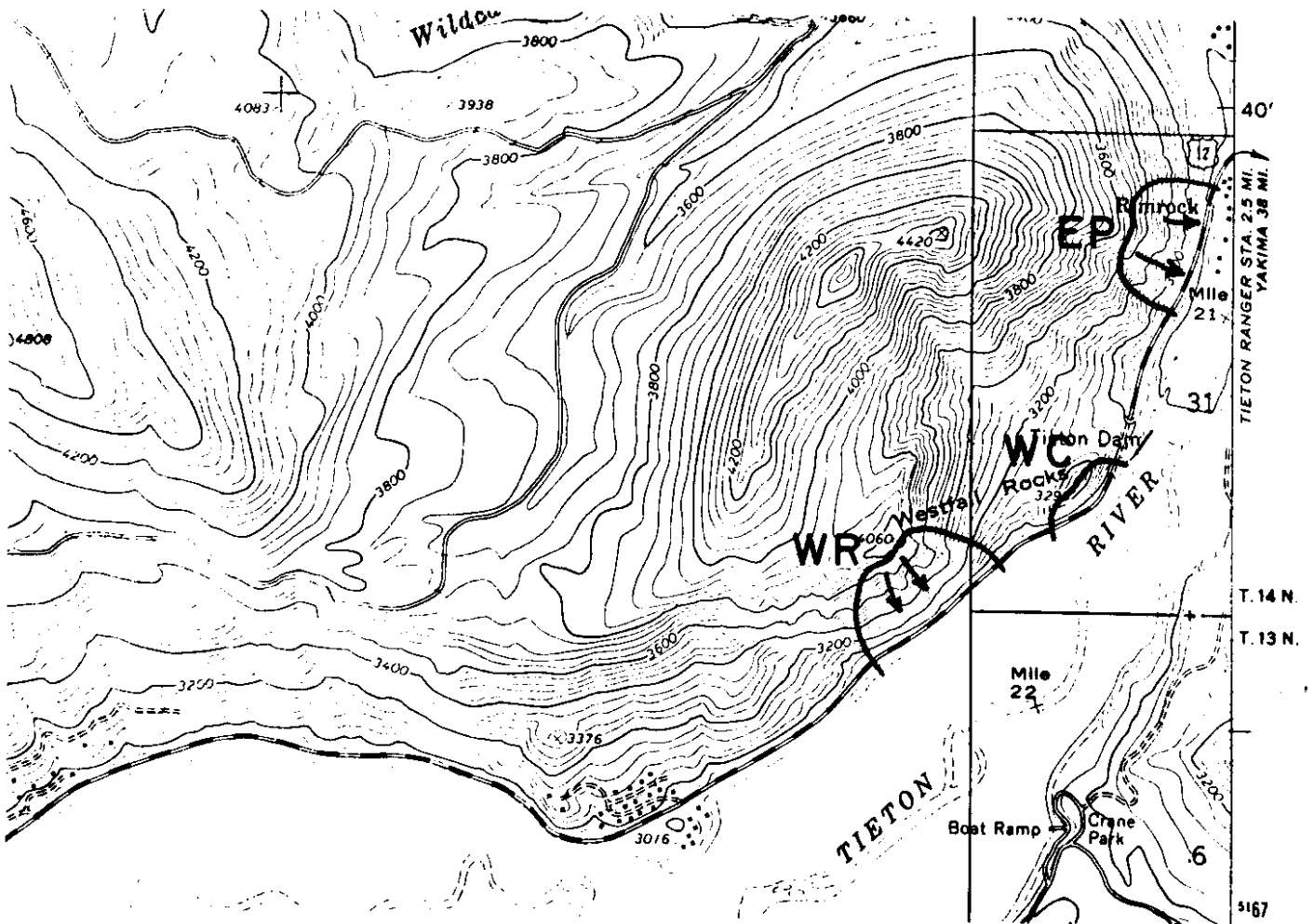
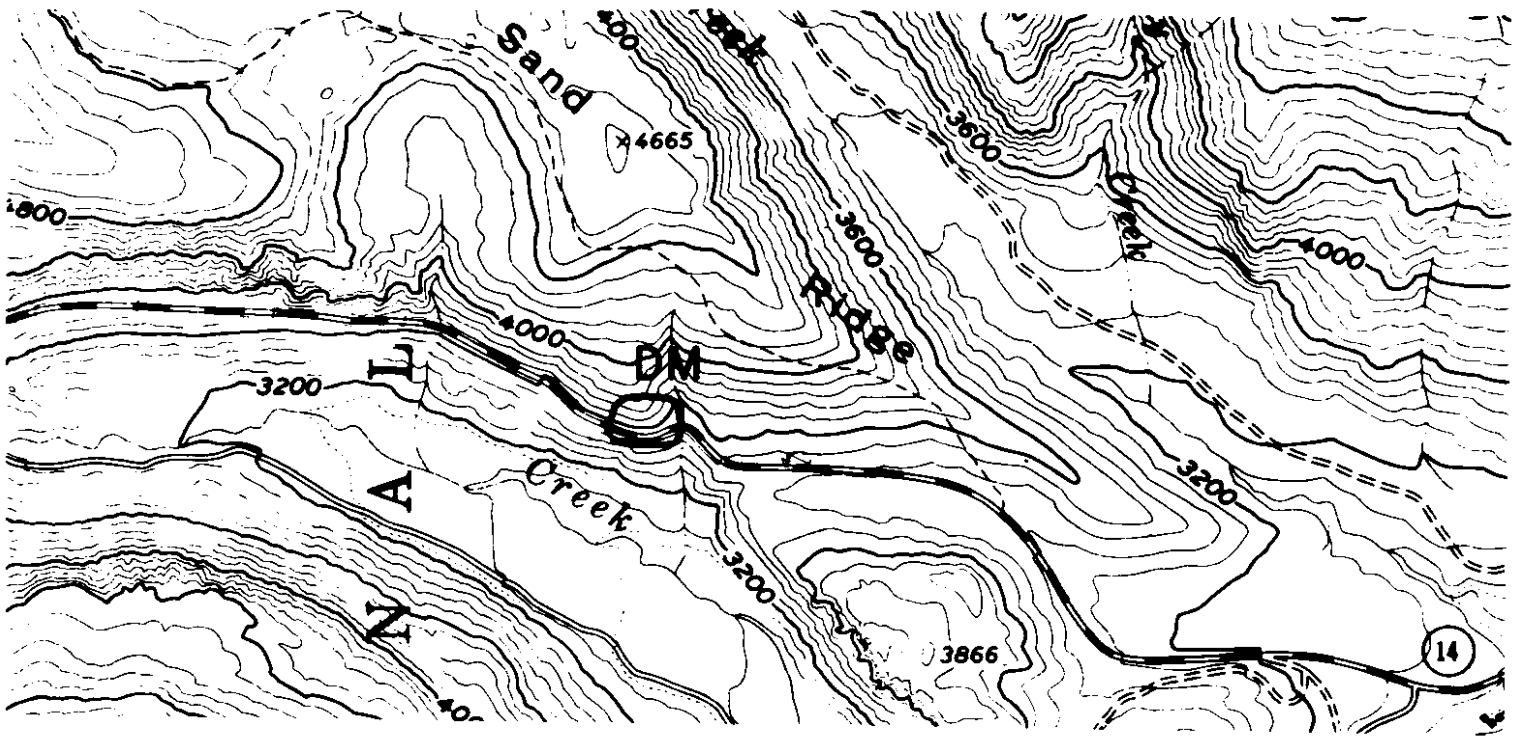
History:

This area slides "all the time" (Highway Department). A man was buried by a slide in the Rocky Point area in 1971.

RP.







Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass East

Name of Path: Deadman's Curve (DM)

Hazard: High

Map: White Pass 15'

Location: Milepost 156.6 Station _____ Other _____

Elevation of starting zone: 3700'

Vertical fall: 100 - 200' Length: _____

Description: Aspect = SW to SE Slope L = 38 - 42°

The terrain is a steep cutbank divided at the inside of the curve by a heavily timbered gully .

The release zones are in the upper portion of the cutbanks.

Breadth at road = 1000'.

Effect on Highway:

Normal run and maximum - to road.

Frequent hazard. During a heavy storm it will also slide from trees just west of the cutbank.

History:

The Highway Department reports there are big bank slides here every year dropping 6-7' of snow into the highway.

DM

Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass East

Name of Path: Westfall Rocks Slide Area (WR)

Hazard: Low to moderate

Map: Rimrock Lake 7.5'

Location: Milepost _____ Station _____ Other _____

Elevation of starting zone: 3600 - 3800'

Vertical fall: 600 - 800' Length: up to 1000'

Description:

A steep cliff area, nearly vertical at highway and broken by ledges and rocky gullies higher up. There are numerous avalanche gullies and sluff areas. Some sluffing or slide activity with most mid-winter snowfalls. Wet slides can be active following cold spring snow storms.

Effect on Highway:

Nuisance sluffs under normal snow conditions at this elevation. Larger avalanches with deep deposition of snow on highway during periods of heavy snowfall below 3500'.

History:

No information available.

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WR

Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass East

Name of Path: West Portal Cliffs (WC)

Hazard: Low to moderate

Map: Rimrock Lake 7.5'

Location: Milepost 165.1 Station _____ Other at west end of tunnel

Elevation of starting zone: 3000'

Vertical fall: 400' Length: 500'

Description: Aspect = ENE Slope L = vertical at lower end

This slide area is smooth bare rock with no vegetation. There are several small slide channels and numerous accumulation zones.

Breadth at road - 0.25

Effect on Highway:

Normal run - to road.

Maximum run - to lake.

Will slide after relatively small accumulation of snow because of numerous bare accumulation zones.

History:

No information available.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: White Pass East

Name of Path: East Portal Slides (EP)

Hazard: Low

Map: Rimrock Lake 7.5'

Location: Milepost 165.6 Station _____ Other _____

Elevation of starting zone: 3500'

Vertical fall: 400' Length: 550'

Description: Aspect: SSE Slope L = 35° Profile = 24°

There is bare rock in release zone with scattered trees in vicinity of rock faces above scree. A central scree gulley is the main slide area, but small slides from the adjacent cliffs are possible.

Breadth at road - 500' total

Effect on Highway:

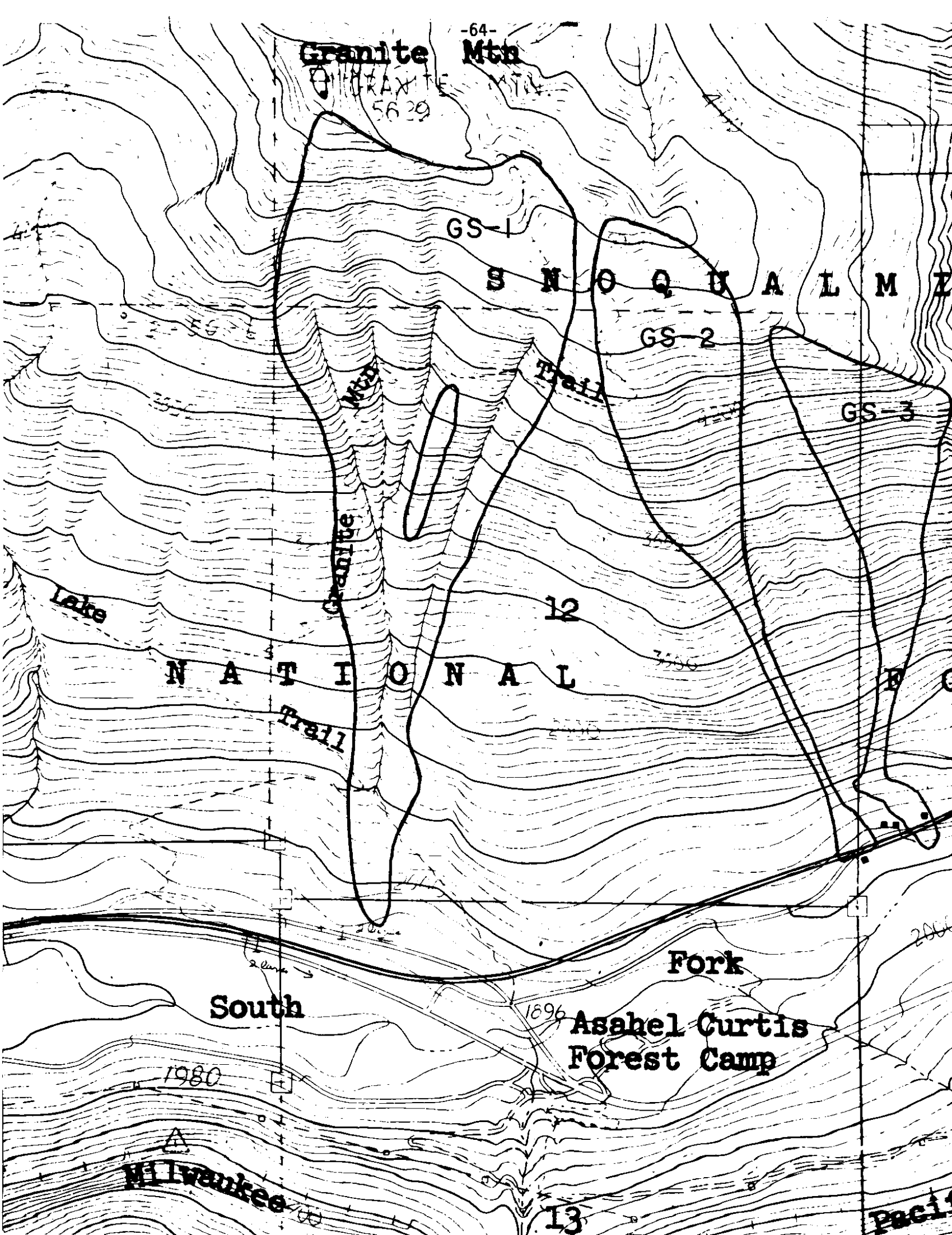
Normal and maximum run to road. This path is apt to slide with every accumulation of 6" or more of snow on an adequate base.

An infrequent hazard due to low elevation and low snowfall.

History:

No information available.

Snoqualmie Pass



-64-

Granite Mtn

GRANITE MTN
5639

GS-1

S N O Q U A L M

GS-2

GS-3

Lake

Granite Mtn

12

N A T I O N A L

Trail

1896

Fork

South

Asahel Curtis
Forest Camp

1980

Milwaukee

13

pac1

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain South No. 1 (GS-1)

Hazard: Low-very infrequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LW44+00 Other _____

Elevation of starting zone: 5,200'

Vertical fall: 3,400' Length: 8,000'

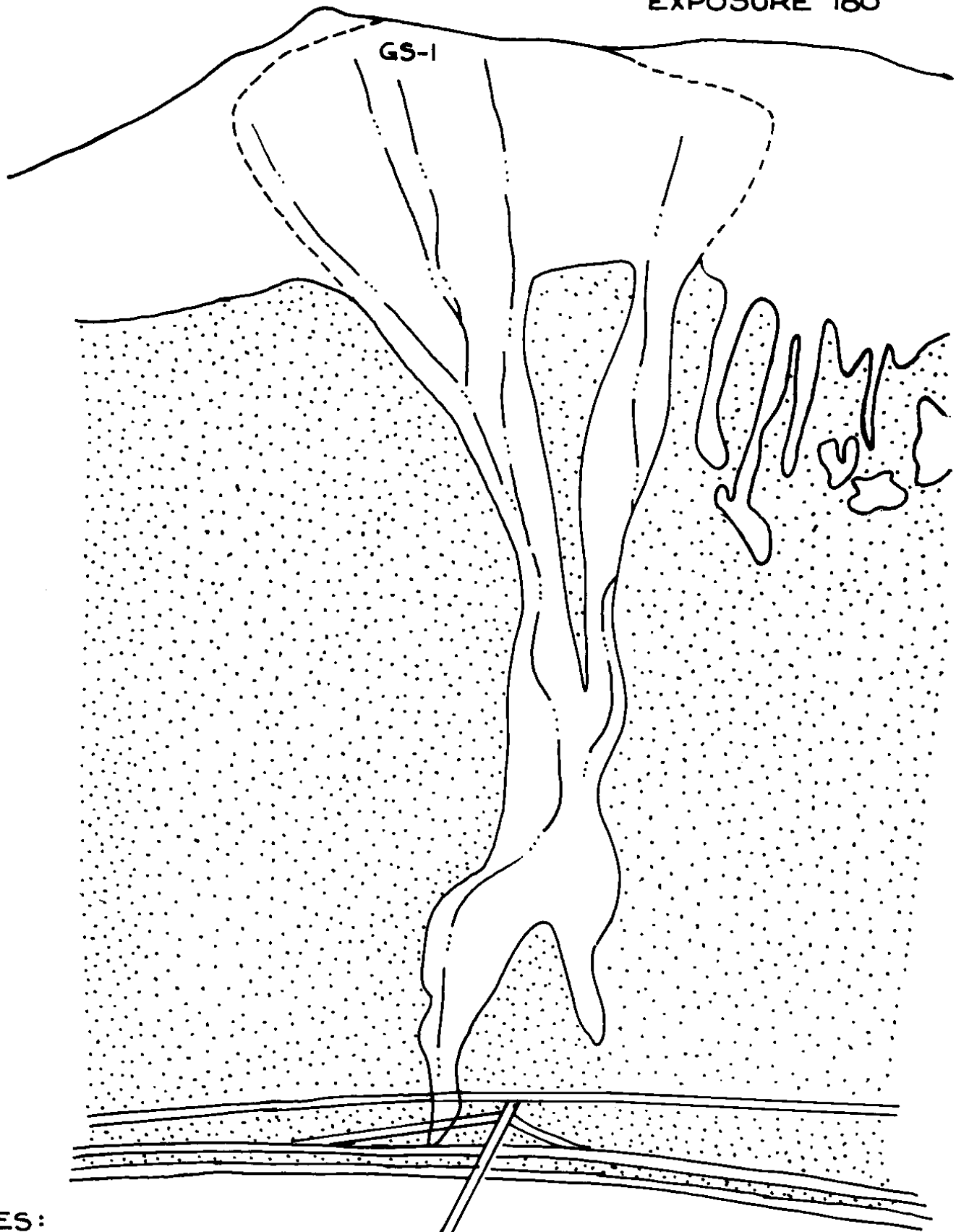
Description: Path GS-1 lies on the southern flank of Granite Mountain. The starting zone is a very large old burn. Only a sparse cover of conifers and huckleberry cover this area. There are several bare rock outcrops. Three distinct gullies from near the summit merge near timber line. Another chute further east joins this path near the runout zone. Midtrack below timberline is a broad old slide path with watercourses thru the center. Vegetation consist of vine maple, huckleberry and a few scattered conifers. Although a tree barrier separates the path from the highway, vegetation indicates that this slide has reached the highway vicinity in past years.

Effect on Highway: No effect on the highway is normally anticipated. Exceptional snowfalls should be monitored for the possibility of an abnormally large avalanche reaching the highway.

History: Observations have detected several large slides which began low in the starting zone just above timberline. All these slides stopped approximately 1000' short of the highway on a bench in the slide path.

SEC. 12 1/3 T. 22 N. R. 10 E

EXPOSURE 180°



NOTES:

GRANITE MOUNTAIN SOUTH GS-1
TIME _____ DATE ____/____/____
OBSERVER _____

CS



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain South No. 2 (GS-2)

Hazard: Very low

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L^w 90+00 Other _____

Elevation of starting zone: 5,100'

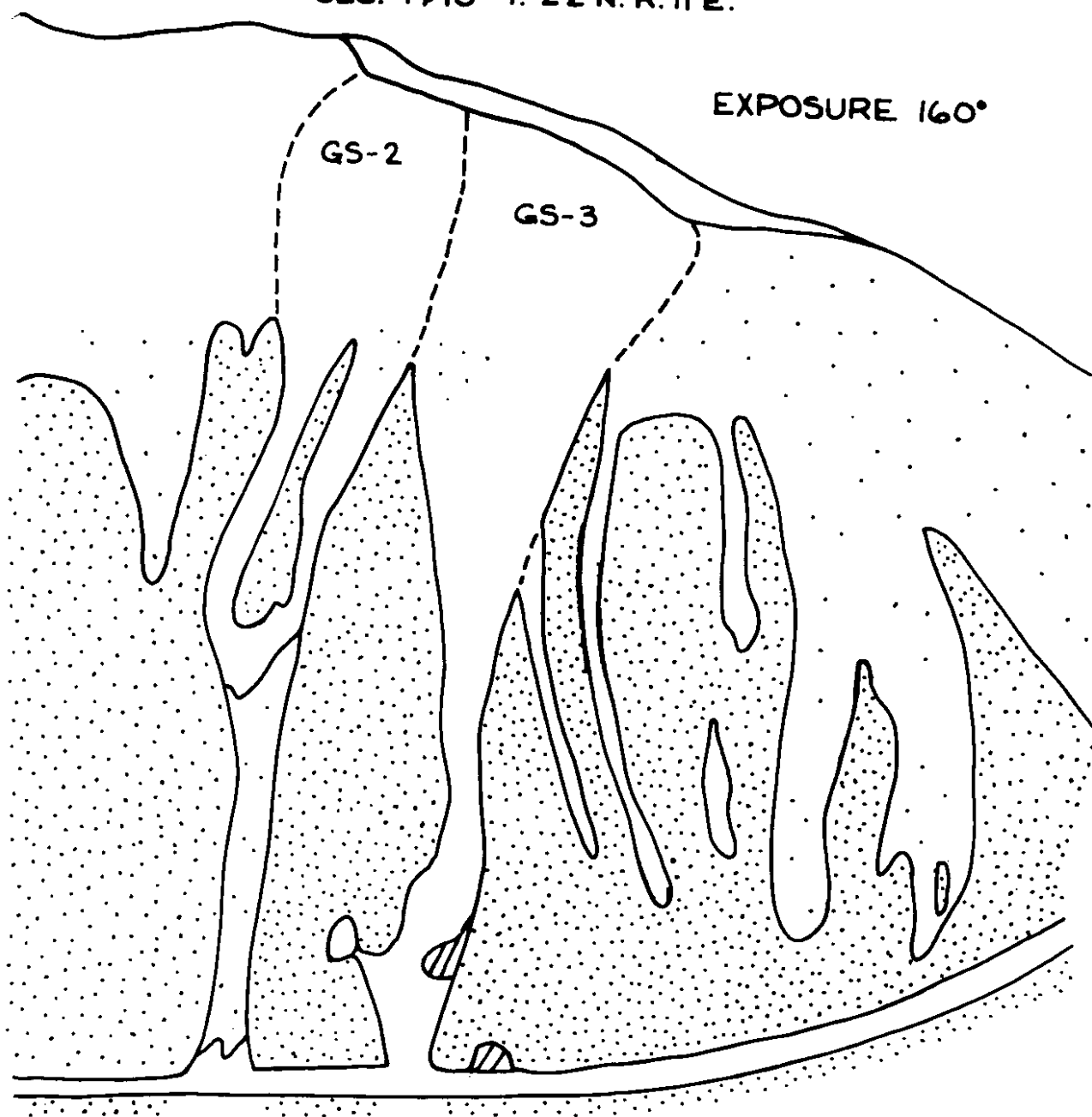
Vertical fall: 3,100' Length: 6,800'

Description: The starting zone of GS-2 begins above timberline in an old burn area. Very little vegetation has established itself in this area. Lower in the track is a wide area filled with vine maple and an open stand of conifers. Below this in the lower half of the track is a denser stand of timber. Evidence from aerial photography indicates that avalanches have passed thru the trees in this area.

Effect on Highway: It is expected that this path will rarely reach the highway. Only unusual snow or avalanche conditions could generate an avalanche large enough to run to the highway.

History: No reliable records.

SEC. 7 1/8 T. 22 N. R. 11 E.



NOTES:

GRANITE MOUNTAIN SOUTH GS 2 & 3

TIME _____ DATE ____/____/____

OBSERVOR _____



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain South No. 3 (GS-3)

Hazard: Moderate, infrequent

Map: Highway Dept. 1:12,100

Location: Milepost _____ Station LW 95+00 Other _____

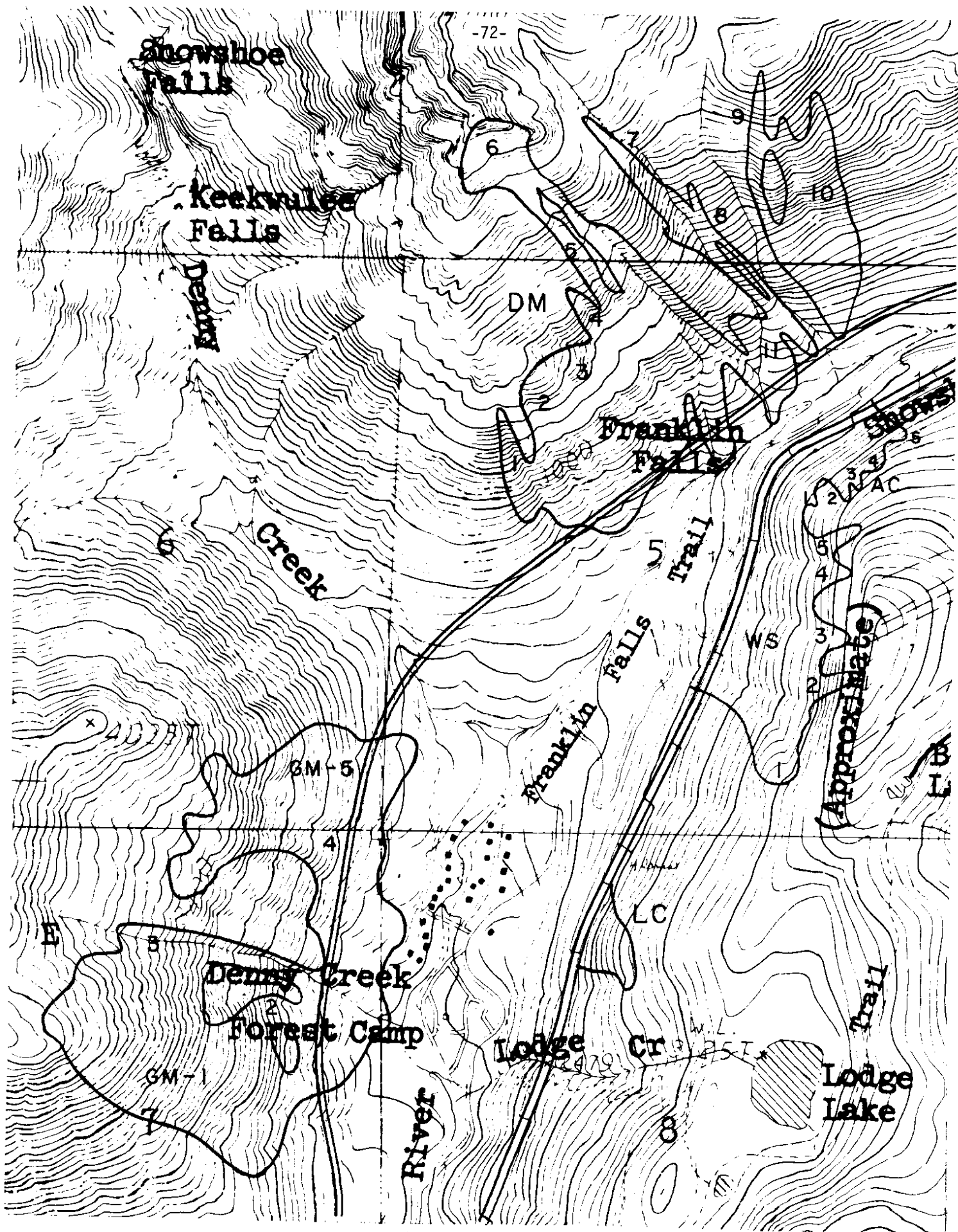
Elevation of starting zone: 4,600'

Vertical fall: 2,600' Length: 5,300'

Description: Beginning in the same high barren ridge as GS-1 and GS-2, Path GS-3 has the same burned over sparsely vegetated starting zone. However, the midtrack and deposition zones are more confined and contain far less brush. Vine maple grows to a height of 4 to 8 feet, but a growth of conifers is eliminated by constant avalanche activity. Above the proposed westbound lanes of SR90, a rock promontory deflects the snow into the treeline and impedes any avalanches which occur.

Effect on Highway: Rock embankment retaining and catchment structures are to be constructed in this path to augment the effects of the promontory. Without such protection, occasional but not necessarily annual avalanches could run to the highway.

History: Infrequent, large, wet, loose avalanches run in this path. Slides are usually deflected just above the proposed highway alignment and seldom run to the alignment. The former landowner has indicated that two cabins have been destroyed approximately where the proposed alignment crosses this slide path.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain No. 1 (GM-1)

Hazard: Low-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LW 152+00 Other _____

Elevation of starting zone: 3,100'

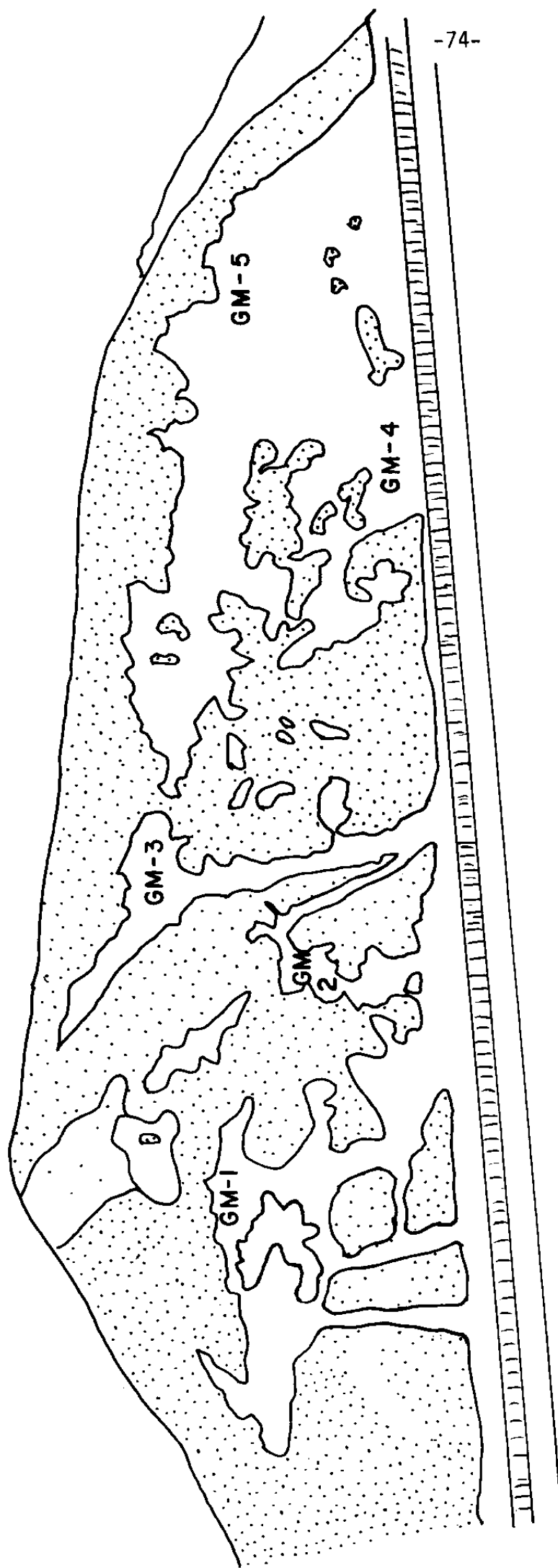
Vertical fall: 700' Length: 1,300'

Description: G-1 is a SE facing area covered with vine maple. It is comprised of several small chutes which mingle and pass through the timber. The paths are irregular and consist of broken rock covered with vine maple to a height of 6 to 12 feet. The chutes drop over a vertical rock cut approximately 40' high onto the highway.

Effect on Highway: A constant sluff cycle can be expected to dump sluffs on the highway at any time. It is doubtful that enough snow will reach the road to completely close the highway. Automobiles waiting for slide clearing at this location will be exposed to slides from paths GM-2 to GM-5.

History: This area slides with each new snowfall and with each warming trend. Large slides develop in the upper reaches but seldom run far because of the irregular timber patches throughout the area. Nearer the highway sliding is much more frequent and noticeably smaller.

EXPOSURE 110°



GRANITE MOUNTAIN
DATE ___/___/___ TIME ___
BY ___

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain No. 2 (GM-2)

Hazard: Moderate-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L^w 159+00 Other _____

Elevation of starting zone: 2,600'

Vertical fall: 200' Length: 400'

Description: Slide path GM-2 is a small open area just above the highway cut. The surface is large angular rock covered with dense vine maple. The highway crosses the upper portion of this path. The deposition of the natural path is very near the Snoqualmie River.

Effect on Highway: Considerable snow should be expected to slide onto the highway with each new snowfall. Infrequent large avalanches may close the highway approximately 150 feet along the centerline. Traffic stopped at this location is in danger of slides at GM-3 to GM-5.

History: During the winter of 1973-74, this path was noted to be a frequently sliding path. Each new snowfall brought on a new series of slides. A considerable amount of snow was deposited on the roadway throughout the winter. On occasion slides have crossed the roadway and continued beyond.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain No. 3 (GM-3)

Hazard: High-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LW 160+00 Other _____

Elevation of starting zone: _____ 3600' _____

Vertical fall: _____ 1200' _____ Length: _____ 2300' _____

Description: Beginning near the ridgeline of Granite Mountain, Path G-3 runs to the valley floor near the Snoqualmie River. The westbound lanes of SR90 will cross the lower third of the path. The starting zone is an old burned area covered with huckleberry and vine maple. Midtrack is a narrow well-eroded streambed with vine maple in places. The runout zone is a rock talus fan filled with vine maple and devils club.

Effect on Highway: During the winter frequent slides from midtrack may close the highway for a short distance. During the spring months, large wet slides from high in the starting zone may deposit a great depth of snow across the highway for a short distance. Guard rails may be severely damaged with these larger slides. In addition, automobiles stopped by slides at this location are exposed to slides from GM-4 and GM-5. This path probably has the highest hazard potential of the Granite Mountain Paths.

History: Midtrack slides occur with nearly each new storm. No midwinter avalanches have yet been observed which began high in the starting zone. Observed slides have filled the roadway prism and gone beyond.

Cascade Mountain Passes
Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain (GM-4)

Hazard: Low-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L^w 168+00 Other _____

Elevation of starting zone: 2,600'

Vertical fall: 150' Length: 300'

Description: Avalanche Path GM-4 is an open area extending from approximately 300' above the proposed westbound lanes to a point about this distance below the highway. The surface consists of large angular rock which is covered by dense vine maple. This is a short path which is effectively separated from slide paths above by a dense stand of conifers.

Effect on Highway: Constant sluffs from this path can be expected. No large snow discharges are anticipated.

History: During the winter of 1973-74, this was the first of Granite Mountain Paths to slide. Sluffs from this path reached the roadway quite early in every new storm.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Granite Mountain No. 5 (GM-5)

Hazard: Moderate-infrequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L^w 178+00 Other _____

Elevation of starting zone: 3,600'

Vertical fall: 1,000' Length: 1,800'

Description: Path GM-5 is a wide, open area above and slightly below the proposed westbound lanes of I-90. Covered by large angular rock talus, the area supports dense vine maple. Topography causes slides to fall at an angle to the roadway rather than directly. This in effect dissipates slide activity once it is started.

Effect on Highway: Infrequent large avalanches could be expected to reach the roadway. It is possible that up to 500 to 600 feet of roadway could be closed during extreme conditions.

History: During the winter of 1973-74, this path ran rather infrequently, but avalanches were usually larger than others in this group. Seldom did any appreciable amount of snow reach the roadway.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Airplane Curve No. 1 through No. 5 (AC-1 through AC-5)

Hazard: Low-frequent (High infrequent)

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LE 230+00 - LE 240+00

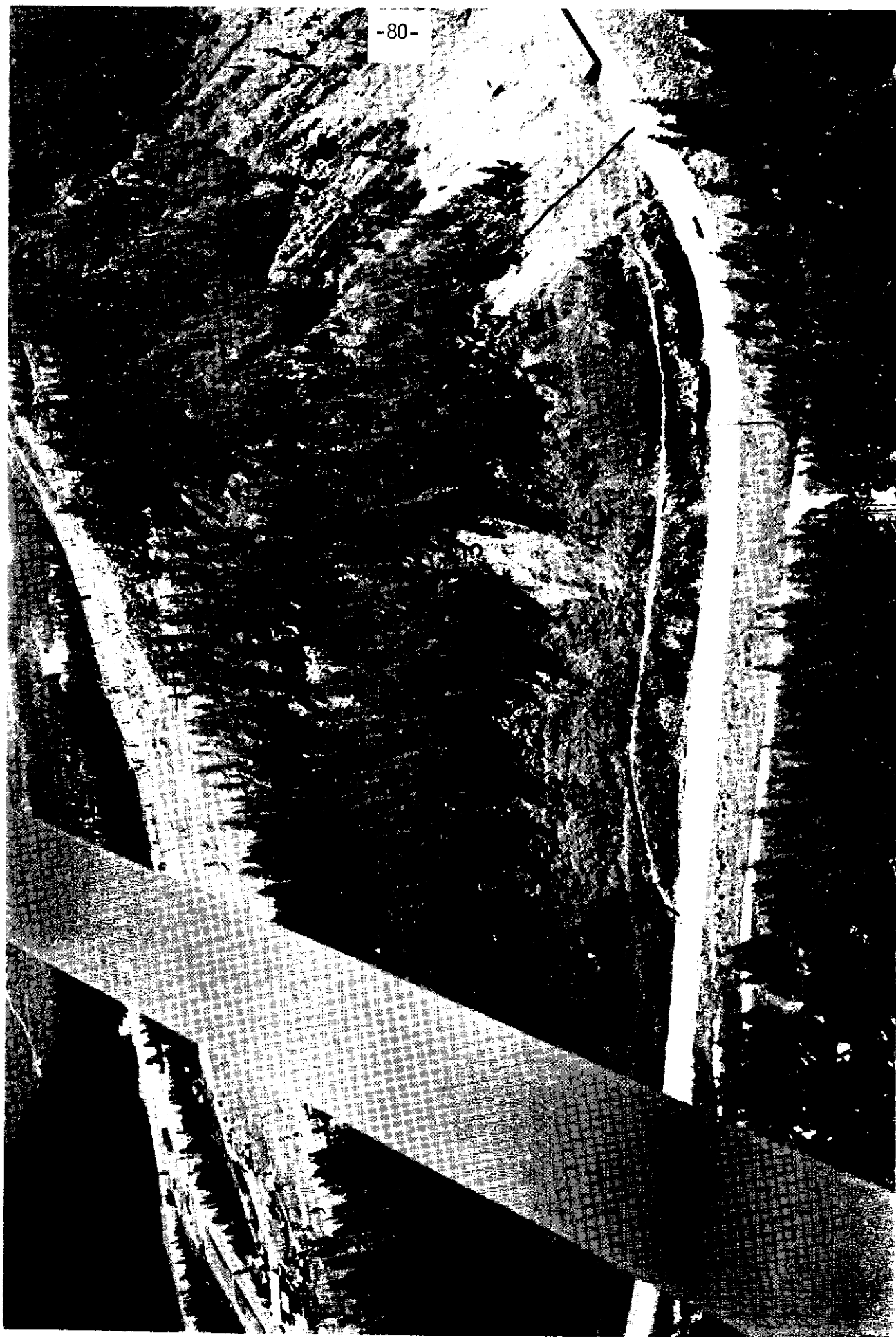
Elevation of starting zone: 3,300'

Vertical fall: 500' Length: 550'

Description: This area is an old railroad cut. Extending from the highway up to cliffs in the tree line, it is of uniform slope consisting of small angular rock talus. The area is covered on about 50% of its area by huckleberry and vine maple. Many avalanches are triggered by snow falling from the cliffs above. Paths AC-1, AC-2 and AC-3 extend to the highway, but Paths AC-4 and AC-5 are blocked by the snowbank created by maintenance operations.

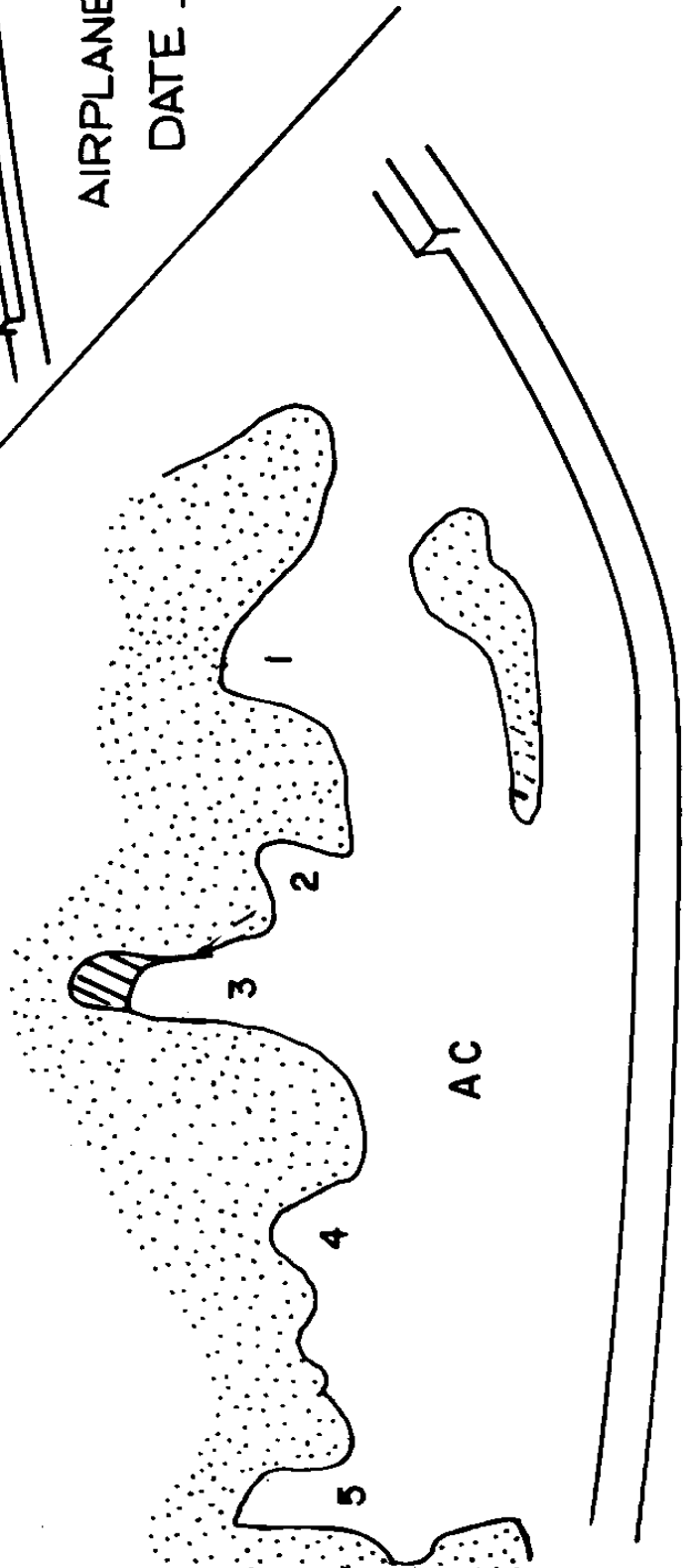
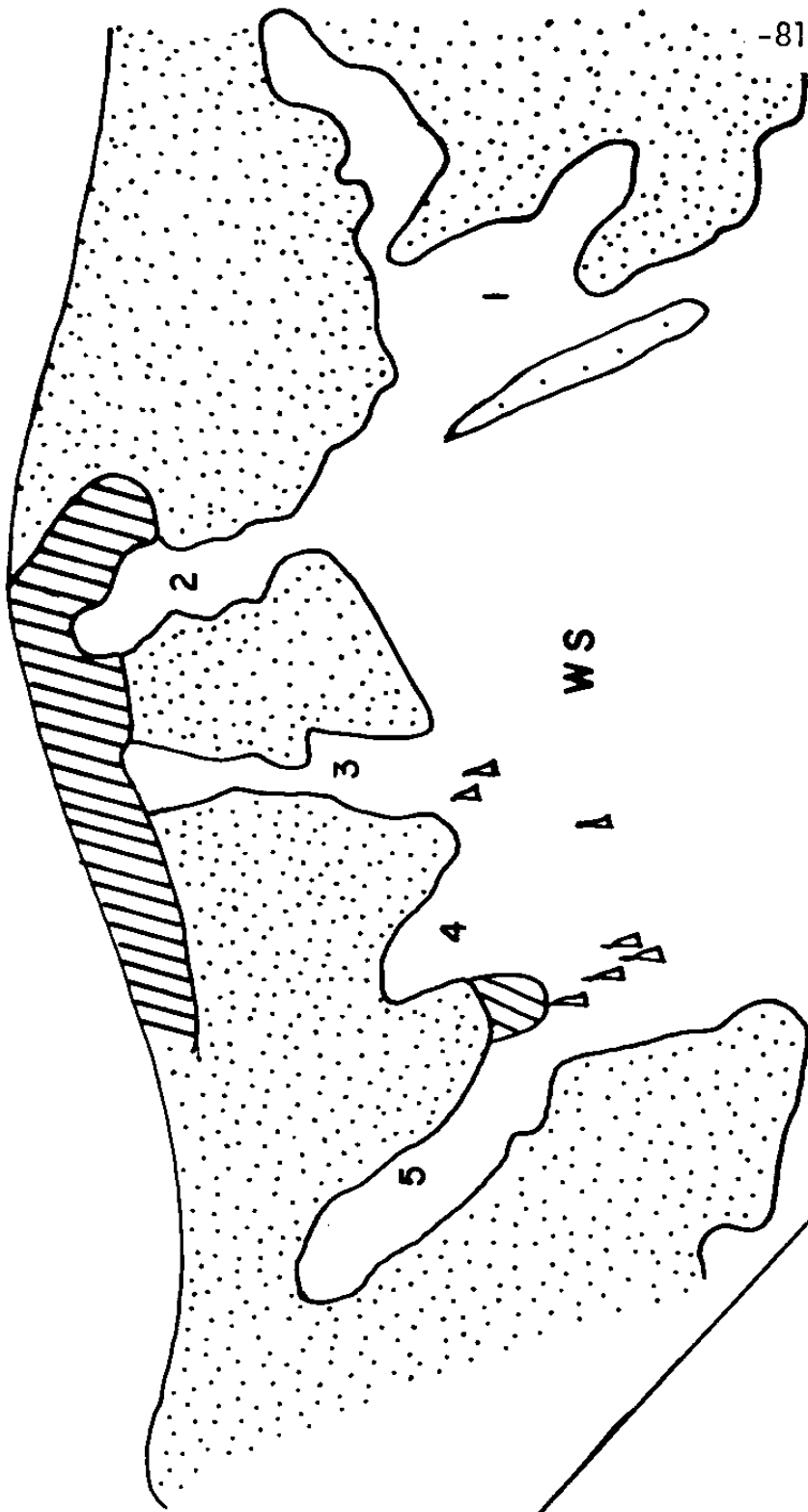
Effect on Highway: Continuous clearing of sluffs and occasional large slides. Cars can be trapped between slides in this area exposing them to slide danger.

History: Over the years, this area has been a continual maintenance problem area. Continual sluffs plague the area between AC-1 and AC-3. Occasional large releases block all four lanes during each winter. Many vehicles have been caught and several including a rotary snowplow have been buried. The most severe slides occurred at Path A-1. Very heavy sluffing occurs in all the Airplane Curve Paths with each new snowfall.



AIRPLANE CURVE/WEST SNOWSHED

DATE ____ BY ____ TIME ____



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: West Snowshed No. 1 (WS-1)

Hazard: Moderate to low

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LW 65+50 to LW 66+50

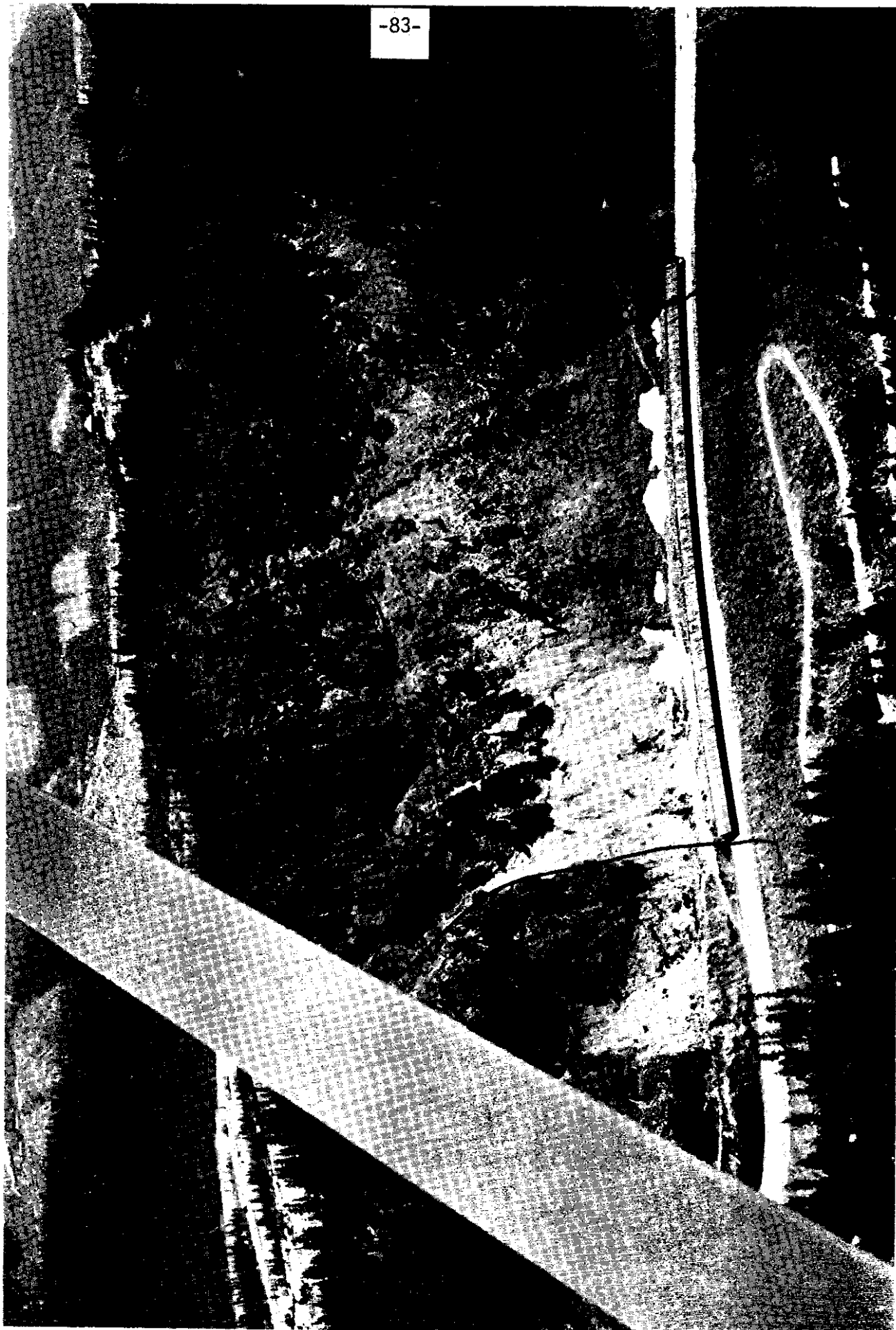
Elevation of starting zone: 3,200'

Vertical fall: 370' Length: 600'

Description: Slides usually begin at base of rock cliff, but also may be triggered by cornices built from strong east winds. Slope angle varies from 35 degrees at top of slide track and steepens to 40 degrees from midtrack to runout zone which is usually the roof of the snowshed. There is a growth of pine from the half to three quarter point in the track and the rest is talus slope.

Effect on Highway: Effect on the highway is minimal, with only occasional sluffs coming over the shed. During extreme snowfall years, however, slides of sufficient magnitude to cover the roadway prism can be expected until excavation behind the snowshed is completed.

History: During the winter of 1973-74, only small sluffs crossed the snowshed. However, large avalanches were observed with nearly each new snowfall. (The WS Paths have a long history of frequent avalanching which led to construction of the snowshed. Only current activity is detailed in this Atlas.)



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: West Snowshed No. 2 through No. 5 (WS-2 through WS-5)

Hazard: Low

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LE 68+50 to LE 76 -

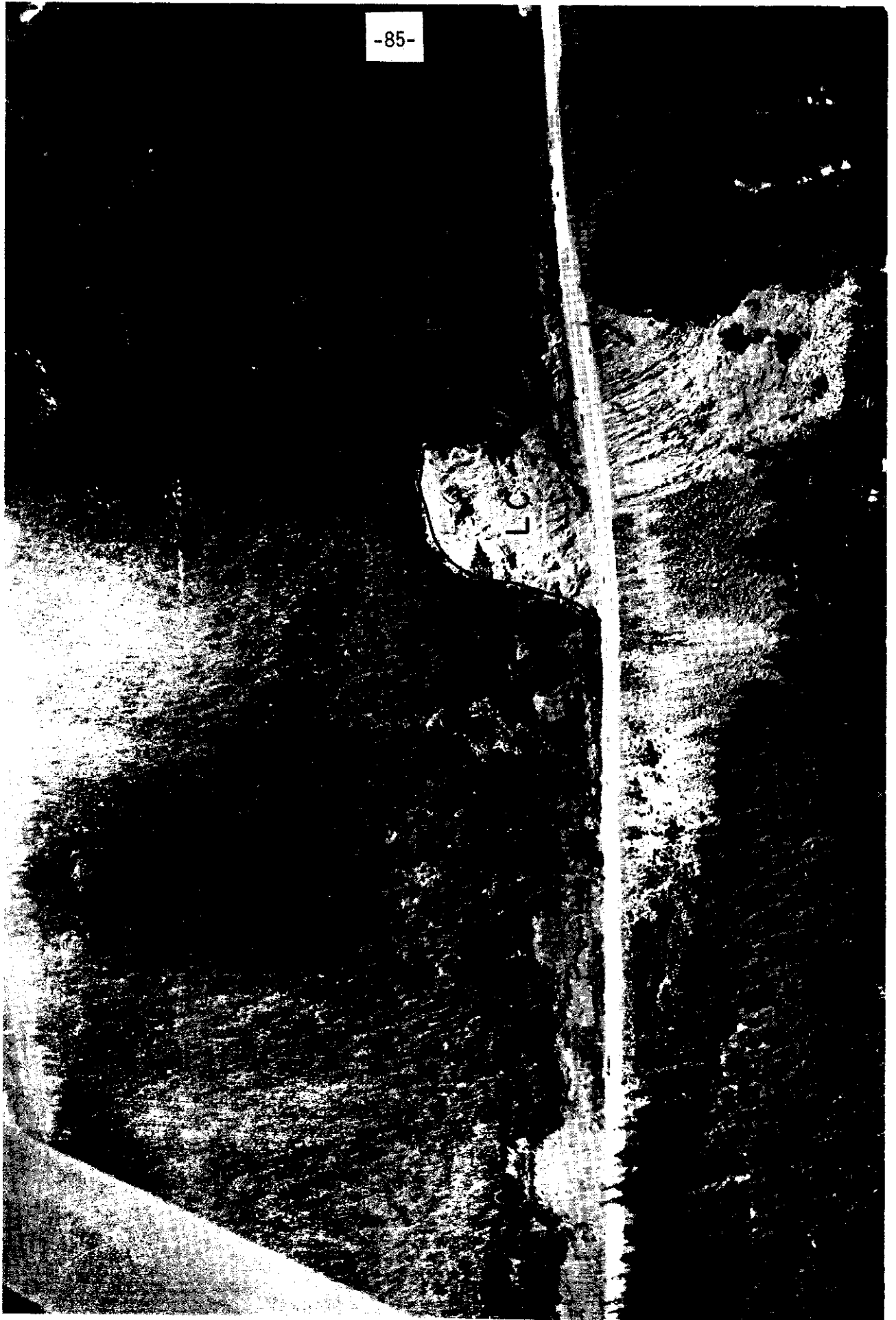
Elevation of starting zone: 3,200' to 3,500'

Vertical fall: 450' to 800' Length: 700' to 950'

Description: The slide paths in this area run on sparsely vegetated talus slopes. The slope angle varies from forty-two degrees to thirty degrees. Slides usually begin at toe of rock cliff, being triggered by snow falling from cliff area. Activity is frequent and small slides usually occur with every new snowfall of three inches or more.

Effect on Highway: Hazard to the highway has been almost completely eliminated in this area due to the excavation behind the snowshed in 1969. Occasionally, a small amount of snow will hit the road at the east end of the shed, but these occurrences are rare.

History: Although sluffs and large slides run with each storm cycle, most slides have been contained by the excavation mentioned above.



Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Lodge Creek (LC)

Hazard: Low, frequent (High, infrequent)

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LE 188+00 Other _____

Elevation of starting zone: 2,850'

Vertical fall: 360' Length: 700'

Description: The Lodge Creek Path is an old excavation on the east side of SR90. It is an undulating area covered with rock rubble. Only a small amount of vegetation is supported, most of which is along the highway. This path faces W-NW and because of the lower elevation usually receives a wet snow which sluffs readily only in steeper places.

Effect on Highway: Small sluffs can be expected to reach the highway with each new snowfall. Larger climax avalanches can be expected to completely close the road infrequently.

History: This area is a persistent slide path. Frequent small sluffs reach the inside lane of the highway. Infrequently, large slides have filled all four lanes with a depth of up to 6 feet at the outside guard rail. These larger slides quite often catch or block a vehicle. This is an area of high volume, high speed traffic.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Denny Mountain No. 1 through No. 4 (DM-1 through DM-4)

Hazard: Moderately high to low

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LW 207+00 to LW 219+00

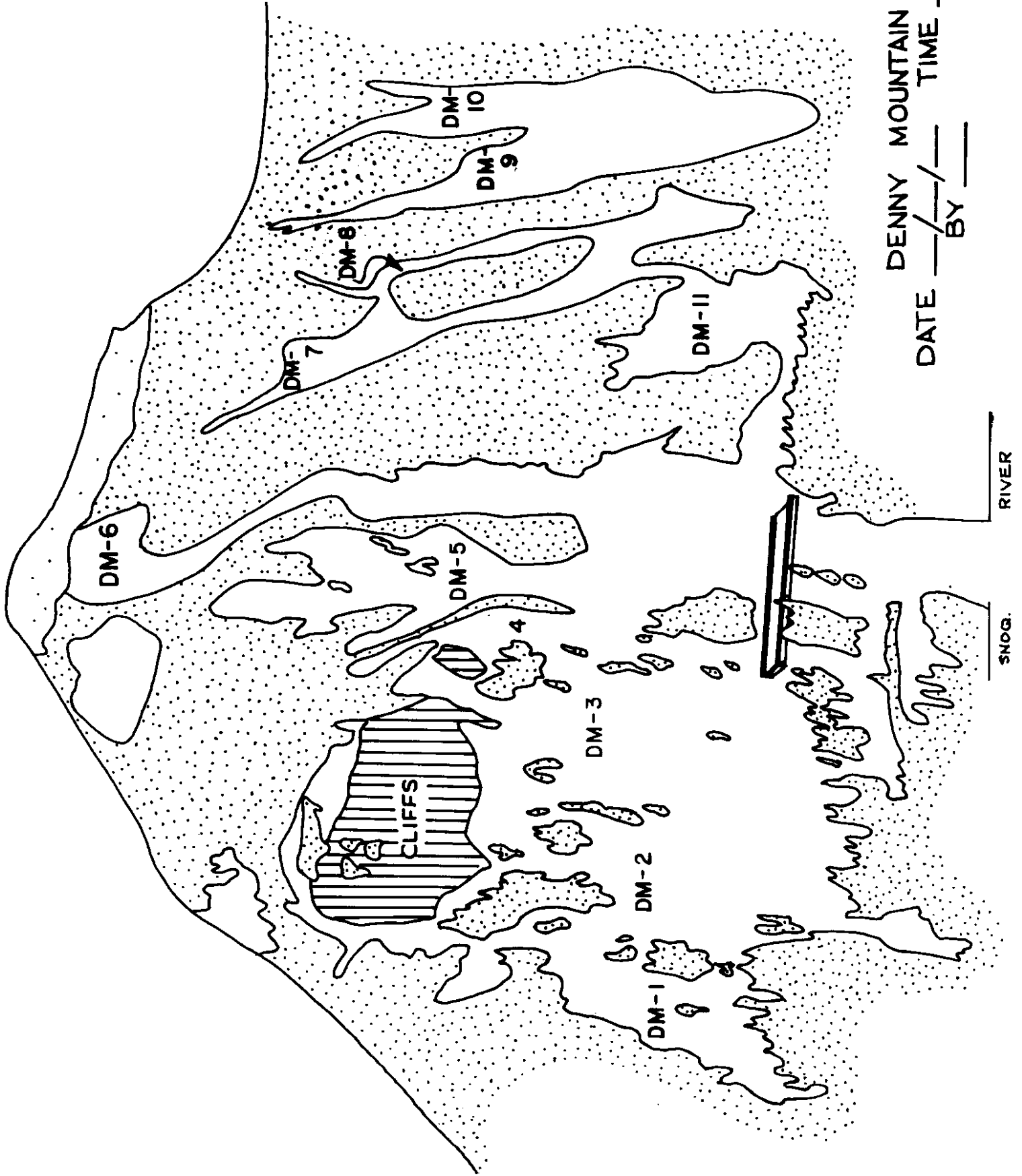
Elevation of starting zone: Approximately 3,300'

Vertical fall: 700' Length: 1,200'

Description: Slide paths D-1, D-2, D-3 and D-4 are similar and adjacent. The slope is an open talus slope with steep near vertical granite cliffs above. Quite often snow falling from these cliffs acts as the trigger for avalanches in this area. The runout zone is a talus slope containing small to very large rocks. Approximately 75% of this area is covered by vine maple 6 to 8 feet high. The runout zone is a slightly flattened area above the lower treeline. The proposed westbound I-90 alignment crosses the lower third of this slope with a slight cut on the upper side.

Effect on Highway: Sluffs can be expected to reach the roadway with each significant new snowfall or continuously with a warming trend. Slides in path D-2 might fill the roadway prism with large amounts of snow with each snowfall. Infrequent large slides could cover the roadway for a distance of 1,000 feet.

History: Observations in the winter 1973-74 indicate that these paths run frequently, although not with every storm. Path D-1 normally generates sluffs. Path D-2, on the other hand, deposits a great deal of snow at the bottom of the runout zone and into the trees. Paths D-3 and D-4 produce frequent sluffs and infrequently, large deep slides. Path D-4 deposits snow against and under the west end of Franklin Falls Bridge. Nearly all slides observed have reached the proposed westbound alignment of Interstate 90.



DENNY MOUNTAIN

DATE ___/___/___ TIME ___

BY ___



Cascade Mountain Passes
Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Denny Mountain No. 5 (DM-5)

Hazard: Moderate

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LW 223+00 Other _____

Elevation of starting zone: Approximately 5,000'

Vertical fall: 2,300' Length: 4,000'

Description: A narrow well-defined track with a series of cliffs along the track in the middle reaches. Near-vertical cliffs bound the SW portion of the lower starting zone. The upper part of the track originates in scattered timber; the lower half is partially filled with talus and supports some vine maple. The runout zone extends into the Snoqualmie River below.

Effect on Highway: The existing Franklin Falls Bridge spans this path. The center bridge pier lies within the avalanche path and is designed to support the load of sliding snow. In rare circumstances, wind blast from a dry powder avalanche could sweep the bridge deck. Debris accumulation under the bridge from previous avalanches could reduce the clearance and increase the probability of damage from this source.

History: Frequent large slides come out of this area and strike the center pier of Franklin Falls Bridge. This path was partially responsible for the destruction of the work bridge destroyed on this site in January of 1971.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Denny Mountain No. 6 (DM-6)

Hazard: Moderately High-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station Approximately LW 225+00

Elevation of starting zone: 5,200'

Vertical fall: 2,600' Length: 4,500'

Description: DM-6 begins near the summit of Denny Mountain. The starting zone is an area of sparse timber and huckleberry. Midtrack is a twisting, well-eroded narrow track. The lower portion is filled with rock talus with vine maple on the shoulders. Avalanche debris is deposited in the Snoqualmie River below Franklin Falls.

Effect on Highway: The Franklin Falls Bridge spans the outrun of this path. Normal slide activity carries avalanching snow beneath the bridge. The out run zones of DM-6 and DM-5 combine above the bridge, with most of the snow from DM-5 passing under the west end and that from DM-6 under the east end. In unusual circumstances, wind blast could reach the bridge deck; this possibility would be enhanced if debris from earlier avalanche reduced the bridge clearance. It is possible, although unlikely, that abnormal flow patterns in DM-6 could lead to avalanche snow reaching the east bridge abutment. A midtrack diversion barrier is planned to reduce this possibility.

History: Occasional large avalanches running to Snoqualmie River. This path is considered primarily responsible for the destruction of the work bridge in January of 1971. A large fracture in the starting zone sent a large amount of snow into the structure. Approximately 50% of this steel piling structure was carried into the Snoqualmie River. During the winter of 1973-74, no releases from the upper starting zones ran the full track, although fractures of 8-12 feet were observed. Avalanching was limited to frequent small sluffs and infrequent larger slides from midtrack. With warmer weather, large wet slides run repeatedly. Nearly all slides from any place in the track pass under the bridge.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Denny Mountain No. 7 and No. 8 (DM-7 and DM-8)

Hazard: Low-frequent, High-infrequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station LW 236+00 Other _____

Elevation of starting zone: 4,600'

Vertical fall: 1,800' Length: 3,500'

Description: These two paths are well-defined rocky fingers. Deep and well eroded, slides are well confined to the track. The upper track is a steep rocky gully. Mid-track is similar, but twists and drops over several sheer cliffs. The runout zone is broader and flattens out as it reaches the tree line. This area supports vine maple and a few small conifers.

Effect on Highway: The proposed I-90 alignment through this area consists of a steep cut. The existing trees at the bottom of the cut will be removed, thereby, extending the runout zone to the highway. The present terrain is relatively flat and slides rarely reach this far. Besides eliminating the natural tree barrier, this cut will extend the steeper uphill slopes an additional 200' toward the highway. Major slides can be expected to have enough velocity to cross the flat area adjacent to the highway.

History: During the winter of 1973-74, these paths slid with nearly each new snowfall. Activity was limited, however, to numerous sluffs throughout the path. The majority of these were mid-track slides with very little sliding from the upper reaches.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Denny Mountain No. 9 and No. 10 (DM-9 and DM-10)

Hazard: Moderate-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L^w 238+00 Other _____

Elevation of starting zone: 4,400'

Vertical fall: 1,800' Length: 3,100'

Description: The starting zones of DM-9 and DM-10 are separated by a rocky spur. These cliffs sluff a great deal of snow to either side into the starting zones. DM-9 is deeply cut into well eroded rock. This track joins the shorter DM-10 in a wide huckleberry field. At the bottom of this slope, there is a sparse conifer stand. The proposed highway alignment will cross this runout area.

Effect on Highway: Continuing sluffs with every new snowfall can be expected to reach the highway. If sluffing does not stabilize the slope, a larger amount of snow will probably reach the highway. When this occurs, up to 400' of roadway may be covered. The proposed cut is 60 feet deep.

History: Throughout the winter of 1973-74, these paths ran with each new snowfall. Slides usually originate near the cliffs and run the full length of the path. Debris is nearly always a large hard slab or wet type. Both paths usually run in unison and fill the deposition zone full width to a depth of several feet.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Denny Mountain No. 11 (DM-11)

Hazard: Low-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station Approximately LW 230+00

Elevation of starting zone: 3,100'

Vertical fall: ~ 400' Length: _____

Description: DM-11 is a small, smooth and even slope fed by several small fingers extending into the trees above. The proposed westbound I-90 alignment crosses the lower quarter of the path with a fill of approximately 15' to 18'.

Effect on Highway: The short path combined with the roadway embankment should not pose a problem to the highway. With a heavy accumulation of snow, a few large sluffs may put a small amount of snow on the highway.

History: Path D-11 runs frequently although not with each storm. Slides normally begin near the top of the track and stop near or above the proposed alignment of Interstate 90.

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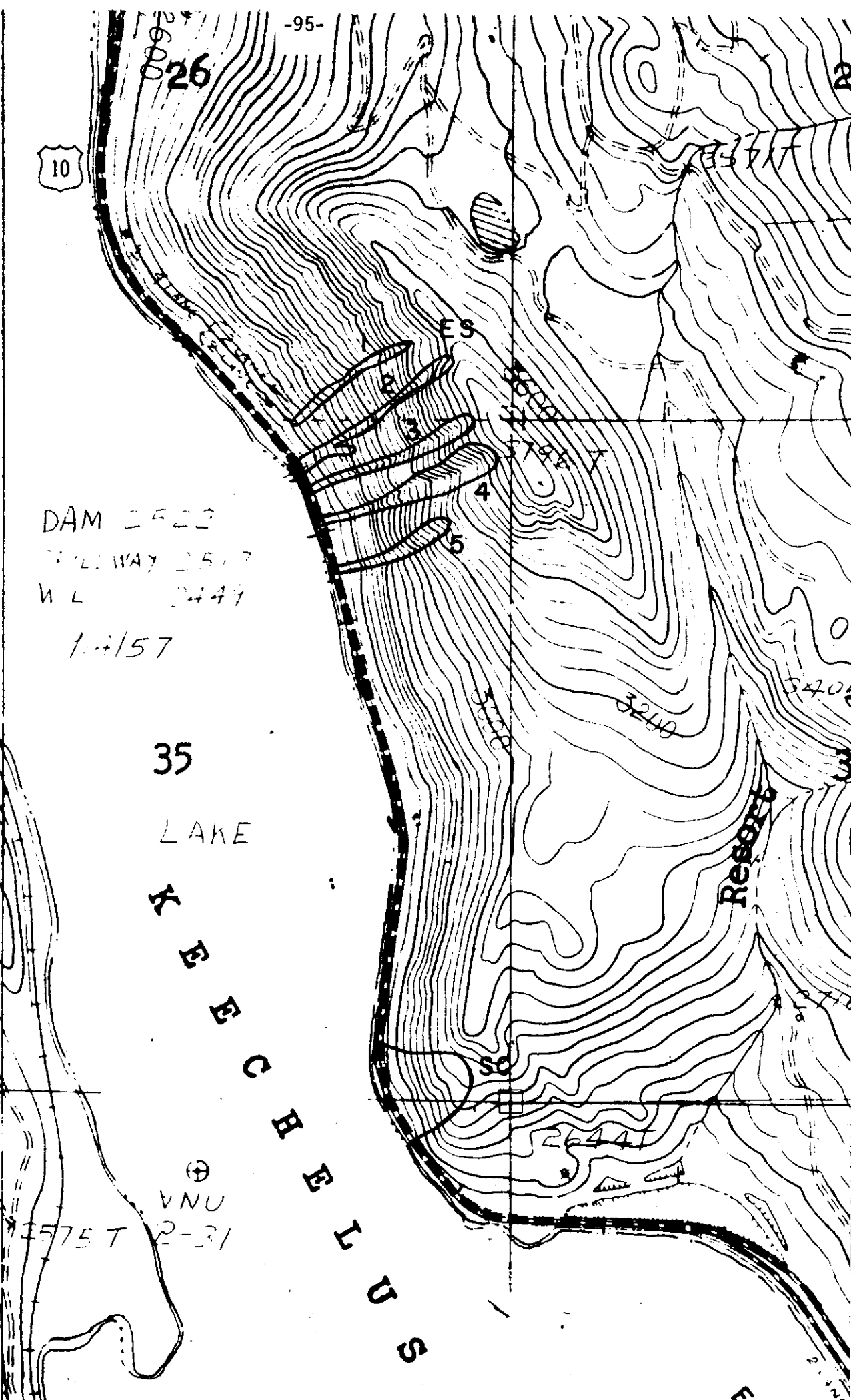
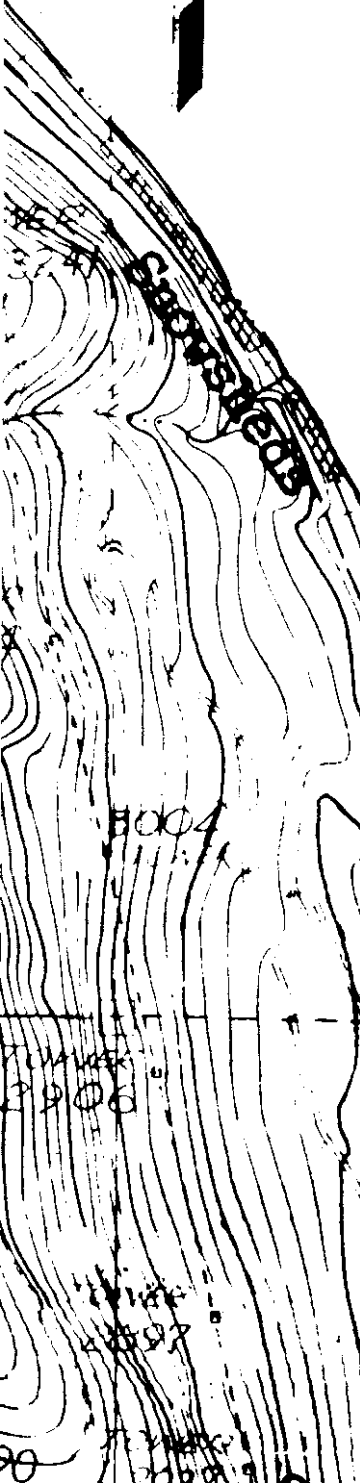
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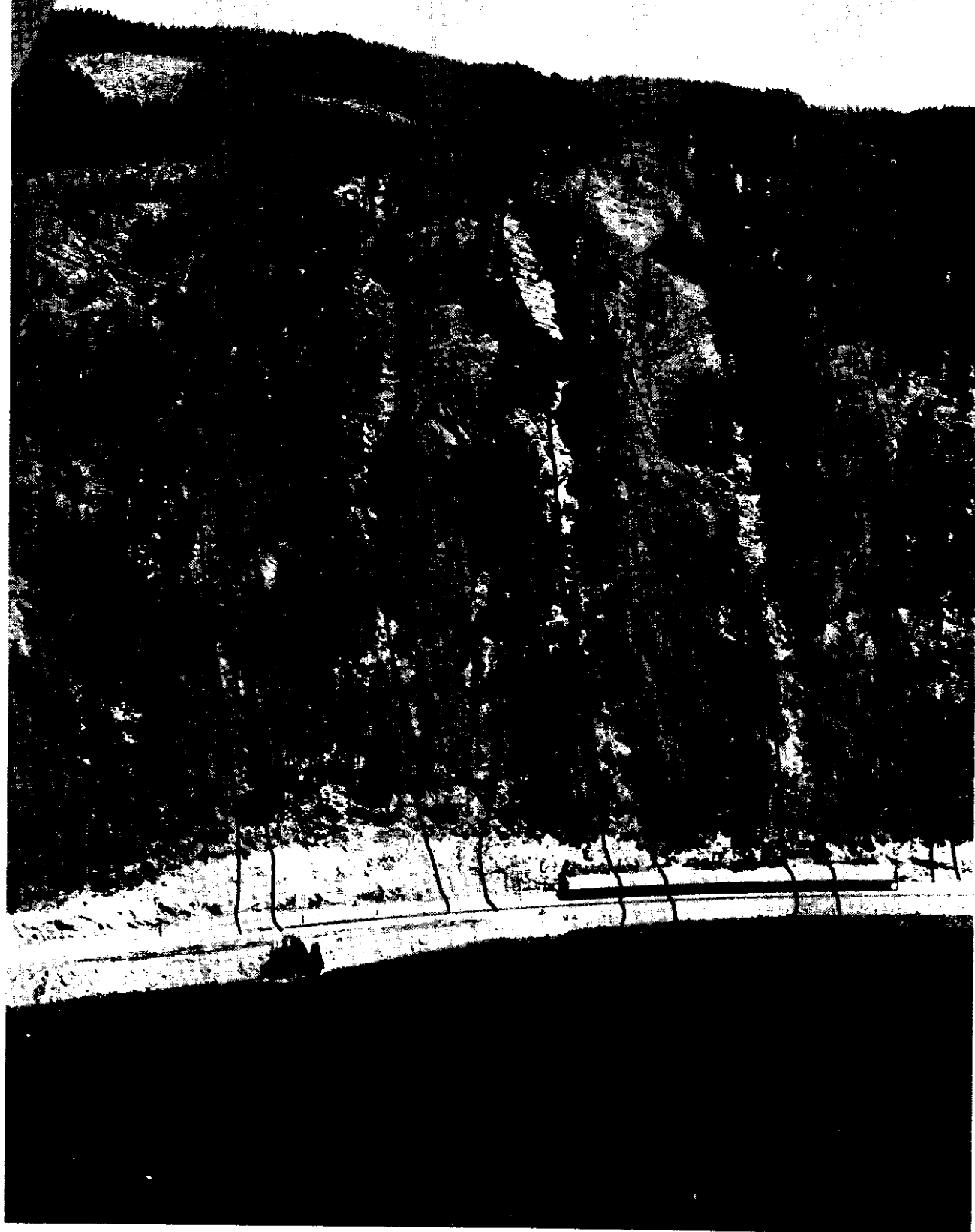
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Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: East Snowshed No. 1 (ES-1)

Hazard: Low-infrequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L 276+30 Other _____

Elevation of starting zone: 3,420'

Vertical fall: 800' Length: 1,400'

Description: This is a small, narrow path which filters through large trees and some vine maple. The exposure is SW.

Effect on Highway: Little effect on highway because the trees usually arrest the sliding snow. Small amounts of snow may occasionally reach the highway.

History: Sluffing throughout this area is constantly bothering maintenance crews. Sluffing is usually confined to the cut banks.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: East Snowshed No. 2 (ES-2)

Hazard: Low to moderate-infrequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L 278+70 Other _____

Elevation of starting zone: 3,600'

Vertical fall: 1,070' Length: 1,520'

Description: Release zone is small and is channeled by a rocky streambed which descends through heavy timber and vine maple. The small size of the starting zone and slide path attribute the amount of deposition on the highway. The path faces the S-SW direction. Just east of ES-2, a smaller avalanche path originating at the 2800' level, ES-2a, joins the former close to the highway.

Effect on Highway: ES-2 runs frequently with heavy snowfalls, depositing snow in the ditch and sometimes covering the westbound lane of the highway. Rocks and brush are sometimes present in the debris. ES-2a brings snow to the highway only when it runs in conjunction with ES-2.

History: This path often runs shortly after the main chutes (E-3 and E-4) have blocked the eastbound lanes. It is not uncommon for vehicles to stop here during clearing operations and be caught by a large sluff.

Cascade Mountain Passes
Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: East Snowshed No. 3 (ES-3)

Hazard: Moderate to high-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L-281+50 Other _____

Elevation of starting zone: 3,640'

Vertical fall: 1,100' Length: 1,820'

Description: This path is a long, rocky gulley. A steep release zone leads to cliffs and then to a well-defined channel throughout the rest of the path. The track is filled with large angular rock and supports a sparse cover of vine maple.

Effect on Highway: Westbound traffic is protected by the snowshed. East bound lanes are blocked occasionally, usually in conjunction with slides from ES-4, and sometimes by a hazardous large volume of snow. When a hazard exists, the traffic is normally diverted through the snowshed.

History: This track runs with nearly every new snowfall. These slides occur throughout the track but seldom cross the snowshed. Slides which crossed the snowshed during the winter of 1973-74 were large wet avalanches. In 1966 a motorist was buried here for 8 hours.

Cascade Mountain Passes
Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: East Snowshed No. 4 (ES-4)

Hazard: Moderate to high-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L-284~ Other _____

Elevation of starting zone: 3,850'

Vertical fall: 1,320' Length: 2,500'

Description: The starting zone is a large bare area dropping off immediately to a cliff. The path narrows toward the bottom. This path generates large volumes of slide snow because of its large starting zone and length. Cornices build on the top of the cliffs.

Effect on Highway: Because of the steepness of slide path and large starting zone, the volume of snow can completely block eastbound traffic after crossing the snowshed. The roadway may be covered up to 200 feet on centerline with depths up to 25-30 feet. Automobiles are easily buried and sometimes collide with the slides which cover the highway.

History: This path slides with virtually every new snowfall. The eastbound lanes must be closed and two-way traffic put through the snowshed each time approximately 6" to 8" of snow falls. This path was the scene of a fatal accident in the winter of 1970-71.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: East Snowshed No. 5 (ES-5)

Hazard: Moderate-high-infrequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L 286 ~ Other _____

Elevation of starting zone: 3,350'

Vertical fall: 700' Length: 1,040'

Description: There is a large, open area at the top of the starting zone. A chute runs through trees about half way down the path. The lower portion of the track is a watercourse which drops over a 20'-high rock cut.

Effect on Highway: ES-5 has the potential of blocking all four lanes of I-90, but seldom does. It has blocked the westbound lanes throughout the years, with small sluffs or as much as 15'-25' at times. Traffic stopped here for clearing operations are easily trapped or buried.

History: During severe winters this path has been a constant problem to snow removal due to sluffing. Large slides at ES-3 or ES-4 are occasionally followed by large slides here.

Cascade Mountain Passes

Avalanche Summary Sheet

Area: Snoqualmie Pass

Name of Path: Slide Curve (SC)

Hazard: Moderately high-frequent

Map: Highway Dept. 1:12,000

Location: Milepost _____ Station L 325+00 Other _____

Elevation of starting zone: 3,000'

Vertical fall: 400' Length: 550'

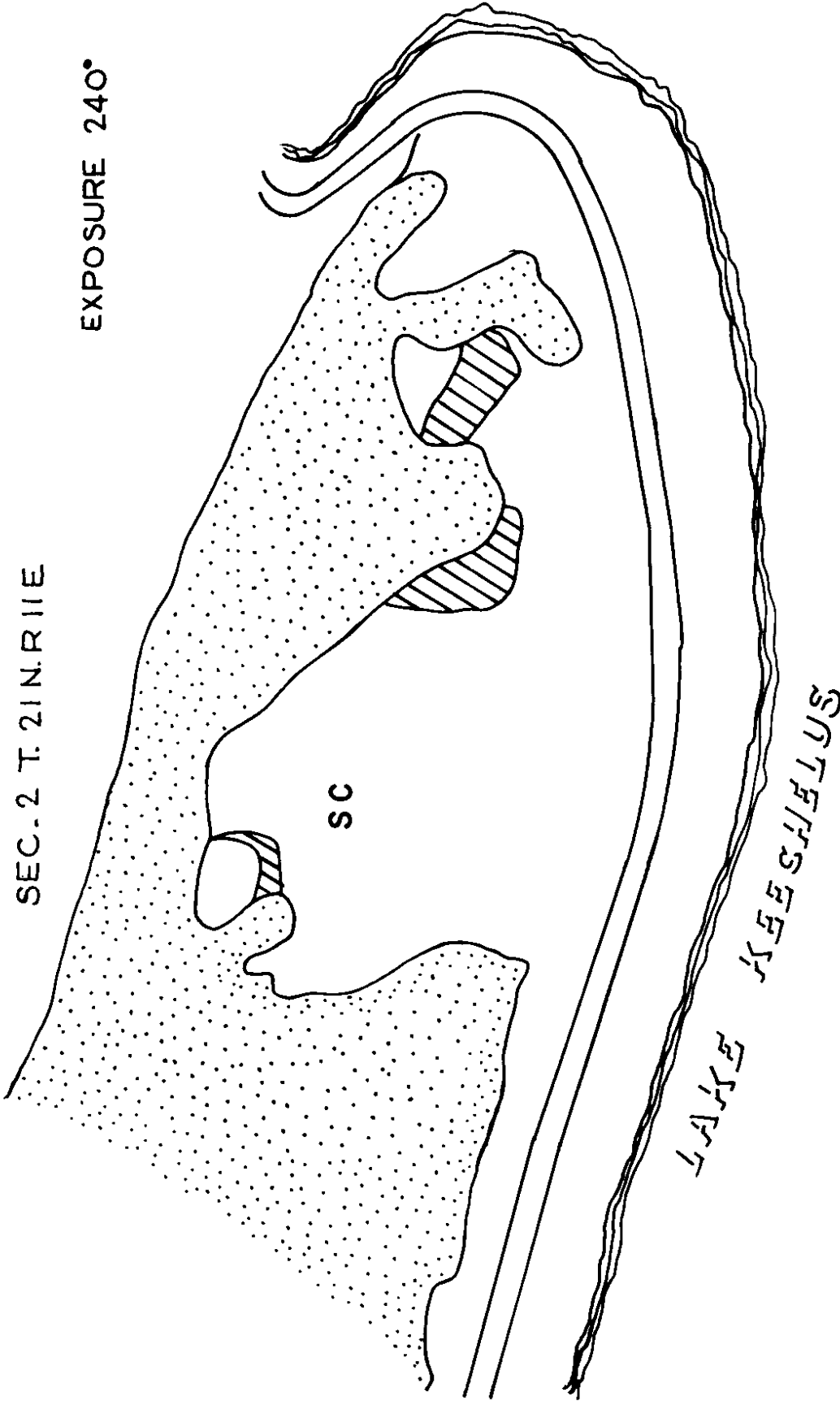
Description: This path is a bare rock excavation left as a result of construction during 1972. The area is broken and uneven, without any vegetation. Slides occur across the face of this area, but usually originate near the crest on either flank. The highway below is divided by a concrete median barrier and Lake Keechelus is on the outside of the highway.

Effect on Highway: Maintenance crews can expect to clear frequent sluffs as well as infrequent slides which might cross the median barrier and fill all four lanes. This is an area of high speed traffic and collision with avalanched snow can be a hazard.

History: In its short history, sluffs in this path have caught numerous vehicles. Infrequent large avalanches have crossed all four lanes, including the median barrier, and run into Lake Keechelus.

SEC. 2 T. 21 N. R. 11 E

EXPOSURE 240°



NOTES:

SLIDE CURVE

TIME ___ DATE ___/___/___
OBSERVER ___

