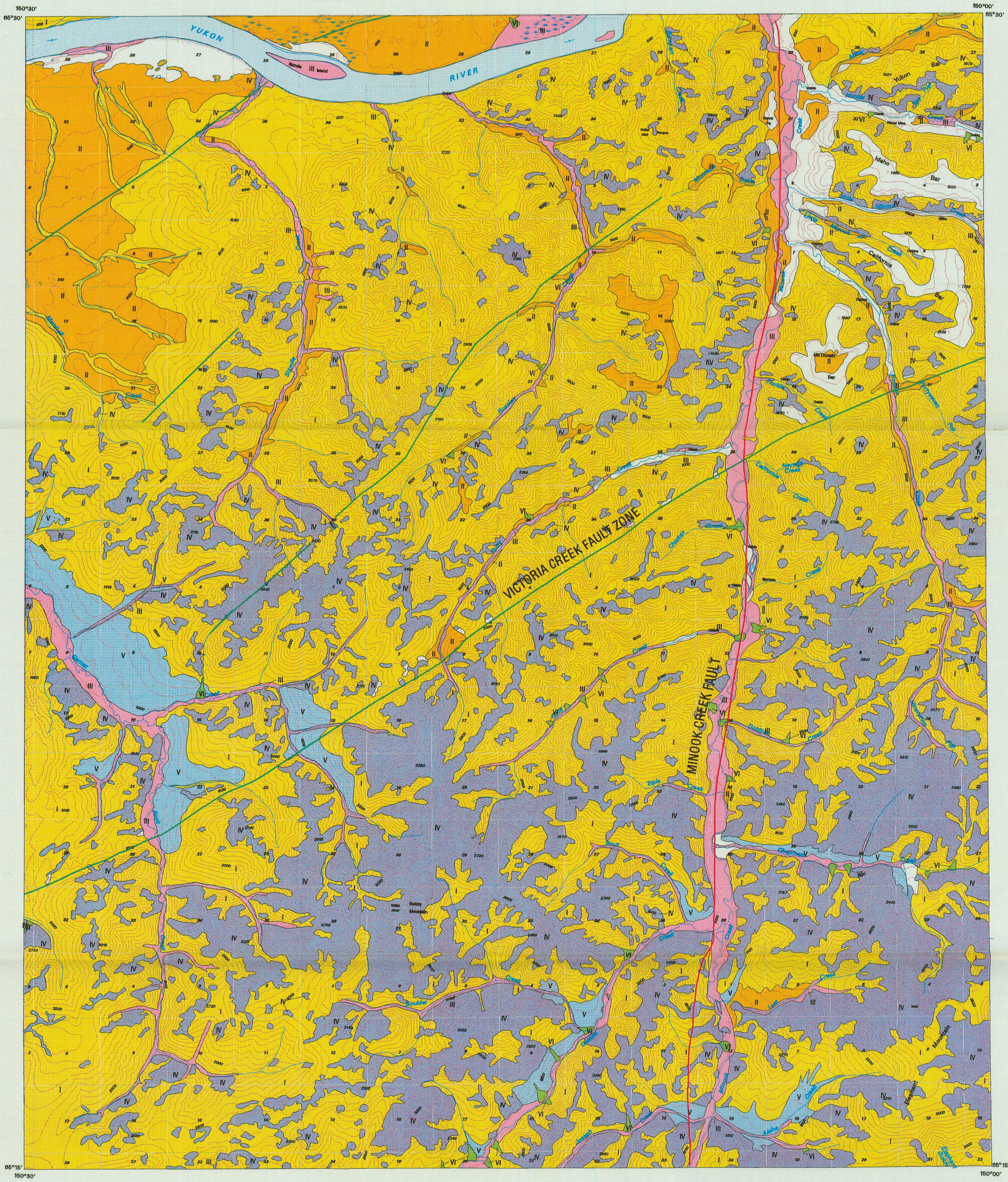
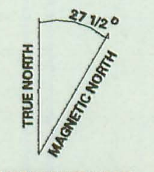
ALASKA DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

REPORT OF INVESTIGATIONS 97-15e
PINNEY 1997



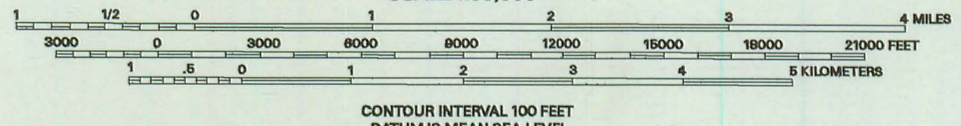

Date: 06/13/97

Base modified from U.S. Geological Survey Tanana B-1 Quadrangle, Alaska (1956). Universal Transverse Mercator projection, 1927 North American datum.




APPROXIMATE MEAN DECLINATION, 1956

SCALE 1:63,360




CONTOUR INTERVAL 100 FEET
DATUM IS MEAN SEA LEVEL


MAP LOCATION

For technical map review I thank R.A. Combellick (DGGS) and R.D. Reger. This work was performed in cooperation with the U.S. Geological Survey under STATEMAP Agreement #1474-HQ-96-AG. Digital cartography by D.S. Pinney and S.A. Haug.

# DERIVATIVE MAP OF POTENTIAL GEOLOGIC HAZARDS IN THE TANANA B-1 QUADRANGLE, CENTRAL ALASKA

By

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1997

## DISCUSSION

This map addresses some of the principal hazards that may be associated with surficial geologic deposits (Pinney, 1997; Reifenstuhl and others, 1997) on the basis of their general physical properties, conditions that are characteristic of their depositional environment, and topography. Potential geologic hazards directly relate to surficial-geologic units because (1) the processes that formed the deposits may be hazardous where still active, (2) postdepositional conditions (like ground ice) may present additional hazards, and (3) materials characteristically present in the deposits are known to be susceptible to certain hazards (like liquefaction). In general, natural hazards in lowlands are related to a lack of bearing strength (such as saturated, organic-rich swamp deposits and thawing of ice-rich permafrost) and to seasonal flooding. In highlands, mass movements are locally a serious concern. Local, unevaluated factors affecting mass movements (rock and snow avalanches, landslides, and debris flows) include sediment textures, bedrock structures, and water content. This map is intended only as a general guide to some common hazards that may be present, depending on other factors like topography and water content, and does not preclude the existence of other unevaluated or site-specific hazards.

Active faulting producing earthquakes is a potential hazard in the map area. Faulting and associated earthquakes can produce sudden displacements and strong shaking that can cause liquefaction and mass movements in both highlands and lowlands. The Minook Creek fault was classified by Plafker and others (1994) as "suspicious," with displacement age unknown but probably Holocene. It has generated numerous earthquakes of magnitude 2 and greater during historic times, and Gedney and others (1972) indicate that there is evidence of Holocene movement along its length. Although not known to be currently active, the Victoria Creek fault zone displaces deposits of Pliocene (?) age (Pinney, 1997), and its trace is clearly visible in aerial photographs of the region. Gedney and others (1972) show at least two earthquakes of magnitude 2 or greater occurring along its length in the map area during the period 1968-1971. Apparent left-lateral offset of a young stream in the northwestern area of the map and possible diversion of lower Sixmile Creek also indicate recent tectonic activity.

Seasonal stream icings (aufeis) are a significant engineering concern along Minook Creek and most of its tributary streams, producing thick accumulations of ice that overflow stream channels and persist well into summer. Mertie (1934) recognized that the widening of the valley floor of Minook Creek below Slate Creek was the result of aufeis blocking the channel and forcing spring streamflow against the valley walls. Aufeis accumulations are used extensively as bridges by placer miners during the early part of the season, but could pose a hazard to structures inadvertently placed in susceptible areas.

This map is derived electronically from the geologic map of the area (Reifenstuhl and others, 1997) using Geographic Information System (GIS) software.

## DESCRIPTION OF MAP UNITS

[referenced geologic units are from Pinney (1997) and Reifenstuhl and others (1997)]

I — Significant ground-ice content. Where perennially frozen, may contain significant pervasive or massive ground ice, or both; during and after melting, susceptible to excessive and differential settlement and loss of shear strength.
Includes geologic units Qac, Qc, Qcs, and Qd.

II — Potentially susceptible to earthquake-induced liquefaction. Where saturated and thawed, there is significant potential for loss of shear strength under strong shaking. Areas of primary loess are not generally subject to this potential hazard.
Significant ground-ice content. Where perennially frozen, may contain significant pervasive or massive ground ice, or both; during and after melting, susceptible to excessive and differential settlement and loss of shear strength. Areas of primary loess are not generally subject to this potential hazard.
Includes geologic units Qer and Ql.

III — Potentially susceptible to earthquake-induced liquefaction. Where saturated and thawed, there is significant potential for loss of shear strength under strong shaking.
Seasonal flooding. Includes seasonal stream icings (aufeis).
Includes geologic units Qal and Qfp.

IV — Rapid mass movements on steeper slopes. Includes landslides, snow avalanches, and debris flows; significant potential for displacement and impacts.
Includes geologic unit Qls and all bedrock units.

V — Significant ground-ice content. Where perennially frozen, may contain significant pervasive or massive ground ice, or both; during and after melting, susceptible to excessive and differential settlement and loss of shear strength.
Rapid mass movements on steeper slopes. Includes landslides, snow avalanches, and debris flows; significant potential for displacement and impacts.
Includes geologic units Qca and Qct.

VI — Seasonal flooding. Includes seasonal stream icings (aufeis).
Rapid mass movements on steeper slopes. Includes landslides, snow avalanches, and debris flows; significant potential for displacement and impacts.
Includes geologic unit Qaf.

No known hazards.
Includes geologic units Qat1, Qat2, Qes, Qfo, Qh, Qof, and QTg.

## MAP SYMBOLS

Probably active fault (historic events possibly associated with fault; geologic evidence of possible Holocene activity). Offset or strong shaking along these zones could pose a hazard to structures.

Possibly active fault (geologic evidence of possible Quaternary activity). Offset or strong shaking along these zones could pose a hazard to structures.

## REFERENCES CITED

Gedney, L, Shapiro, L., Van Wormer, D., and Weber, F., 1972, Correlation of epicenters with mapped faults, east-central Alaska, 1968-1971: U.S. Geological Survey Open-file Report 72-128(535), 7 p.

Mertie, J.B., Jr., 1934, Mineral deposits of the Rampart and Hot Springs districts, Alaska: U.S. Geological Survey Bulletin 844-D, p. 163-226.

Pinney, D.S., 1997, Surficial geologic map of the Tanana B-1 Quadrangle, central Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigations 97-15c, 1 sheet, scale 1:63,360.

Plafker, G., Gilpin, L.M., and Lahr, J.C., 1994, Neotectonic map of Alaska, *in* Plafker, G., and Berg, H.C., eds., The Geology of Alaska, *in* Decade of North American Geology: Boulder, Geological Society of America, v. G-1, scale 1:2,500,000.

Reifenstuhl, R.R., Dover, J.H., Pinney, D.S., Newberry, R.J., Clautice, K.H., Liss, S.A., Blodgett, R.B., Bundtzen, T.K., and Weber, F.R., 1997, Geologic map of the Tanana B-1 Quadrangle, central Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigations 97-15a, 1 sheet, scale 1:63,360.



This DGGS Report of Investigations is a final report of scientific research. It has received technical review and may be cited as an agency publication.