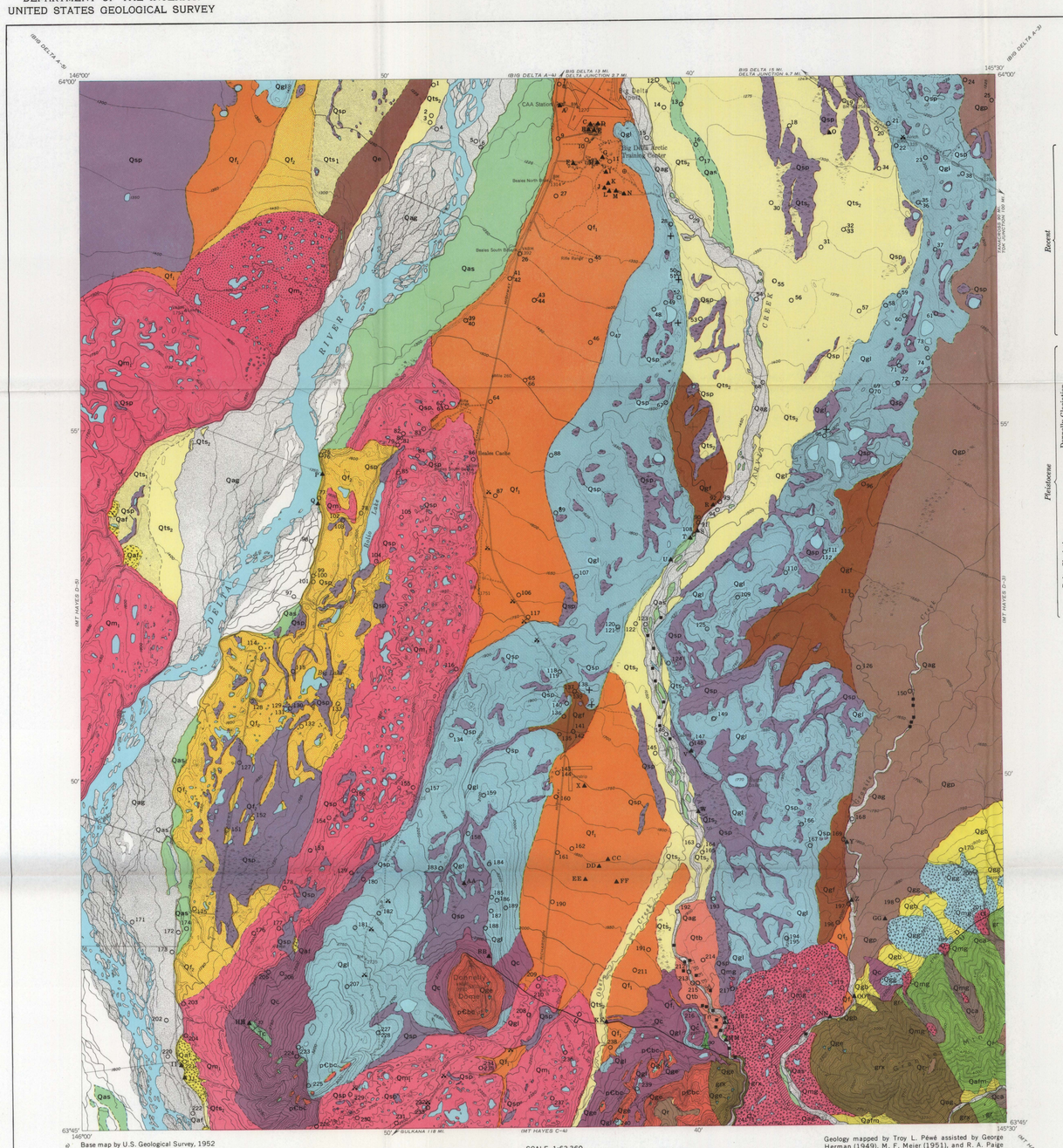


Base map by U.S. Geological Survey, 1952

SCALE 1:63 360

1 ½ 0 1 2 3 4 5 MILES

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 50 FEET
DOTTED LINES REPRESENT HALF-INTERVAL CONTOURS
DATUM IS MEAN SEA LEVEL

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1964

Geology mapped by Troy L. Péwé assisted by George Herman (1949), M. F. Meier (1951), and R. A. Paige (1955); and by G. William Holmes in association with W. S. Benninghoff (1955–56) and assisted by Daniel Sokol (1955)

EXPLANATION

Loess of Quaternary age covers most of the land surface of the quadrangle except the flood plain and mountainous areas. The isopach loess map (below) indicates distribution and thickness of loess

SEDIMENTARY ROCKS

CENOZOIC — QUATERNARY

Recent

- **Qag** — Flood-plain gravelly alluvium
- **Qas** — Flood-plain sandy alluvium
- **Qts2, Qts1, Qtb** — Stream terrace deposits
  - Qts2, *younger (lower) deposits*
  - Qts1, *older (higher) deposits*
  - Qtb, *deposits with many boulders*

Pleistocene

Donnelly Glaciation

- **Qf2, Qf1** — Glaciofluvial deposits
  - Qf2, *younger deposits*
  - Qf1, *older deposits*
- **Qm2, Qm1, Qmg, Qc** — Glacial-moraine deposits
  - Qm2, *younger moraine deposits*
  - Qm1, *older moraine deposits*
  - Qmg, *granitic moraine deposits*
  - c, *channelled granitic moraine deposits*

Delta Glaciation

- **Qgf** — Glaciofluvial deposits
- **Qgl, Qgg, Qge** — Glacial-moraine deposits
  - Qgl, *lowland moraine deposits*
  - Qgg, *granitic moraine deposits*
  - Qge, *glacial erratics*

- **Qsp** — Silt and peat
- **Qc, Qca** — Colluvium
  - Qc, *Colluvium*
  - Qca, *alpine colluvium*
- **Qaf, Qafm** — Alluvial-fan deposits
  - Qaf, *silt and gravel, in lowlands*
  - Qafm, *gravel, on mountains*
- **Qe** — Eolian sand
- **Qr** — Rubble
- **Qgp, Qgb** — Glacial and nonglacial stream deposits undifferentiated
  - Qgp, *pebble and cobble gravel*
  - Qgb, *boulder gravel*

TERTIARY

- **Tn** — Nenana Gravel
- **Tc** — Coal-bearing rocks

IGNEOUS AND METAMORPHIC ROCKS

MESOZOIC

- **gr, grx** — Granodiorite
  - grx, *gradational contact zone*

PRECAMBRIAN

- **pCbc** — Birch Creek Schist

Contact
Dashed where gradational, indefinite, or inferred

Fault
Dotted where concealed
U, *upthrown side*
D, *downthrown side*

Strike and dip of beds

Strike of vertical beds

Gravel pit

107 Sample site

Area of large boulders

A Site of subsurface data or measured stratigraphic section

Subsurface-temperature recording site

Ventifact locality

SELECTED SUBSURFACE DATA AND MEASURED STRATIGRAPHIC SECTIONS

[Letter refers to location on geologic map]

A.[1] 0–235 ft, sandy gravel. Water table, 166 ft.

B.[1] 0–3 ft, sand; 3–18 ft, coarse gravel; 18–40 ft, fine gravel and sand; 40–70 ft, coarse gravel and boulders; 70–120 ft, medium gravel and sand; 120–205 ft, fine gravel and "clay"; 205–240 ft, coarse gravel and sand. Water table, 176 ft.

C.[1] 0–192 ft, sandy gravel. Water table, 177 ft.

E.[1] 0–20 ft, silt and boulders; 20–55 ft, gravel; 55–111 ft, gravel and sand; 111–163 ft, gravel; 163–193 ft, gravel and sand; 193–200 ft, coarse gravel (aquifer). Water table, 180 ft.

F.[1] 0–10 ft, sand and gravel; 10–40 ft, sand, gravel, and boulders; 40–88 ft, sand and gravel; 88–122 ft, sand and gravel; 122–128 ft, red sand and gravel; 128–145 ft, gray sand and gravel; 145–175 ft, red sand and gravel; 175–185 ft, fine sand and gravel, water bearing; 185–195 ft, coarse sand and gravel; 195–203 ft, fine gravel and sand; 203–214.7 ft, coarse sand and gravel. Permafrost reported from 24–88 ft and from 96–108 ft. Water table, 178 ft.

G.[1] 0–230 ft, sandy gravel. Water table, 183 ft.

H.[1] 0–218 ft, sand and gravel. Permafrost reported 40–118 ft. Water table, 182 ft.

0–220 ft, sandy gravel. Water table, 198 ft.

I.[1] 0–3 ft, silty gravelly sand; 3–5 ft, silty sand; 5–12 ft, silty gravelly sand; 12–20 ft, silty sand; 20–25 ft, silty gravelly sand; 25–35 ft, silty sand; 35–43 ft, silty gravelly sand; 43–47 ft, silty sandy gravel; 47–50 ft, silty sand.

J.[1] 0–30 ft, sandy gravel; 30–40 ft, silty gravelly sand; 40–43 ft, sandy silt; 43–55 ft, silty sand; 55–60 ft, silty gravelly sand; 60–63 ft, silty sandy gravel; 63–70 ft, silty gravelly sand; 70–80 ft, silty sandy gravel.

K.[1] 0–31 ft, sandy gravel; 31–40 ft, silty gravelly sand; 40–55 ft, silty sand; 55–62 ft, silty gravelly sand; 62–76 ft, silty sandy gravel; 76–86.5 ft, sandy gravel; 86.5–94 ft, silty sand; 94–111 ft, silty gravelly sand; 111–120 ft, silty sandy gravel.

L.[1] 0–25 ft, gravel; 25–90 ft, gravel, sand, and sandy silt; 90–210 ft, "clay gravel"; 210–213 ft, silt, sand, and gravel; 213–229 ft, sand, gravel, and silt (water bearing); 229–234 ft, "clay gravel", sand, and silt; 234–270 ft, gravel, sand, and silt, locally cemented. Water table, 208 ft.

M.[1] 0–0.5 ft, silt; 0.5–305 ft, silt and gravel; 305–315 ft, silt, sand, and gravel; 315–330 ft, silt, sand, and gravel with a few boulders; 330–390 ft, silt, sand, and gravel; 390–400 ft, coarse gravel and sand. Reported "frozen" to 217 ft.

N.[1] 0–252(?) ft, sandy gravel. Water table, 212 ft.

O. 0–0.4 ft, dark-brown peat; 0.4–1.0 ft, black silt; 1–4 ft, saturated light-brown mottled silt. Frozen ground at 4 ft.

P.[2,3] 0–1 ft, reddish-brown silt; 1–2 ft, light-brown silt; 2–8 ft, reddish-brown and light-brown laminated silt; 8–9.5 ft, compact light-brown till of Donnelly Glaciation, slightly oxidized; 9.5–14 ft, compact gray till of Donnelly Glaciation, calcareous deposit on pebbles near top; 14–100 ft, light-yellowish-brown loose, sandy glaciofluvial gravel of Donnelly Glaciation, to base of river bluff.

Q.[2,3] 0–1 ft, tan loess containing fossil gastropods; 1–2 ft, brown silt; 2–14 ft, compact light-brown till of Donnelly Glaciation; 14–54 ft, light-brown sandy glaciofluvial gravel of Donnelly Glaciation with boulders 6 ft in diameter; 54–104 ft, slumped material to base of bluff.

R.[2] 0–7 ft, well-stratified loess with layers of birch bark, sticks, leaves, and stumps; 7–7.2 ft, white volcanic ash; 7.2–11 ft, stratified loess with layers of organic material ¼ to 1 in. thick; 11–15 ft, unstratified nonorganic gray to iron-brown mottled loess; 15–45 ft, glaciofluvial sandy gravel of Delta Glaciation; 45–53 ft, silty sandy till of Delta Glaciation with many coal fragments to base of bluff.

S.[2] 0–7 ft, light-brown loess with peat and wood fragments; 7–7.1 ft, gray ash; 7.1–13 ft, inorganic light-brown loess; 13–43 ft, light-yellowish-brown, slightly oxidized, poorly stratified gravel and sand (glaciofluvial material of Delta Glaciation); 43–50 ft, light-brown silty till of Delta Glaciation to base of bluff.

T.[2] 0–6 ft, loess; 6–46 ft, yellowish-brown compact sandy till of Delta Glaciation; 46–100 ft, slumped material to base of bluff.

U.[2] 0–6 ft, loess; 6–56 ft, yellowish-brown compact sandy till of Delta Glaciation; 56–100 ft, slumped material to base of bluff.

V.[2] 0–4 ft, loess; 4–16 ft, medium-light-olive-gray weathered till of Delta Glaciation containing coal fragments and many small quartz pebbles ¼ to ½ in. in diameter; 16–37 ft, moderate-yellowish compact till of Delta Glaciation; 37–41 ft, silver to purplish silt; 41–56 ft, yellowish compact till of Delta Glaciation; 56–91 ft, slumped material to base of bluff.

W.[2] 0–0.5 ft, mottled light-brown and brown sand; 0.5–6 ft, light-brown laminated and crossbedded sand; 6–7.2 ft, gray silt with peat; 7.2–8.2 ft, orange sand; 8.2–9.5 ft, orange gravel; 9.5–10 ft, black-stained gravel; 10–14 ft, coarse sand with rounded granitic boulders as much as 7 ft in diameter.

X. 0–0.2 ft, vegetative mat; 0.2–2.5 ft, silty sandy gravel; 2.5–12 ft, sandy gravel; 12–16 ft, silty sandy gravel; 16–27 ft, sandy gravel; 27–50 ft, silty gravelly sand. Permafrost 32.9–47.2 ft. Seasonally frozen ground 0–20 ft on May 20, 1959.

Y.[2] 0–15 ft, stratified glaciofluvial gravel of Delta Glaciation containing many ¼- to ½-in. pebbles; 15–65 ft, yellowish compact silty sandy till of Delta Glaciation contains numerous coal fragments, many ¼- to ½-in. quartz pebbles, and Tertiary conglomerate cobbles to base of bluff.

Z.[2] 0–50 ft, stratified glaciofluvial gravel of Delta Glaciation; 50–70 ft, yellowish compact till of Delta Glaciation to base of bluff.

AA. 0–0.8 ft, vegetative mat; 0.8–4 ft, gray silty sandy till of Delta Glaciation.

BB. 0–5 ft, gray clayey silt containing pebbles 1–3 in. in diameter.

CC. 0–0.3 ft, vegetative mat; 0.3–2.5 ft, silty sandy gravel; 2.5–51 ft, sandy gravel. Seasonally frozen ground 0–16 ft on May 9, 1959.

DD. 0–0.5 ft, vegetative mat; 0.5–2 ft, loess; 2–71.8 ft, sandy gravel. Water table, 68 ft. Seasonally frozen ground 0–18 ft on May 14, 1959.

EE. 0–0.6 ft, vegetative mat; 0.6–3 ft, sandy silt with pebbles; 3–4 ft, silty sandy gravel; 4–69 ft, sandy gravel; 69–96 ft, gravelly sand; 96–100 ft, silty gravelly sand. Water table, 69 ft.

FF. 0–0.4 ft, vegetative cover; 0.4–5.6 ft, sandy silt; 5.6–6.3 ft, silty sand; 6.3–31 ft, sandy gravel. Seasonally frozen ground 0–20 ft on May 18, 1959.

GG. 0–0.5 ft, vegetative layers; 0.5–1.5 ft, brown silty sand; 1.5–3.5 ft, fine gravel with silt seams. Sand at 3.5 ft.

HH.[2] 0–3 ft, till of Delta Glaciation (slumped); 3–7 ft, quartz and chert conglomerate; 7–10 ft, sandstone; 10–11.5 ft, coal; 11.5–16.5 ft, sandstone; 16.5–41 ft, conglomerate; 41–42.5 ft, coal; 42.5–45 ft, sandstone; 45–51 ft, clay; 51–54 ft, coal; 54–62 ft, clay; 62–64 ft, sandstone (Clyde Wahrhaftig, written communication, 1951).

II.[2] 0–2 ft, interbedded ash-brown to light-brown sandy loess and dark organic sandy silt containing gastropods and charred organic twigs; 2–29.7 ft, gray to tan sandy loess with ⅛- to ¼-in. black vegetative layers, contains gastropods in the upper 2 ft, many stumps, gross stratification; 29.7–30 ft, white volcanic ash layer; 30–38.5 ft, tan to gray micaceous silty sand; 38.5–45.7 ft, gray to tan organic micaceous silt with gross stratification and layers of compressed reeds, limbs of trees, and stumps in place to base of bluff.

JJ.[2] 0–7 ft, light-brown powdery loess containing wood, peat, laminae of orange loess, and wavy 0–0.5 ft laminae of light-gray ash at base; 7–21 ft, light-brown powdery loess with scattered wood fragments, peat lenses, and light-yellowish-brown laminae of loess; 21–41 ft, poorly sorted, poorly stratified light-yellowish-brown sandy silty gravel with boulders as much as 2 ft across.

KK.[2] 0–4 ft, loess; 4–50 ft, yellowish-brown sandy glaciofluvial gravel of Donnelly Glaciation to base of bluff.

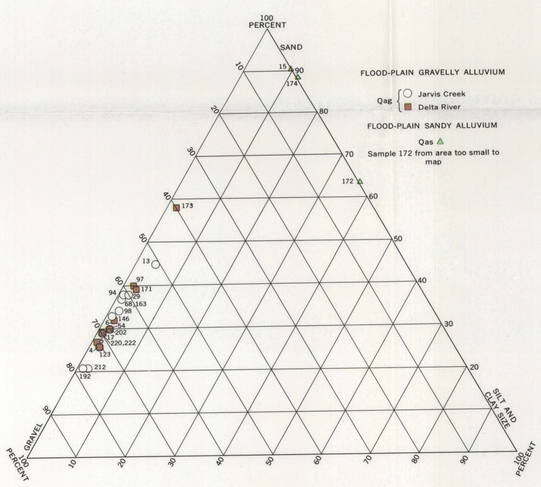
LL.[2] 0–70 ft, moderate-yellowish-brown bouldery sandy till of Donnelly Glaciation to base of bluff; contains many 2- to 10-foot granite boulders.

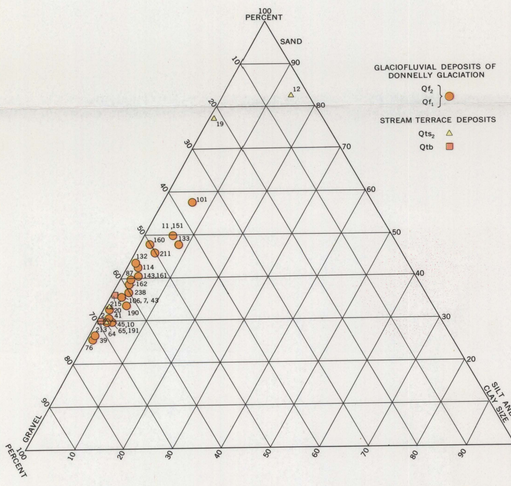
MM.[2] 0–0.5 ft, loess; 0.5–11 ft, till of Donnelly Glaciation, containing granitic boulders 4 feet in diameter; 11–19 ft, fairly well consolidated Tertiary sandstone and conglomerate of iron-stained, ¼- to 2-in. pebbles to base of bluff.

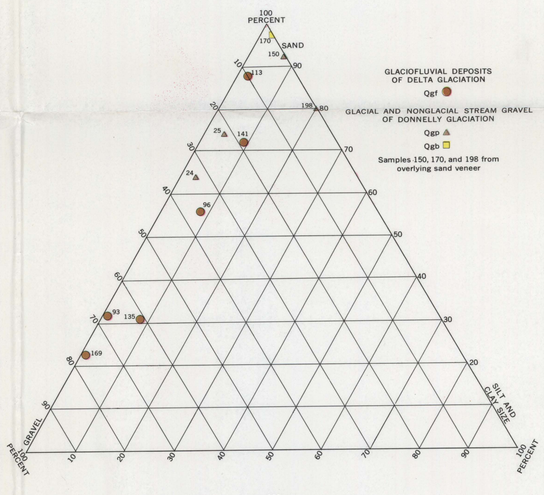
NN.[2] 0–34 ft, bouldery granitic till of Donnelly Glaciation; 34–35 ft, stratified sand and gravel; 35–45 ft, schist to base of bluff.

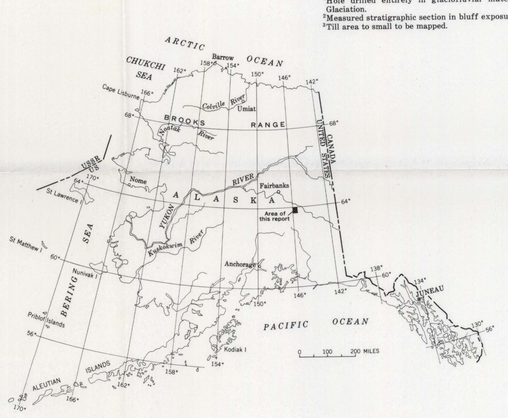
OO.[2] 0–70 ft, interbedded poorly stratified silt and sand layers with angular fragments of quartz, gneiss, and schist 6–10 in. in diameter; 70–90 ft, interbedded poorly stratified silt and sand layers with angular fragments 1- to 2-in. in diameter; 90–95 ft, rounded cobbles and boulders to base of bluff.

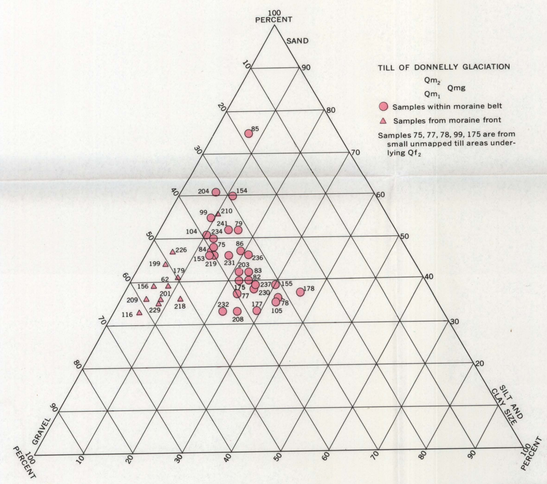
[1]Hole drilled entirely in glaciofluvial material of Donnelly Glaciation.
[2]Measured stratigraphic section in bluff exposure.
[3]Till area to small to be mapped.

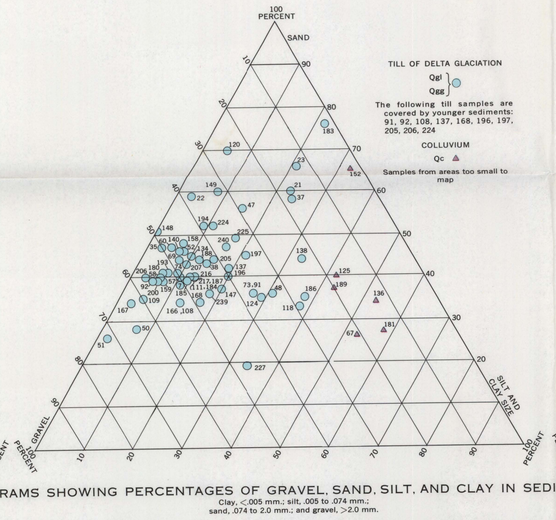


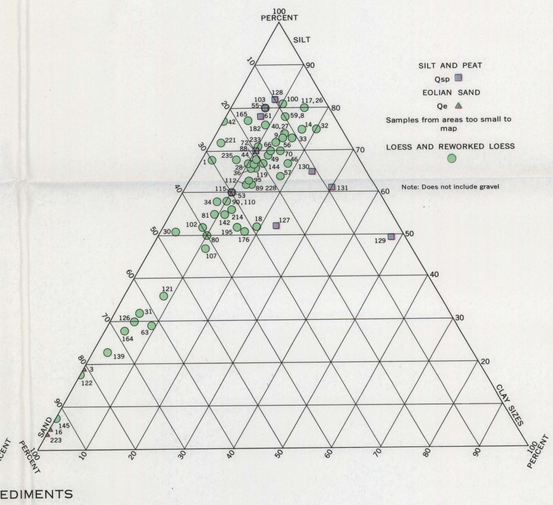






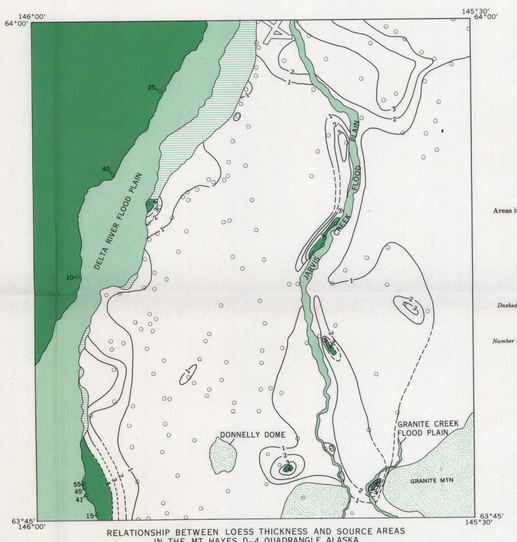






DIAGRAMS SHOWING PERCENTAGES OF GRAVEL, SAND, SILT, AND CLAY IN SEDIMENTS

Clay, <.005 mm.; silt, .005 to .074 mm.; sand, .074 to 2.0 mm.; and gravel, >2.0 mm.



RELATIONSHIP BETWEEN LOESS THICKNESS AND SOURCE AREAS IN THE MT HAYES D-4 QUADRANGLE, ALASKA

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1964—G63213

GEOLOGY OF THE MT. HAYES D-4 QUADRANGLE, ALASKA

By
Troy L. Péwé and G. William Holmes

1964

For sale by U.S. Geological Survey, price $1.50 per set