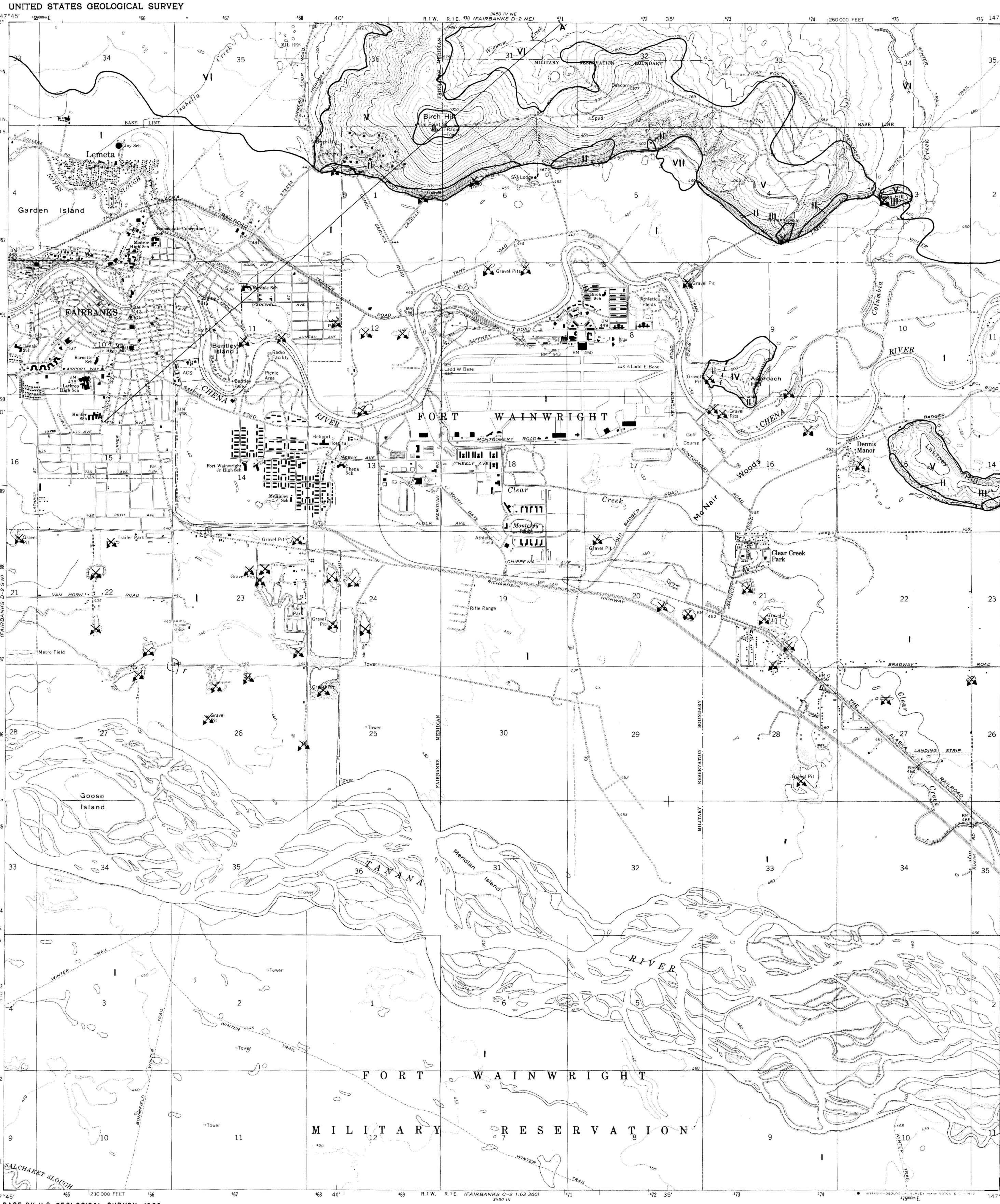
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF- 669C



BASE BY U.S. GEOLOGICAL SURVEY, 1966

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1966 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

MAP SHOWING CONSTRUCTION MATERIALS IN THE FAIRBANKS D-2 SE QUADRANGLE, ALASKA

BY
TROY L. PÉWÉ AND JOHN W. BELL
1975

SOURCES OF CONSTRUCTION MATERIALS

This map is based on data presented on the Geologic map of the Fairbanks D-2 SE quadrangle (Map I-942, Péwé and others, in press), the Map showing distribution of permafrost in the Fairbanks D-2 SE quadrangle (Map MF-669A, Péwé and Bell, 1975a), the Map showing ground water conditions in the Fairbanks D-2 SE quadrangle (Map MF-669B, Péwé and Bell, 1975b), and the Map showing foundation conditions in the Fairbanks D-2 SE quadrangle (Map MF-669D, Péwé and Bell, 1975c). Additional information, especially detailed subsurface data, can be obtained from these maps.

This map provides basic information on where construction materials may be obtained near the surface. The map units are defined on the basis of type of material and distribution of permafrost.

The flood plain of the Tanana and Chena Rivers is an excellent source of sand and gravel, although most of the coarser sediments are covered by as much as 15 feet of silt. Old channel sloughs, meanders, and basins may contain as much as 30 feet of river silt; the exact location of these deposits is detailed on the geologic, foundation conditions, and permafrost maps. Many gravel pits already exist on the flood plain, but the supply of sand and gravel is virtually limitless.

The upland hills are bedrock with a cover as much as 200 feet of windblown silt (loess). The suitability of the bedrock for use in construction is variable, and the bedrock generally is not as good a source of gravel as the flood plain. However, the granite at Approach Hill and the basalts at Sage Hill, west of Sage Hill, and Lakloey Hill provide good sources of concrete aggregate and borrow material. Recently, the bedrock has been widely used as a decorative rock rather than a source of gravel. The best sources of coarse material in the upland areas are the placer-mine dredge tailings, which are excellent for foundation material and pervious fill, especially when processed.

Permafrost generally limits the accessibility of the material and can in some places prevent removal. Discontinuous permafrost exists throughout the flood plain, and, where it is present, the sand and gravel are difficult to excavate. Therefore, the best locations for gravel pits are those that have a minimum of silt cover and contain little or no permafrost.

The upland hills are generally free of permafrost and present no major excavation problems. The silt mantle generally is well drained, dry, and very easily removed unless it is frozen. The bedrock may contain an upper weathered zone about 3-10 feet thick that is easily removed compared with the fresh bedrock, which in some instances has to be blasted.

The valley bottoms of the upland contain thick silt accumulations that are perennially frozen and have high ice content. The silt also contains much organic material, and, as a result, these deposits generally are undesirable as sources of material. Silt is the only easily accessible material, and, if it is frozen, blasting is required. Creek gravel (exposed as tailings) is buried 30-300 feet beneath the silt, making it usually inaccessible.

In some areas of the flood plain adjacent to the upland, valley-bottom silt has been deposited over river sand and gravel as alluvial fans. These silt fans are as much as 50 feet thick and contain discontinuous permafrost. The areas of the fan that are unfrozen may supply silty material, or it is possible, though perhaps impractical, to remove the silt to obtain river sand and gravel.

It should be noted that the map units are generalized and local variations may occur, especially near contacts between units. Detailed mechanical analyses, soil properties, and moisture contents are given on the foundation conditions map.

SELECTED BIBLIOGRAPHY

Burton, Wayne, 1971, Alaska's agriculture, an analysis of developmental problems, Fairbanks, Alaska: University of Alaska, Institute of Social, Economic, and Government Research, ISEGR Rept. No. 30.

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

Péwé, T. L., 1954, Effect of permafrost on cultivated fields, Fairbanks area, Alaska: U.S. Geol. Survey Bull. 989-F, p. 315-351.

_____, 1958, Geologic map of the Fairbanks D-2 quadrangle, Alaska: U.S. Geol. Survey Geol. Quad. Map GQ-110.

_____, 1966, Permafrost and its effect on life in the north: Corvallis, Ore., Oregon State Univ. Press, 40 p.

Péwé, T. L., and Bell, J. W., 1975a, Map showing distribution of permafrost in the Fairbanks D-2 SE quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-669A, scale 1:24,000.

_____, 1975b, Map showing ground water conditions in the Fairbanks D-2 SE quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-669B, scale 1:24,000.

_____, 1975c, Map showing foundation conditions in the Fairbanks D-2 SE quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-669D, scale 1:24,000.

Péwé, T. L., Bell, J. W., Forbes, R. B., and Weber, F. R., 197_, Geologic map of the Fairbanks D-2 SE quadrangle, Alaska: U.S. Geol. Survey Misc. Inv. Ser. Map I-942, scale 1:24,000. (in press)

EXPLANATION

I

RIVER SILT, SAND, AND GRAVEL

Primarily gravel (70 percent) with layers of sand (20 percent) and silt (5 percent); assorted rock types with up to 5 percent chert; generally covered by a layer of silt. Largest gravel generally no more than 3 inches in diameter. Thickness of sand and gravel 10 to more than 400 feet. Top layer of silt and silt of sloughs and basins homogeneous; fairly well sorted with 10-30 percent clay content; may contain organic material. Top silt as much as 15 feet thick; silt of sloughs and basins as much as 30 feet thick. Sand and gravel are perennially frozen (permafrost) to known depths of as much as 275 feet; permafrost randomly located; permafrost absent under rivers, lakes, and on the inside of stream meander curves. Silt in sloughs and basins contains permafrost that may extend into underlying sand and gravel; young sloughs are generally unfrozen or contain discontinuous permafrost

Sand and gravel easily excavated with power equipment except where perennially frozen; silt easily excavated except where perennially frozen. Sand and gravel good for subgrade, base course, and, if processed, for road metal and concrete aggregate. In recent years, the river gravel has been cast in panels for use as decorative facing. Silt generally poor for most uses. High water table in flood plain (10-15 feet below the surface) can cause gravel pits to fill with water

II

SCHIST BEDROCK

Upper 3-10 feet is weathered and decomposed bedrock; primarily gravel (50-60 percent) with sand (20-30 percent) and silt (10-30 percent). Fresh bedrock may be a soft schist or a harder variety containing quartzite; locally contains marble; contains hard quartz veins. Fresh bedrock cut by numerous joints, fractures, and foliation planes. Both fresh and weathered bedrock covered by as much as 3 feet of windblown silt. Generally free of permafrost; north-facing slopes may contain permafrost with low ice content.

Weathered bedrock easily excavated with hand or power tools unless frozen. Fresh bedrock generally is easily excavated with little to moderate blasting even where containing permafrost; some varieties, especially those high in quartzite or vein quartz, may require additional blasting. Resistant layers more easily excavated where interbedded with schistose rocks; excavation easier where joints, fractures, and foliation planes abundant. Schist varieties good for unclassified embankment fill, but only poor to fair for selected use as base course when processed; breaks down with repeated traffic and frost action. Harder varieties good for rip rap and ballast, and coarse aggregate; if processed, good for base course and road metal. Many varieties, especially the marble, are good as decorative rocks

III

BASALT BEDROCK

Upper 3-10 feet is weathered and decomposed bedrock; fresh bedrock has well-developed joints. Both fresh and weathered bedrock covered by as much as 3 feet of windblown silt. Generally free of permafrost; north-facing slopes may contain permafrost with low ice content. Maximum thickness of basalt probably 200 feet

Pillow lavas easily excavated with power tools; little or no blasting required. Columnar basalt requires blasting. Pillow lavas excellent for subgrade, base course, or pervious fill without crushing. Good for road metal and concrete aggregate if crushed. Columnar lava may require crushing for most uses

IV

GRANITE BEDROCK

Upper 3-10 feet is weathered and decomposed bedrock. Both fresh and decomposed bedrock covered by as much as 3 feet of windblown silt. Generally free of permafrost; north-facing slopes may contain permafrost with low ice content. Thickness at least 100 feet

Weathered material easily excavated with power tools and is good for base course, road metal, and concrete aggregate without crushing. Unweathered material requires blasting and is good for rip rap and pervious fill

V

LOESS

Windblown silt 3-200 feet thick covers upland hilltops and middle and upper slopes; not mapped where less than 3 feet thick. Silt is well sorted; less than 10 percent clay; locally organic. Free of permafrost except in isolated patches with little or no ice content on north-facing slopes. Where loess overlies muck, both units are mapped as muck. Loess overlying muck is shown only in cross section. Overlies bedrock

Easily excavated with hand tools unless frozen. Stable in nearly vertical cuts in original position; loses much of vertical stability upon reworking. Good source of fine-grained sediment and possible source of impervious fill. Loess is powdery when dry, plastic and sticky when wet. Generally above water table and well drained. Good agricultural soil if fertilized

VI

MUCK

Valley-bottom accumulations of reworked silt 30 to more than 300 feet thick; perennially frozen with high ice content. Well sorted, less than 10 percent clay; locally contains layers and lenses of sand and gravel. Contains abundant organic matter. Poorly drained and marshy in summer; land clearing produces quagmire. Overlies old creek gravel more than 100 feet thick. Where loess overlies muck, both units are mapped as muck.

Very difficult to excavate unless thawed; blasting moderately successful. When thawed, viscous sediment slides into excavation, except near contact with the loess. Thawed and dry muck easily excavated; can maintain fair vertical stability. Possible source of fine-grained sediment and impervious fill where organic content relatively low. Water table locally high where perched on permafrost. Poor to fair for agriculture if fertilized and drained

VII

ALLUVIAL-FAN SILT

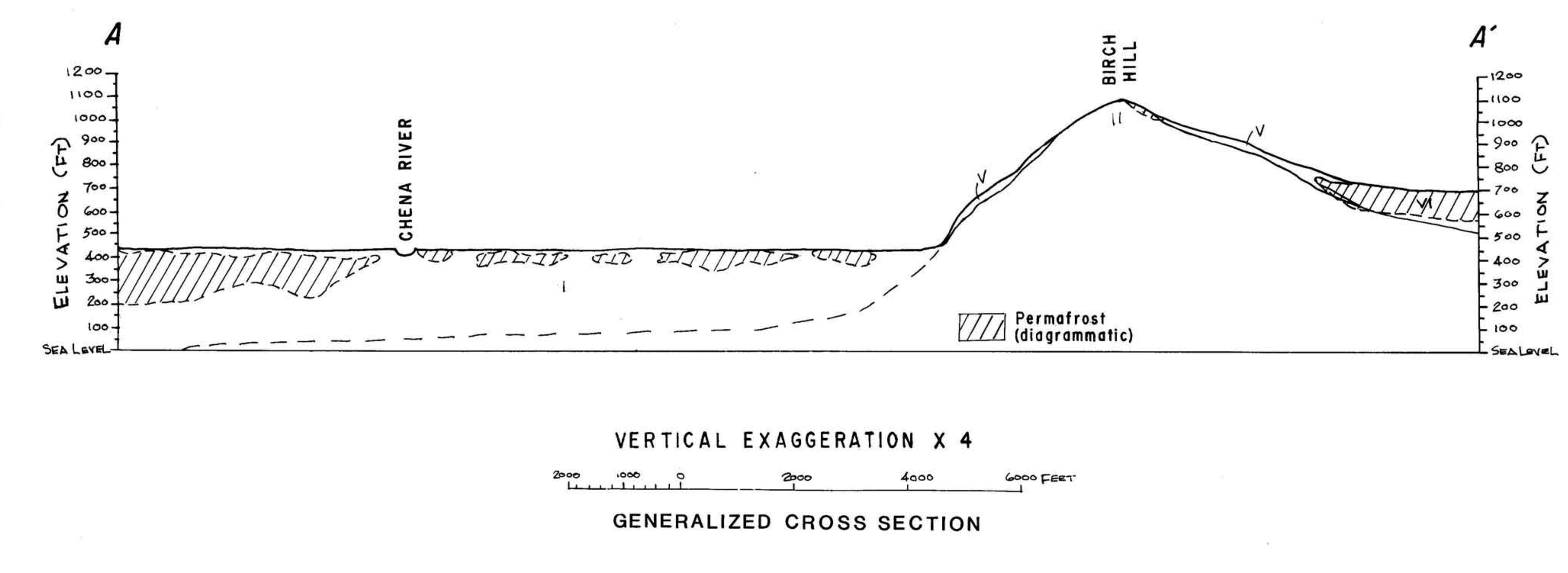
Alluvial-fan silt as much as 50 feet thick overlying river sand and gravel; well sorted with less than 10 percent clay. Locally contains layers of sand and gravel and organic matter. Discontinuous permafrost with moderate ice content; permafrost may extend into underlying river sand and gravel. Fair to well drained in unfrozen areas; poorly drained in frozen areas. Underlying sand and gravel has same characteristics as flood-plain deposits

Can be excavated with hand tools or light power equipment except where perennially frozen. Possible source of fine-grained sediment and impervious fill; material is powdery when dry and sticky when wet. Water table generally lies in underlying river gravel except where locally perched on permafrost. Good for agriculture if fertilized

SYMBOLS

Contact
Generally indefinite or gradational

Gravel pit



VERTICAL EXAGGERATION X 4

GENERALIZED CROSS SECTION

For sale by U. S. Geological Survey, price $.50

☆U.S. GOVERNMENT PRINTING OFFICE: 1975-0-690-036/58