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SCIENTIFIC INVESTIGATIONS MAP 2856
Version 1.0

SURFICIAL GEOLOGIC MAP OF THE TANACROSS B-5 QUADRANGLE, EAST-CENTRAL ALASKA

By
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2004

Base from U.S. Geological Survey, 1948; minor revision 1994
Universal Transverse Mercator projection
10,000-foot grid based on Alaska coordinate system, zone 2
1000-meter Universal Transverse Mercator grid ticks, zone 7
1927 North American Datum

SCALE 1:63 360
CONTOUR INTERVAL 100 FEET
SUPPLEMENTARY CONTOUR INTERVAL 50 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

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INTRODUCTION

The Tanacross B-5 quadrangle, in east-central Alaska, is transected east to west by the Alaska Highway. The map area is about 320 km east of Fairbanks and about 160 km west of the Yukon border. The quadrangle contains parts of three physiographic provinces—the Alaska Range, the Yukon-Tanana Upland, and the Northway-Tanana Lowland (Wahrhaftig, 1965). The high, rugged, glaciated landscape of the eastern Alaska Range dominates the southwestern map area. Within this area, several peaks rise to more than 1,800 m asl (above sea level); the highest peak, Mount Neuberger, rises to 2,056 m asl. In contrast, the gently rolling hills of the Yukon-Tanana Upland, in the northern map area, generally rise only to between about 730 and 950 m asl. Between the Alaska Range and the Yukon-Tanana Upland lies the Northway-Tanana Lowland (hereafter referred to as the upper Tanana Valley), which contains the westerly flowing Tanana River. Altitudes along the valley floor generally range between 470 and 520 m asl.

The dominant feature within the map area is the Tok fan (Qtf). This large (about 450 km2), nearly featureless fan contains a high percentage of volcanic clasts derived from outside the present-day drainage basin of the Tok River. Relative to the size of this fan, the present Tok River is an underfit stream. During the various glaciations of the Pleistocene, a series of glaciers filled the Copper River basin to the south of the map area and ice lobes spilled over Mentasta Pass into the Tok River drainage. For instance, during the late Wisconsin (Donnelly) glaciation an ice lobe flowed about 16 km north of Mentasta Pass into the Mineral Lake area (Richter, 1976) about 55 km south of the map area. This ice lobe undoubtedly carried many clasts of volcanic rocks from the Copper River basin, and upon deglaciation these clasts were shed as outwash and deposited throughout the Tok River valley and onto the Tok fan. Hence, the Tok fan was probably built by outwash from a succession of glacial lobes spilling over Mentasta Pass during the various glaciations of the Pleistocene. Further information is given in the unit description of this fan.

The Alaska Range was heavily glaciated during the Pleistocene (Péwé, 1975), and deposits of both middle and late Pleistocene glaciations were recognized in both the Tanacross B-5 quadrangle and the adjacent Tanacross B-6 quadrangle to the west by Holmes (1965). The older (Delta) glaciation was named by Péwé (1953) for prominent moraines in the Delta Junction/Fort Greeley area, about 180 km to the west-northwest of the map area; the younger (Donnelly) glaciation was also named by Péwé (1953) for a large moraine near Donnelly dome south of Delta Junction. Glaciers of the Donnelly glaciation were generally less extensive than those of the Delta glaciation. In the map area, deposits of both glaciations are represented as end moraines at the mouths of unnamed valleys where they generally form broad hummocky end moraines of low relief that extend out onto the flanks of the range in the southwestern map area. Further information is given in the unit descriptions of these glacial deposits.

Unlike other parts of the Alaska Range to the west, glaciation does not seem to have occurred during the Holocene within the Tanacross B-5 quadrangle. In many areas of the world, the most extensive advance of glaciers during the Holocene occurred during the “Little Ice Age” (about the 16th to the mid-19th century; Bradley, 1999). Glacial deposits of the Little Ice Age are commonly found fronting present-day glaciers and snowfields in mountainous regions throughout the world. Little Ice Age moraines are characterized by sharp-crested, rubbly moraines as much as 50 m or more in height that rest at the angle of repose, lack soils, and are generally devoid of vegetation. Hence, these deposits are easily recognized both on aerial photographs and in the field. None were observed in the map area, although they are present elsewhere in the higher parts of the Alaska Range to the west.

Permafrost (permanently frozen ground) is common throughout the map area, especially in the highly organic deposits (Qor) within the upper Tanana Valley, in the coalescing fan deposits (Qfc) that form a large apron along the northern flank of the Alaska Range, and in the fine-grained colluvium (Qco) and colluvium and alluvium (Qca) of the Yukon-Tanana Upland. In these areas, the ground is covered by a thick mat of vegetation, and permafrost is common below a depth of 50 cm. At many localities the presence of permafrost is indicated by stunted black spruce (Picea mariana). Within the Alaska Range above treeline (the upper limit of small, scattered, wind-swept trees—krummholz), permafrost is indicated by the presence of rock glaciers (Qrg) and collapse pits in till (Qty) caused by the melting of underlying ice. Man-made structures can be disrupted and damaged by the melting of underlying permafrost. Hence, care should be taken when building in permafrost areas.

The climate of the map area is typical of that of the Alaskan interior. Winters are long and cold, summers are short and generally mild, and precipitation is light. Climate records for the town of Tok, along the Alaska Highway just east of the map border, indicate a mean January temperature of –26.4∞C, and a mean July temperature of 14.5∞C. Mean annual precipitation at Tok is 23.5 cm with almost 60 percent occurring during the summer months (June, July, August) (Western Regional Climate Center, unpublished data accessed Dec. 1, 2003, on the World Wide Web at URL http://www.wrcc.dri.edu/index.html).

The lower reaches of the map area are colonized by boreal forest and muskeg that in many areas reflect the underlying geology. The boreal forest consists primarily of black spruce, white spruce (Picea glauca), balsam poplar (Populus balsamifera), and quaking aspen (Populus tremuloides). Black spruce is characteristic of cold, poorly drained, nutrient-poor sites where it commonly grows as small, stunted trees 3–5 m high (Johnson and others, 1995). Well-drained sites are commonly inhabited by white spruce, 10–20 m in height, balsam poplar, and quaking aspen, along with some black spruce, which can reach a height of about 10 m in these more favorable locations. Muskegs, which commonly contain Sphagnum mosses and heath shrubs, are characterized by areas of poor drainage and high water table, and may contain permafrost at shallow depths. Black spruce may also be present in the muskegs and will commonly form open-canopied stands of low, stunted trees (Johnson and others, 1995). Timberline, the upper altitudinal limit of large, upright trees, is generally about 850 m asl. Above timberline, small, scattered, wind-swept trees (krummholz; predominantly white spruce), alpine tundra, and rocky slopes dominate.

The Alaska Highway (originally called the “Alcan” Highway) crosses east to west through the Tanacross B-5 quadrangle for about 25 km, mainly over the Tok fan (Qtf). The highway stretches for 2,290 km from Dawson Creek in British Columbia to Delta Junction in Alaska and traverses rugged mountains, wild rivers, and large expanses of forest and muskegs. The U.S. Army Corps of Engineers built the original highway in just 8 months and 12 days in 1942 (Cohen, 2001) as an overland route to relieve Alaska from the wartime hazards of shipping; the highway was then turned over to civilian contractors for improvements (widening, graveling, and rerouting in many areas). Paving was completed in about 1984. Today, the Alaska Highway is one of the primary transportation corridors in Alaska, carrying both freight and passengers.

The village of Tanacross, an Athabascan Indian community (population about 140), is located near the western edge of the map about 1.6 km north of the Alaska Highway, along the south side of the Tanana River. Although the base map (1948) depicts the village in a meander loop north of the river, the village was moved to the south side of the river during the 1970’s because of frequent floods (unpublished data accessed May 27, 2004, on the World Wide Web at URL http://www.nativevillageoftanacross.com/nvthistory.html).

Mapping of the surficial deposits in the Tanacross B-5 quadrangle was accomplished by a variety of methods including (1) compilation from existing geologic maps—mainly Holmes (1965), Foster (1970), and Carter and Galloway (1978), (2) stereoscopic analysis of aerial photographs (1:46,000-scale 1954 black and white and 1:63,000-scale 1978 color-infrared), and (3) fieldwork, including limited helicopter use. Where localities could be examined in the field, detailed information was obtained on the surficial deposits. Data from these easily accessible areas were then extrapolated to the less accessible areas. Unit boundaries were plotted on a stable mylar topographic base with the use of a photogrammetric stereo plotting instrument (Kern PG2). Lines were digitized on screen from the scanned mylar.

Surficial deposits in the Tanacross B-5 quadrangle consist of man-made, alluvial, colluvial, organic, glacial, and periglacial deposits. Deposits shown on this map are generally greater than 1 m thick; thinner discontinuous colluvial and eolian deposits, residual material on bedrock, and some artificial fill were not mapped and are incorporated with the underlying mapped unit. For example, in many areas a mantle of light-yellowish-brown (10YR 6/2) loess, usually less than 25 cm thick, blankets the surface. Because of the thin, discontinuous nature of this material, it could not be accurately mapped. In addition, many contacts between map units are approximately located because of the lack of exposures or gradational nature of the surficial deposits in the map area (for example, the contacts between bedrock (Br) and coalescing fan deposits (Qfc) along the north flank of the Alaska Range; and between undivided colluvium (Qco) and bedrock (Br) on steep slopes in both the Alaska Range and the Yukon-Tanana Upland).

The age ranges of the various divisions of the Quaternary Period are modified from Hansen (1991) and Richmond and Fullerton (1986) and are as follows: (1) Holocene, 0–10,000 yrs ago; (2) late Pleistocene, 10,000–127,000 yrs ago; (3) middle Pleistocene, 127,000–778,000 yrs ago; and (4) early Pleistocene, 778,000–1,806,000 yrs ago. Age assignments for the surficial deposits in the quadrangle are based chiefly on stratigraphic and depositional relations and the degree of erosional modification of the original-surface morphology. Grain-size terminology of the surficial deposits is based on visual identification and follows the modified Wentworth grain scale (American Geological Institute, 1982). In descriptions of surficial deposits, the term “clast” refers to a particle greater than 2 mm in diameter, whereas the term “matrix” refers to particles less than 2 mm in size. The dry matrix colors of the surficial deposits in the map area were determined by comparison with a Munsell Soil Color Chart (Munsell Color, 1973).

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Artificial fill deposits

Artificial fill (latest Holocene)—Compacted and uncompacted fill composed mostly of silt, sand, gravel, and rock fragments beneath the Alaska and Glenn Highways. Fill consists of subrounded and rounded, pebble- and cobble-size clasts derived from local gravel pits on the Tok fan (Qtf) and angular (crushed), pebble-size basaltic rock fragments, also derived from Tok fan deposits, all in a pale-brown (10YR 6/3) to light-yellowish-brown (10YR 6/4) silty sand to sand matrix. In places, where unit overlies areas of high water table, such as near western map border, unit may be susceptible to failure by liquefaction and slumping of underlying material during seismic events. Such liquefaction and slumping caused severe damage along the Glenn Highway between Slana and Mentasta Pass (about 75 km south of map area) during the magnitude 7.9 earthquake of November 3, 2002 along the nearby Denali fault (Harp and others, 2003). Thickness of unit ranges from about 1–1.5 m on Tok fan to as much as 5 m in areas of permafrost and muskeg near western border of map

Alluvial deposits

Floodplain alluvium of Tanana River (Holocene)—Floodplain deposits of Tanana River, including those in recently abandoned channels and winding sloughs. Upper 1–2 m of unit, commonly an overbank deposit, consists of dark-olive-gray (5Y 3/2), well-sorted, massive fine to medium sand that locally contains minor amounts of pebbles. Poorly exposed lower part of unit consists of unstratified to stratified, well-sorted sand, pebbly sand, and sandy-cobbly pebble gravel. Clasts are chiefly subrounded to rounded. Unit locally includes organic (Qor) deposits and alluvium underlying low terraces that are marked by meanders and channel scars (Holmes, 1965) along river. Areas underlain by this unit are subject to periodic flooding during times of high discharge and, because of unit’s high water table, are also prone to liquefaction during seismic events. Harp and others (2003) observed that in Tok area nearly every channel bar along Tanana River showed extensive liquefaction effects from the November 3, 2002 earthquake. Exposed thickness about 2 m; base not exposed; estimated maximum thickness 20 m

Alluvium(?) of Tanana River (Holocene and Pleistocene)—Origin of unit unknown, but believed to be a fine-grained alluvium of Tanana River. Poorly exposed, but limited field observations indicate unit consists of dark-olive-gray (5Y 3/2), well-sorted, massive, medium- to fine-grained sand overlain by about 40 cm of light-yellowish-brown (10YR 6/2) silt (loess?). Holmes (1965) referred to this deposit as “alluvial silt” of Pleistocene age and described an exposure along Fish Creek, in west-central map area, as “alluvium composed of well-stratified, brown, black, or gray silt, sandy silt containing interbedded wood fragments, and both convoluted and undisturbed peat layers.” Foster (1970) referred to this deposit as a “fluvial and lacustrine deposit” of Holocene or Pleistocene age that consists of “sand, silt, and admixtures of organic material.” Unit forms broad area on north side of Tanana River, north-northwest of town of Tanacross. Surface of unit about 20 m above Little Tanana Slough. Estimated maximum thickness 30 m

Tok fan deposit (Pleistocene)—Large (about 450 km2), low-gradient, well-drained, nearly featureless fan deposited by Tok River (east of map area). Unit consists mainly of well-stratified, well-sorted, unconsolidated pebble, cobbly pebble, and pebbly cobble gravel with a matrix of dark-olive-gray (5Y 3/2) medium sand. Also contains lenses and layers of sand and pebbly sand, usually less than 25 cm thick. In places, upper meter or more of unit is iron stained (Holmes, 1965; Foster, 1970), and in some areas clasts have a thin (<2 mm) coating of calcium carbonate. Clasts are chiefly subrounded to rounded and include a high percentage (commonly 60–70 percent) of basaltic or andesitic (Holmes, 1965) cobbles and pebbles derived from outside the present-day Tok River drainage in the Copper River drainage to the south. Unit locally overlain by 10–20 cm of loess consisting of a light-yellowish-brown (10YR 6/4) silt and fine sandy silt. Unit is an aquifer and supplies water to homes and public structures built upon it. At head of Tok fan, near southern map boundary, water table is at a depth of 40–50 m; in vicinity of town of Tok (just east of map area), water table is about 15–20 m deep; at Tanacross, it is at a depth of 2–4 m (T. Holohan, Holohan Drilling Co., oral commun., 2001; G. Burnham, Burnham Construction Inc., oral commun., 2003). Exposed thickness about 15 m; estimated maximum thickness 50–100 m

Alluvial and colluvial deposits

Fan deposits (Holocene and late Pleistocene)—Small fans deposited mainly by flowing water and debris flows. In Alaska Range, unit consists mainly of an unstratified to poorly stratified, poorly sorted, clast-supported gravel with a pale-brown (10YR 6/3), silty sand matrix. Clasts are angular to subangular cobbles and boulders mainly of biotite gneiss and schist. In Yukon-Tanana Upland, unit consists of an unstratified to poorly stratified, poorly sorted gravel with a pale-brown (10YR 6/3), silty sand matrix. Clasts are angular to subangular cobbles and boulders of mainly fine grained biotite and biotite-hornblende granodiorite, although a small fan along eastern map border north of Tanana River is composed of dark-gray basalt clasts. In both Alaska Range and Yukon-Tanana Upland, unit may contain bouldery debris flow levees about 1 m high. Locally, may include colluvium (Qco) and sheetwash alluvium. Unit is subject to both flood and debris flow hazards. Estimated maximum thickness 20 m

Colluvium and alluvium (Holocene and late Pleistocene)—Poorly exposed but appears to consist mainly of poorly sorted and poorly stratified, locally organic rich silt, silty sand, sand, and pebbly sand, deposited by both colluvial and alluvial (including sheetwash) processes. Foster (1970) referred to these deposits as “alluvium and colluvium in small stream valleys” of Holocene age and described unit as consisting of “primarily silt and sand.” Unit forms broad, gently sloping areas in northern map area. Permafrost common at depths below 50 cm. Maximum estimated thickness of unit 10 m

Coalescing fan deposits along front of Alaska Range (Holocene and late Pleistocene)—Broad belt of coalescing fan deposits (referred to as “fan-apron deposits” by Holmes, 1965) deposited mainly by flowing water and debris flows along front of Alaska Range in southwestern map area. Unit consists mainly of unstratified to poorly stratified, poorly sorted to well-sorted, clast-supported gravel with a light-olive-brown (2.5Y 5/4) to pale-brown (10YR 6/3), silty sand and sand matrix. Clasts consist mainly of biotite gneiss and schist. Clast size is gradational. At higher elevations, along flank of Alaska Range, unit consists of cobbly boulder gravel; here, clasts are predominantly subangular to subrounded, and largest clasts are as much as 1.5–2 m in intermediate diameter. Farther downvalley, unit consists mainly of subrounded to rounded pebbles and cobbles with a minor amount of boulders; largest clasts are about 1 m in diameter. At distal margins, unit consists mainly of coarse to medium sand and pebbly sand. Charcoal, collected from a stream exposure of poorly bedded, light-yellowish-brown (10YR 6/4), medium sand 125 cm below unit’s surface, yielded a radiocarbon age of 955±40 yrs B.P. (WW-4765). In places, unit contains bouldery debris flow levees about

1 m high. Unit forms an extensive, steeply dipping, low-relief surface along flank of Alaska Range. Unit contains glacial outwash near western map border where unit is immediately downvalley from till (Qty and Qto); and may locally include colluvium (Qco) and sheetwash alluvium. Unit is subject to both flood and debris flow hazards. Exposed thickness about 6 m; estimated maximum thickness 30 m

Older coalescing fan deposits along front of Alaska Range (middle to early(?) Pleistocene)—Upland gravels deposited mainly by flowing water and debris flows along front of Alaska Range in southwestern map area. Unit consists of mainly unstratified to poorly stratified, poorly sorted to well-sorted, clast-supported gravel with a light-olive-brown (2.5Y 5/4) to pale-brown (10YR 6/3) silty sand and sand matrix. Clasts are mainly biotite gneiss and schist. Unit may locally include colluvium (Qco) and sheetwash alluvium. Unit forms an extensive, steeply dipping, low-relief surface along flank of Alaska Range. Originally mapped by Holmes (1965) as Delta-age till, unit consists of a remnant of a once more extensive, but now deeply dissected fan apron formed by coalescing fans deposited along flank of Alaska Range. Unit stands generally at higher altitudes than younger coalescing fan deposits (Qfc). Estimated maximum thickness 30 m

Colluvial deposits

Colluvium, undivided (Holocene and late Pleistocene)—On slopes within Alaska Range, unit consists mainly of poorly stratified, poorly sorted, clast-supported, cobbly boulder gravel deposited mainly by mass-wasting processes. Clasts are angular to subrounded and generally consist of biotite gneiss and schist. Matrix is mainly a pale-brown (10YR 6/3) sand. In places, unit contains bouldery debris flow levees about 1 m high. Unit includes undifferentiated rock avalanche, debris flow, and solifluction deposits, as well as fan (Qfa), talus (Qta), younger till (Qty), and rock glacier (Qrg) deposits too small to show at map scale; hence, unit is subject to a wide range of geologic hazards. Exposed thickness about 5 m; estimated maximum thickness 20 m.

On slopes within Yukon-Tanana Upland, unit is poorly exposed but appears to consist primarily of poorly sorted and poorly stratified, locally organic rich silt, silty sand, sand, and pebbly sand. Permafrost common at depths below 50 cm. Maximum thickness estimated to be 10 m

Talus deposits (Holocene and late Pleistocene)—Poorly stratified and poorly sorted, angular rock fragments, ranging in size from pebbles to large boulders, deposited mainly by rockfall at base of steep slopes and cliffs in Alaska Range. Largest clasts are as much as 2 m in intermediate diameter. Limited exposures suggest unit grades into finer material at depth. Locally contains bouldery debris flow levees. At some sites, toe of deposit is lobate indicating rock glacier-like flowage. Many boulders on surface of unit have an extensive lichen cover that indicates they have been stable for at least the past several centuries. Upper reaches of unit rest at angle of repose, and therefore unit is potentially unstable. May locally include some alluvial deposits and colluvium (Qco). Unit is prone to rockfall hazards from above slopes. Locally, unit may exceed 20 m in thickness

Landslide deposits (Holocene and late Pleistocene)—Mainly flow and rotational types of movement (Varnes, 1978) of near-surface materials have resulted in several landslide deposits within and on lower flanks of Alaska Range. Deposits are a heterogeneous mixture of unconsolidated surficial material and bedrock fragments in a wide range of sizes. In some deposits, boulders may exceed 1 m in intermediate diameter. Size and lithology of clasts and matrix depend on the various bedrock and surficial deposits involved in the landslide. Locally, may include small alluvial and talus (Qta) deposits. One of the landslides in map area (also identified by Carter and Galloway, 1978), near western map border, underlies a section of the Alaska Highway and causes constant damage to the roadway. Some of these landslides may have been induced by seismic events, such as the magnitude 7.9 earthquake of November 3, 2002, that triggered thousands of landslides in Alaska Range and surrounding areas (Harp and others, 2003). In adjacent Tanacross B-4 quadrangle to the east, this earthquake may have triggered a small recent landslide near confluence of Tanana River and Porcupine Creek. When inspected in August 2003, the trunks of many large white spruces on this landslide were tilted and split by recent movement, and ground contained “pull-apart” trenches 1–2 m deep and 3–5 m across. Maximum thickness of unit estimated to be about 30 m

Organic deposits

Organic-rich deposits (Holocene and late Pleistocene)—Mainly black (10YR 2/1) to brown (10YR 4/3) peat, woody peat, muck, and organic-rich sand, silt, and clay. Unit occurs in low-lying areas adjacent to Tanana River, and in large areas south of Lake Mansfield and Fish and Wolf Lakes. As limits of this unit were hard to identify in the field and on aerial photographs, in many cases unit boundaries were taken directly from topographic map. Areas underlain by this unit have poor drainage and a high water table, are subject to periodic flooding, and may contain permafrost at shallow depths. Thickness 1–10 m

Glacial deposits

Younger till of Alaska Range glaciers (late Pleistocene; Donnelly glaciation)—Till deposited by glaciers heading in valleys in Alaska Range during Donnelly glaciation. Mainly an unstratified and unsorted, clast-supported, pebbly cobble gravel with a pale-yellow (5Y 7/3) sandy silt and sand matrix. Clasts consist of mainly subangular to subrounded granite, biotite gneiss and schist, and quartzite pebbles, cobbles, and occasional boulders. Largest clast is about 1 m in diameter. Unit commonly forms broad, hummocky moraines, as high as 20 m, in southwestern map area. Unit may locally include some colluvium (Qco) and talus (Qta) deposits and small areas of bedrock (Br). Age of Donnelly glaciation is probably equivalent in part to oxygen isotope stage 2, which is dated at about 12–24 k.y. ago (Martinson and others, 1987). Thickness probably greater than 30 m in places

Older till of Alaska Range glaciers (middle Pleistocene; Delta glaciation)—Till deposited by glaciers heading in valleys in Alaska Range during Delta glaciation. Mainly an unstratified and unsorted, clast-supported, pebbly cobble gravel with a pale-yellow (5Y 7/3) to light-yellowish-brown (10YR 6/4) sandy silt and sand matrix. Clasts consist of subangular to subrounded granite, biotite gneiss and schist, and quartzite pebbles, cobbles, and occasional boulders; largest is about 50 cm in diameter. Unit forms broad, hummocky, subdued moraines extending beyond limits of Donnelly moraines in southwestern map area. Locally includes alluvium and colluvium (Qco), and small areas of bedrock (Br). Farther to the west, Delta-age deposits have been found to be equivalent in age to marine oxygen isotope stage 6 (Begét and Keskinen, 2003), thought to have occurred between about 130 and 188 k.y. ago (Martinson and others, 1987). Thickness probably greater than 30 m in places

Periglacial deposits

Rock glacier deposit (Holocene and late Pleistocene)—Mapped at only one locality in map area, in southwestern corner of map. Deposit was not inspected in the field, but rock glacier deposits on adjacent Tanacross B-6 quadrangle (Carrara, 2004) consist of poorly stratified and poorly sorted, large, angular rock fragments formed by periglacial processes and deposited on slopes mainly at head of cirques in Alaska Range. Surface of these deposits is usually covered with angular cobbles and boulders. Larger surface clasts may be 2–3 m in intermediate diameter; grades into finer material at depth. Steep frontal slopes of these deposits, which may be as much as 30 m high, are commonly at angle of repose. These frontal slopes are lobate, indicating flowage induced by either interstitial ice or an ice core at depth. Upper reaches of unit commonly grade into steep talus (Qta) slopes. Unit may locally include talus (Qta) deposits. Some of these deposits on adjacent Tanacross B-6 quadrangle appear to be presently inactive in that they contain collapse pits as much as several tens of meters in diameter and 5 m deep, probably caused by melting of underlying ice (Carrara, 2004). Estimated maximum thickness in map area 20 m

Felsenmeer (Pleistocene and Pliocene(?))—Large, tabular-shaped, subangular to angular boulders derived from underlying bedrock by intense frost action. Many boulders are turned on edge. Area between boulders contains stone stripes with many platy, angular rock fragments of pebble and cobble size standing on edge. Mapped at only two localities in map area, along crest of Alaska Range on high, flat summits at altitude of about 1,800 m asl, in southwestern map area. Poorly exposed. Thickness probably less than 5 m

BEDROCK

Granitic, metamorphic, and volcanic rocks (Quaternary(?) to Paleozoic)—Small bedrock hill about 1.6 km north of Alaska Highway on Tok fan and a mountain along eastern map border just north of Tanana River are composed of dark-gray or dark-greenish-gray basalt believed to be Quaternary or Tertiary in age (Foster, 1970). In northeastern map area, Foster (1970) identified felsic volcanic rocks consisting of light-colored lava, tuff, tuff breccia, pumice breccia, volcanic conglomerate, and tuffaceous sediments of Tertiary age. North of Tanana River, bedrock is primarily granitic rocks of Mesozoic age, consisting of mainly fine grained biotite and biotite-hornblende granodiorite but ranging in composition from diorite to granite (Foster, 1970). Finally, within map area, Alaska Range is composed of metamorphic rocks of Paleozoic age, primarily quartz-biotite gneiss and schist, quartz-hornblende gneiss, quartz-feldspar-biotite gneiss, augen gneiss, quartz-muscovite-garnet gneiss, and quartzite (Foster, 1970)

Contact

Glacial meltwater channel

Volcanic crater

Radiocarbon age site (south-central map area)

Gravel pit

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