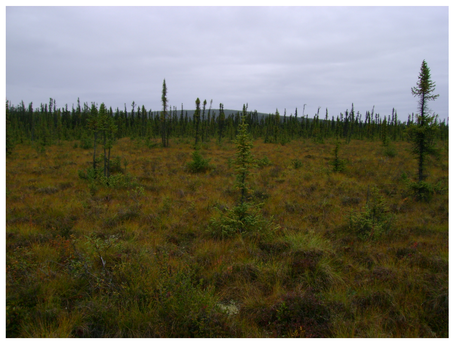
ALASKA DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

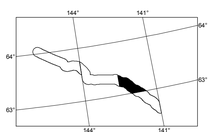
PRELIMINARY INTERPRETIVE REPORT 2012-1C
Reger and others, 2012
SHEET 1 OF 2

Explanatory text accompanies map

Aerial view of collapsed open-system pingo in the Ladue River valley. (Photograph taken 08/19/2009 by T.D. Hubbard.)



View of tussock tundra with scattered black spruce, typical of discontinuously frozen permafrost with moderate to high ice content, in a tributary to the Ladue River. (Photograph taken 08/21/2009 by T.D. Hubbard.)



Location of Map Area in Proposed Corridor

APPROXIMATE MEAN
DECLINATION, 2010

EXPLANATION OF MAP UNITS

(Map units below might not all appear on this sheet)
Question mark (?) in map unit label means questionable identification

Fr	CONTINUOUSLY FROZEN, MODERATE TO HIGH ICE CONTENT
Fm	CONTINUOUSLY FROZEN, LOW TO MODERATE ICE CONTENT
Dm	DISCONTINUOUSLY FROZEN, LOW TO MODERATE ICE CONTENT
Dl	DISCONTINUOUSLY FROZEN, LOW ICE CONTENT
Sm	SPORADICALLY FROZEN, LOW TO MODERATE ICE CONTENT
Sl	SPORADICALLY FROZEN, LOW ICE CONTENT
G	GENERALLY UNFROZEN (ISOLATED PERMAFROST MASSES)
U	NO PERMAFROST
	LAKES - ALL LAKES ARE ASSUMED UNFROZEN

MAP SYMBOLS

- - - - - -	PHOTOINTERPRETIVE BOUNDARY—All boundaries are inferred or approximately located
GC	GARDINER CREEK LOCALITY DISCUSSED IN REPORT
M-1	SOIL MOISTURE LOCALITY DISCUSSED IN REPORT
TM	TEMPERATURE LOCALITY DISCUSSED IN REPORT
PES	PERMAFROST EXPERIMENT SITE DISCUSSED IN REPORT
✲	INTACT OR BREACHED OPEN-SYSTEM PINGO

EXPLANATORY MATERIAL FOR PERMAFROST MAP

INTRODUCTION

Permafrost, or perennially frozen ground, is rock or soil that remains continuously colder than 0°C for 2 years or longer (Muller, 1947; Ferrians and others, 1969; Péwé, 1966, 1982). On the basis of the interpretation of ~1:65,000-scale false-color, infrared aerial photographs, this map illustrates the inferred extent and estimated ice content of permafrost between the ground surface and a depth of 6 m in the proposed corridor straddling the Alaska Highway between Tetlin Junction and the Canada border from July 1978 to August 1981, the dates of the aerial photographs. The presence or former presence of permafrost and the ground-ice content are inferred from several indicators, including vegetation, slope and aspect, landform, soil type, local drainage, and terrain features, such as open-system pingos, polygonal ground, and thermokarst pits, gullies, and ponds (Kreig and Reger, 1982). After initial permafrost maps were completed, airborne-resistivity data became available and we were able to compare our initial interpretations with those data, producing map changes that better represent local conditions. The lack of confirming subsurface data causes our interpretation to be considered tentative until validated by multi-year ground-temperature measurements that verify the persistence of frozen ground. Permafrost classifications in areas that were burned just prior to August 1980 are less reliable than in unburned areas because the vegetation was destroyed or significantly altered and, in these areas, interpretation of permafrost is based primarily on landform and setting, which are less diagnostic than vegetation. The user is cautioned that this map has not been verified by field observations, except very locally, although we have considerable field experience in the Tanana River valley and during our interpretation referred to available published and unpublished reports. Physical properties of map units are extrapolated from similar deposits in the region and from previously published reports and data. Detailed subsurface investigations should be completed prior to development.

DESCRIPTION OF PERMAFROST MAP UNITS

Symbols indicate the inferred continuity of permafrost in upper-case letters and the estimated ice content in lower-case letters. For example, 'Dm' indicates that discontinuous permafrost with low to moderate ice content is inferred between the ground surface and a depth of ~6 m. Classes of permafrost continuity are consistent with classes used in previous mapping in Alaska (Ferrians, 1965; Kreig and Reger, 1982; Brown and others, 1997; Jorgenson and others, 2008).

Symbol	Description
F	CONTINUOUSLY FROZEN—More than 90 percent of the area is inferred to be underlain by permafrost
D	DISCONTINUOUSLY FROZEN—Between 50 and 90 percent of the area is inferred to be underlain by permafrost
S	SPORADICALLY FROZEN—Between 10 and 50 percent of the area is inferred to be underlain by permafrost
G	GENERALLY UNFROZEN (ISOLATED MASSES)—Between 0 and 10 percent of the area is inferred to be underlain by permafrost
U	NO PERMAFROST—Seasonally frozen but the ground is inferred to be warmed to a temperature above 0°C at least once during any 2-year period
r	MODERATE TO HIGH ICE CONTENT—Estimated to typically contain 50 to >1,000 percent gravimetric soil moisture relative to dry weight
m	LOW TO MODERATE ICE CONTENT—Estimated to typically contain 25 to 50 percent gravimetric soil moisture relative to dry weight
l	LOW ICE CONTENT—Estimated to typically contain 6 to 25 percent gravimetric soil moisture relative to dry weight

REFERENCES CITED

Brown, J., Ferrians, O.J., Jr., Heginbottom, J.A., and Melnikov, E.S., 1997, Circum-arctic map of permafrost and ground-ice conditions: U.S. Geological Survey Circum-Pacific Map CP-45, 1 sheet, scale 1:10,000,000.

Ferrians, O.J., Jr., 1965, Permafrost map of Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-445, 1 sheet, scale 1:2,500,000.

Ferrians, O.J., Jr., Kachadoorian, Reuben, and Greene, G.W., 1969, Permafrost and related engineering problems in Alaska: U.S. Geological Survey Professional Paper 678, 37 p.

Jorgenson, Torre, Yoshikawa, Kenji, Kanevskiy, Mikhail, Shur, Yuri, Romanovsky, Vladimir, Marchenko, Sergei, Grosse, Guido, Brown, Jerry, and Jones, Ben, 2008, Permafrost characteristics of Alaska, *in* Kane, D.L., and Hinkel, K.M., eds., Proceedings of the Ninth International Conference on Permafrost, Fairbanks, Alaska, University of Alaska Fairbanks, p. 121–122.

Kreig, R.A., and Reger, R.D., 1982, Air-photo analysis and summary of landform soil properties along the route of the Trans-Alaska Pipeline System: Alaska Division of Geological & Geophysical Surveys Geologic Report 66, 149 p.

Muller, S.W., 1947, Permafrost or permanently frozen ground and related engineering problems: Ann Arbor, Michigan, J.W. Edwards, Inc., 231 p.

Péwé, T.L., 1966, Permafrost and its effect on life in the North: Corvallis, Oregon State University Press, 40 p.

———1982, Geologic hazards of the Fairbanks area, Alaska: Alaska Division of Geological & Geophysical Surveys Special Report 15, 109 p.

RECONNAISSANCE INTERPRETATION OF 1978 – 1981 PERMAFROST, ALASKA HIGHWAY CORRIDOR, PARTS OF TANACROSS A-1, A-2, A-3, AND B-3 QUADRANGLES, ALASKA

by

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SCALE 1 : 63360

1 1/2 0 1 2 3 4 5 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 24000 27000 FEET
1 .5 0 1 2 3 4 5 6 7 KILOMETERS

CONTOUR INTERVAL 100 FEET
TANACROSS A-1, A-3, AND B-3 — SUPPLEMENTARY CONTOUR INTERVAL 50 FEET
TANACROSS A-1, A-2, AND B-3 — MEAN SEA LEVEL
TANACROSS A-3 — NATIONAL GEODETIC VERTICAL DATUM OF 1929

Topographic base map from:

U.S. Geological Survey Topographic Maps:
Tanacross A-1 (1952 - minor revisions 1971)
Tanacross A-2 (1955 - minor revisions 1972)
Tanacross A-3 (1948 - minor revisions 2000)
Tanacross B-3 (1949 - minor revisions 1964)

Projection:

Universal Transverse Mercator Zone 7

Datum:

North American Datum of 1927

Interpreted permafrost field verification by:

R.D. Reger and T.D. Hubbard (2009)

Airphoto interpretation by:

R.D. Reger (2009, 2010)

GIS layers created by:

G. Davidson (2009), T.D. Hubbard (2009, 2010), P.E. Gallagher, and R.E. Westbrook (2010, 2011)

Digital cartography by:

P.E. Gallagher, R.E. Westbrook (2010, 2011), and J.R. Weakland (2011, 2012)

Reviewed by:

T. Jorgenson (2010)