

Important note: This portion of the proposed trans-Alaska pipeline route is considered to be subject to the following maximum probable earthquakes -- from north edge of quadrangle to Donnelly Dome, Richter magnitude 7.5; from Donnelly Dome to Paxson, Richter magnitude 8.0; from Paxson to south edge of quadrangle, Richter magnitude 7.0.

Map unit Symbol	Name	Description	Distribution and Thickness	Terrain and Natural Slopes	Drainage and Permeability	Permafrost	Susceptibility to Frost Action
Qac	Active flood plain	Poorly stratified unconsolidated sand, pebbles, cobbles, and boulders of variable composition. Delta River gravel consists mostly of quartzite, quartz, gneiss, and diorite.	Found in active flood plain of all major streams. Thickness in most places unknown, but may be up to 200 feet near bedrock hills, and approximately 700 feet near the Tanana River, a short distance north of map area.	Flat plain with a complex network of braided channels. Local relief 2 to 8 feet.	Drainage excellent and permeability high. Subject to frequent flooding. Ground-water table generally less than 8 feet below surface.	Permafrost generally absent.	Low
Qca	Colluvium, alpine type	Poorly-stratified layers and lenses, and unstratified unconsolidated, angular to rounded, poorly sorted detrital bedrock fragments and gravel, one inch to six inches in diameter, in a matrix of organic-rich sand or silt.	Mapped only in vicinity of Donnelly Dome but covers almost all non-vertical bedrock slopes as a thin veneer. Estimated thickness 1 to 20 feet.	Moderate to steep slopes. May occur as single or coalescing solifluction lobes, marked by terracettes, frost scars, festoons, stone stripes and hummocks.	Well drained except on moderate slopes, on treads of some lobes, and in frost scars and other depressions. Low permeability.	Depth to permafrost two to five feet. Moderate to high ice content.	High
Qsw	Swamp deposits	Poorly stratified, organic-rich eolian, alluvial, lacustrine, or bog silt.	Overlie lowland units of many types. Generally less than 15 feet thick.	Low-lying bogs, swamps, meadows, and sinuous abandoned channels.	Impermeable substratum of permafrost and organic silt in broad basin-like depressions creates poor drainage, marshy and eroded in summer. Frequently subject to flooding.	In broad basin-like areas depth to permafrost 1-1/2 to 2 feet. Active layer 1-1/2 to 2 feet thick; permafrost 5 to 30 feet thick and continuous. High ground ice content of small segregations.	High
Qrg	Rock glaciers	Coarse, angular, rock fragments from 2 to 5 feet in diameter, made up of slightly weathered red, brown, greenish, or black slates, quartzites and volcanics.	Slopes of Rainbow Mountain. More than 10 feet but generally less than 100 feet thick.	Elongate rock lobes with longitudinal ridges and furrows, and a terminal zone of arcuate ridges and furrows ending in a steep front.	Good drainage and permeability.	Ice may be present at bottom of deposit.	Very low except near base of deposit.
Qaf	Alluvial fans	Coarse, poor to well-stratified, poorly sorted, sandy gravel; subangular to rounded cobbles commonly 4-12 inches in diameter; boulders, up to 10 feet in diameter, rare.	At base of steep slopes of hills and mountains. Large and well developed along the margins of Delta River valley. Five to more than 50 feet thick.	Fans form individually or when close together, they coalesce. Slopes at toe end are 1/2 to 3 percent and steepen to 5 to 8 percent at apex or upper end.	Surface drainage good. Permeability generally high, but layers that contain a high percentage of fines have low permeability and force ground water to surface as seeps and springs.	Fine grained materials in older parts of fans may be frozen at depths of 3 to 5 feet, but active parts largely unfrozen.	Low except in silt and sand where moderate to high.
Qmu	Unmodified moraine	Unsorted heterogeneous mixture of gravel sand, and silt generally consisting of silty, sandy gravel. Gravel generally angular to subrounded. Deposits include irregular lenses and pockets of sandy gravel and gravelly sand.	Occurs near the termini of glaciers in the higher parts of the Alaska Range.	Very steep slopes of hummocky lateral and end moraines.	Generally good drainage and fair permeability.	Probably present locally.	Generally low, high locally in fine-grained materials.
Qab	Abandoned flood plain	Material of essentially the same composition as unit Qac above, but with more continuous mantle of silt and fine sand of alluvial and eolian origin, which in many places supports dense vegetation with large trees.	Found in many places bordering the active flood plain of the major rivers. Thickness is that of active flood plain plus 10 to 30 feet.	Flat plain with abandoned, braided channels which, locally, are filled with organic-rich silt. Generally separated from active flood plain by low terrace scarp.	Drainage excellent and permeability high except locally in silt where perennially frozen. Low-lying areas subject to infrequent flooding.	Ice-rich permafrost generally absent except in silt and sand.	Low, except in silt and fine sand, where moderate to high.
Qmy	Young moraine	Coarse, unstratified, unsorted, sandy till with some outwash, generally ranging from silty sandy gravel to gravelly, sandy silt. Gravel with rounded and angular cobbles and boulders of granite or resistant metamorphic rocks.	Irregularly shaped areas on lower bedrock slopes and uplands, and broad, lobe-shaped areas on north side of Alaska Range.	Gently undulating and lake dotted terrain underlain by ground moraine, and slightly modified hummocky end moraine. Slopes 5 to 33 percent; local relief up to 200 feet.	Drainage and permeability fair to good, except in silty deposits and in perennially frozen bogs where it is generally poor.	Permafrost present at shallow depths in silt-covered lowlands; absent on dry well-drained slopes.	Low in gravelly material; high in fine-grained soils.
Qgn	High-level alluvium	Well-stratified layers and lenses of unconsolidated silt, sand and gravel. Gravel moderately to well rounded light yellowish brown to gray, of largely granitic origin. Sand fine to coarse grained, yellowish brown. Locally covered with organic-rich silt or eolian sand.	Low terraces along the Delta River, Jarvis Creek and along small streams draining the Granite Mountains. Thickness unknown. Loess and organic silt cover 2 to 10 feet.	Gently undulating surfaces approximately parallel to stream gradient, or moderate to gentle piedmont slopes, channelled.	Good to fair surface drainage; locally poor in frozen bogs.	Permafrost at approximately three feet where silt cover is thick, elsewhere deeper than 20 feet. Low ice content except in bogs.	Low, except locally where fine grained.
Qmo	Old moraine	Similar to unit Qmy above, particles angular to well-rounded, one to 12 inches in diameter, some silt cover.	Narrow crescent-shaped belts one to three miles wide and 20 to 30 miles long extending north from the Alaska Range to the Tanana River. Thickness from ten to more than 100 feet.	Gently rolling knob and swale topography with shallow ponds. Slopes 1 to 20 percent.	Partially developed drainage system, excellent to good surface drainage locally poor in swales, bogs and areas where perennially frozen.	Permafrost three to four feet in swales and muskeg-covered slopes, probably 25 feet deep on dry slopes and knobs. Ice content low to high.	Moderate to low.
Ts	Tertiary sediments	Poorly consolidated, moderately well-sorted, gray to yellow-brown, conglomerate, sandstone, siltstone, claystone and lignite coal. Conglomerate clasts 1/4 to 8 inches in diameter, well-rounded, composed of granite, gneiss, quartzite, quartz, limestone, chert, mafics, and schist. Mantled in most places by gravelly till or outwash.	Present on both north and south flanks of the mountains, forms lowland from mountains south to Paxson, exposed in upper Jarvis Creek. Thickness from 50 to 1500 feet.	Form lowlands, low mountain plateaus with low rolling surface and benches with steep sides eroding into serrate ridges.	Surface drainage good, permeability good to poor.	Permafrost is probably present.	Low in gravels. Finer grained material moderate to high.
Pzm	Paleozoic or Mesozoic sediments	Slate, chert, greenstone, limestone, ultramafics, graywacke, siltstone, shale, pyroclastics, lava, and some phyllite.	Present in Alaska Range in a wedge between the McKinley and Hines Creek segments of the Denali Fault, and south of the Denali Fault. Thickness unknown, but in thousands of feet.	Form high mountains, peaks which have been glaciated. Steep slopes, vertical cliffs.	Excellent surface drainage, low permeability. Evidence of subsurface drainage in limestone lacking.	"	Slates frost heave readily, other rocks low.
gr	Granitic intrusive rocks	Quartz monzonite, granodiorite, quartz diorite, some monzonite and diorite.	Plutons near Denali Fault and Summit Lake.	In the Alaska Range form some of the highest, most rugged mountains.	Excellent surface drainage. Poor to excellent permeability.	"	Low
me	Mafic intrusive rocks	Basalt, andesite, dacite, greenstone, and a few sedimentary rocks included.	Various localities in the Alaska Range, in flows and sheets, or massive bodies. Thickness from tens to thousands of feet.	Forms low, flat or gently rolling surfaces or steep mountain sides.	Excellent surface drainage. Poor permeability.	"	"
mi	Mafic and ultramafic intrusive rocks	Gabbro, diorite, dunite, peridotite, and serpentinite.	South of the Denali Fault--small masses west of the Delta River, a few small bodies intruding schist north of the Denali Fault.	Low rounded hills, high steep sided mountains, and bare, low rounded rubble-covered ridges.	Good surface drainage. Fair permeability.	"	Low to moderate in weathered rock.
gn	Precambrian (possibly Paleozoic) gneissic rocks	Hornblende gneiss, calcareous magnesium gneiss and pelitic gneiss.	South of the Denali Fault, west of the Delta River. Thickness probably in thousands of feet.	Form rugged mountains supporting alpine glaciers.	Excellent surface drainage. Fair permeability.	"	Stone stripes, rock rings, solifluction lobes present.
pēs	Precambrian (possibly Paleozoic) schist and related rocks	Phyllite, calcareous phyllite, green-schist, light-colored quartzite, quartz schist, and muscovite schist.	Phyllite, calcareous phyllite, and greenschist found in Alaska Range in narrow fault blocks south of the Denali Fault; quartzite, quartz schist, and muscovite schist found north of the Denali Fault.	Form high, steep-sided mountains in Alaska Range.	Good to excellent surface drainage, poor to good permeability.	Permafrost is probably present, but at depth on warm south-facing slopes. Low ice content.	Frost heaving low, moderate in weathered rock.

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey standards and nomenclature.