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PRELIMINARY PHOTOINTERPRETIVE MAPS OF THE GEOLOGY, GEOLOGIC-MATERIALS, PERMAFROST, AND WETLANDS-CLASSIFICATION, FAIRBANKS B-6 QUADRANGLE, ALASKA

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PRELIMINARY PHOTOINTERPRETIVE MAP OF GEOLOGY, FAIRBANKS B-6 QUADRANGLE, ALASKA
(SHEET 1 OF 4)

This geologic map illustrates extents and types of unconsolidated deposits and bedrock in the Fairbanks B-6 Quadrangle. This map was prepared by interpreting 1:65,000-scale color-infrared and black-and-white aerial photographs. The user is cautioned that this geologic map has not been verified by field observations, although the photointerpreter has had field experience in similar quadrangles and during the interpretation referred to all available ground-truth data provided in published and unpublished reports. Physical properties of map units were obtained from previous reports or extrapolated from similar deposits in the region; they may be later revised as a result of detailed field observations and laboratory tests. Evaluations of these deposits as construction materials and their estimated ice contents are presented on photointerpretive maps of geologic materials (sheet 2) and permafrost (sheet 3), respectively.

Legend

Symbols	Descriptions
Qaa	ACTIVE FLOOD-PLAIN ALLUVIUM---Chiefly well-sorted and well-stratified layers and lenses of silt, sand, pebbles, and cobbles composing river bars subject to frequent inundation; generally unfrozen with shallow water table.
Qai	INACTIVE FLOOD-PLAIN DEPOSITS---Chiefly 10 to 20 ft of overbank silty sand and sandy silt overlying gravelly riverbed sand and sandy gravel beneath surfaces subject to infrequent inundation by streams; moisture contents range from 9 to 21 percent and average about 13 percent; generally unfrozen in younger area and discontinuously frozen in older areas; active channels are floored by 5 to 20 ft of sand and silty sand that are generally unfrozen; fills of inactive channels include 7 to 12 ft of discontinuously frozen organic silt over sand and gravelly sand.
Qab	ABANDONED FLOOD-PLAIN ALLUVIUM---Chiefly 10 to 20 ft of overbank sandy silt and silty sand overlying sandy riverbed gravel beneath surfaces subject to rare inundations by streams; overbank sequences contain organic-silt channel fills 7 to 20 ft thick; generally frozen.
Qat	STREAM-TERRACE ALLUVIUM---Chiefly 4 to 20 ft of organic sandy silt and silty sand overlying well-sorted sand and gravel beneath stream terrace treads no longer subject to inundation by the stream that deposited the alluvium; locally subject to seasonal stream icings; continuously frozen.

Qao — OUTWASH ALLUVIUM---Sand and gravel deposited by former proglacial streams; locally subject to seasonal stream icings; discontinuously frozen.

Qaff — FINE-GRAINED VALLEY-FILL AND DISTAL ALLUVIAL-FAN ALLUVIUM---Chiefly silt and sand with lenses of gravel (channel fills) deposited by major streams and in distal zones of broad, gently sloping, and coalescing piedmont fans; locally subject to stream icings; continuously frozen.

Qel — LOESS---Silt with up to 10 percent very fine sand carried by winds and deposited as a blanket over the topography; organic rich on lower slopes and lowland sites; moderate to high moisture content (more than 15 percent moisture) in lowland sites; discontinuously frozen on some lower south-facing slopes and continuously frozen on some lower north-facing slopes and lowland sites.

Qes — DUNE SAND---Chiefly fine eolian sand (0.125- to 0.25-mm diameter) with small amounts (2 to 16 percent) of silt (Alaska Architectural and Engineering Company, 1981; Collins, 1985); generally covered by up to 13 ft of organic and inorganic silt with a trace to some sand (loess), which averages about 3 ft thick; sand blanket is up to 165 ft; moisture content is low (3 to 4 percent); discontinuously frozen.

Qed — DEFLATION-BASIN DEPOSITS---Chiefly 5 to 10 ft of fine eolian sand with trace amounts of silt or up to 2 ft of surface organic silt and sandy silt (loess) overlying eolian fine sand in elongate basins deflated by winds scouring out dune sand; locally incorporates organic deposits of intermittent shallow lakes; discontinuously frozen.

Qlr — RETRANSPORTED SILT AND LOWLAND LOESS---Chiefly organic silt with variable amounts of sand and lenses of locally derived gravel that are deposited by slope runoff and streams draining bedrock slopes covered by upland silt; complexly mixed with primary airfall loess laid down on lowland sites and debris-flow deposits; subject to seasonal stream and slope icings; continuously frozen.

Qsr — RETRANSPORTED SAND AND LOESS---Chiefly 4 to 20 ft of silty organic sand formed by reworking of eolian sand by surface streams and complex mixing with primary airfall silt laid down on lowland sites; subject to local seasonal stream and slope icings; continuously frozen.

Qs — SWAMP DEPOSIT---Primarily fibrous and locally woody peat with organic silt and sand deposited in local basins; up to 8 ft thick; discontinuously frozen.

Qlt — THAW-LAKE DEPOSIT---Organic silt and sand with local fibrous and woody peat deposited in lake basins developed by thawing of ice- and organic-rich silt; continuously frozen.

Qbc — CONGLOMERATE AND SANDSTONE---Weakly consolidated coarse-grained sedimentary rocks of the Nenana Gravel (Prindle, 1913; Mertie, 1937; Péwé and others, 1966); weathered to depths up to 20 ft; unfrozen to discontinuously frozen.

Symbol

------ Approximate contact

References

Alaska Architectural and Engineering Company, 1981, Soils investigation for Totchaket agricultural road [Project Ag-107]: Fairbanks, 68 p.

Collins, F.R., 1985, Map showing a vegetated dune field in central Alaska: U.S. Geological Survey Miscellaneous Field Studies Map FM-1708, scale 1:250,000, 1 sheet.

Mertie, J.B., Jr., 1937, The Yukon-Tanana region, Alaska: U.S. Geological Survey Bulletin 872, 276 p.

Péwé, T.L., Wahrhaftig, Clyde, and Weber, F.R., 1966, Geologic map of the Fairbanks, Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-455, scale 1:250,000, 1 sheet.

Prindle, L.M., 1913, A geologic reconnaissance of the Fairbanks Quadrangle, Alaska: U.S. Geological Survey Bulletin 525, 220 p.

PHOTOINTERPRETIVE MAP OF GEOLOGIC MATERIALS, FAIRBANKS B-6 QUADRANGLE, ALASKA (SHEET 2 OF 4)

This geologic-materials map illustrates extents and types of geologic materials within the Fairbanks B-6 Quadrangle that are useful for construction. Literature review and field observations in similar areas indicate that each geologic unit (for example stream-terrace alluvium) has a definite composition wherever that unit occurs. Therefore, presence of certain geologic materials is inferred from the presence of particular units on the geologic map of this quadrangle (sheet 1). The user is cautioned that this materials map has not been verified by field observations, although the photointerpreter has had field experience in similar quadrangles. Therefore, this map is subject to revision pending field verification. Physical properties of map units have been extrapolated from similar deposits in the region and later may be revised as a result of detailed field observations and laboratory tests.

This geologic-materials map is generalized; it does not attempt to show exact locations of specific materials. The intent is to indicate general areas that deserve consideration for certain materials and to eliminate other general areas from consideration for these materials. Local variations frequently occur, especially near unit boundaries. Potential uses of map units are qualitatively summarized in table 1, which shows potential availability of various construction materials in each geologic-materials map unit. Precise economic evaluations of specific deposits as sources of construction materials will require detailed examination of each deposit, including areal extent, volume, grain-size variation, thickness of overburden, thermal state of the ground, and depth to the water table as well as logistical factors, demand, and land ownership. Estimated ice contents of map units are presented on the photointerpretive map of permafrost in this quadrangle (sheet 3).

Legend

Symbols	Descriptions
G	GRAVEL AND SAND---Alluvium of former proglacial outwash streams; locally subject to seasonal icings; discontinuously frozen.
M	SILT---Upland loess; generally unfrozen.
S	SAND---Eolian sand forming sheets and dunes; generally covered by up to 13 ft of organic-rich lowland loess, except where recently scoured or reactivated; up to 165 ft thick; discontinuously frozen.

SG — SAND AND GRAVEL---Chiefly coarse-grained alluvium beneath active flood plains and terrace treads and fillings of former channels meandering across distal surfaces of broad, gently sloping, and coalescing piedmont fans; may be subject to frequent flooding by streams or local inundation by seasonal stream icings; generally unfrozen to continuously frozen.

SM — SAND AND SILT---Chiefly fine-grained alluvium laid down in distal parts of broad, gently sloping, and coalescing piedmont fans, or deposited by streams draining bedrock slopes covered by upland silt; subject to local stream icings; continuously frozen.

SM/G — SAND AND SILT OVERLYING GRAVEL---Chiefly alluvium beneath inactive and abandoned flood plains; thickness of fine-grained alluvial cover varies up to 17 ft; infrequently to rarely flooded; generally unfrozen to continuously frozen.

OM — ORGANIC SILT---Chiefly retransported silt and lowland loess; subject to local seasonal stream and slope icings; continuously frozen.

OS — ORGANIC SAND---Chiefly retransported sand and lowland loess; subject to seasonal stream and slope icings; continuously frozen.

Pt — PEAT---Chiefly swamp deposits; locally subject to seasonal stream icings; sporadically to continuously frozen.

Bs — COARSE-GRAINED SEDIMENTARY ROCK---Weakly indurated conglomerate and sandstone of the Nenana Gravel (Prindle, 1913; Péwé and others, 1966) weathered to depths of up to 20 ft; unfrozen to discontinuously frozen.

Symbols

------ Approximate contact

.[n] Location of subsurface data

Table 1---Probability[1] of locating various construction materials in geologic-materials map units, Fairbanks B-6 Quadrangle

	Map Unit									
Material	G	M	S	SG	SM	SM/G	OM	Os	Pt	Bs
Gravel and sand	G	N	N	G/M	P	M	N	N	N	G
Sand	G	N	G	M	P	M	N	N	N	G
Mixed coarse and fine materials	P	N	N	P	N	P	N	N	N	G
Clay	N	N	N	N	N	N	N	N	N	N
Crushed aggregate	G	N	N	M	N	N	N	N	N	N
Riprap/ Armor rock	G	N	N	N	N	N	N	N	N	N
Building stone	N	N	N	N	N	N	N	N	N	N

[1] The imprecise designators "good" (G), "moderate" (M), "poor" (P), and "nil" (N) are purposely used to indicate the relative probability of locating good deposits of each construction material in various map units. No definitive values are assigned to each term, but they may indicate a probability of 80 percent or more for "good", 30 to 80 percent for "moderate", less than 30 percent for "poor", and essentially zero percent for "nil".

Subsurface Data

Abbreviations in subsurface-data descriptions

Org - Organic or organic material
Cl - Clay or clayey
Si - Silt or silty
Sa - Sand or sandy
Gr - Gravel or gravelly
Cob - Cobbles
Fr - Frozen
Unfr - Unfrozen
BH - Bore hole

w/ - with
tr - a trace amount (4 to 12 percent) of
s - some (12 to 30 percent)
& - and (30 to 50 percent)
occ - occasional (4 to 8 percent by volume)
part - partings of
lenses - lenses of
interbed - interbedded with

Sample description of test-hole log

1. 0-3 ft Org; 3-25 ft SiGr w/sSa,occCob; 25-30 ft GrSa w/lenses Sa. Fr 0-20 ft. [3-15-65]. (Smith, 1967; BH 32).

Soils encountered at location number 1 on the map were: from the ground surface to a depth of 3 feet, organic material; from 3 to 25 feet deep, silty gravel with some (12 to 30 percent) sand and occasional (4 to 8 percent by volume) cobbles; from 25 to 30 feet deep, gravelly sand with lenses of sand. Soils were frozen from the ground surface to a depth of 20 feet. The test was drilled on March 15, 1965. It is listed as bore hole 32 in a 1967 report by Smith (report would be listed under References).

Subsurface data descriptions, Fairbanks B-6 Quadrangle

1. 0-6 ft SiSa; 6-29 ft SaGr & GrSa w/tr-sSi; 29-47 ft SiSa w/lenses GrSa; 47-70 ft SaGr,occCob; 70-75 ft SaGr; 75-78 ft SiSa; 78-83 ft SaGr; 83-95 ft SiSa w/lenses Sa & Gr; Fr 13-95 ft. [8-15-87]. (Shannon and Wilson, 1987; BH B-1).

2. 0-5 ft Sa w/sGr; 5-14 ft Sa & Gr w/tr-sSi; 14-20 ft Sa w/sGr; 20-55 ft interbed SaGr & GrSa. Unfr. [8-15-87]. (Shannon and Wilson, 1987; BH B-2A).

3. 0-4 ft SaSi; 4-13 ft SiSa; 13-17 ft Sa w/sSi; 17-24 ft GrSa w/sSi; 24-50 ft interbed Sa & SaGr,occCob. Unfr. [8-16-87]. (Shannon and Wilson, 1987; BH B-2B).

4. 0-19.5 ft SiSa; 19.5-27 ft Sa w/sSi & Gr; 27-100 ft Sa w/tr-sSi. Fr 17-100 ft. [8-17-87]. (Shannon and Wilson, 1987; BH B-3).

5. 0-0.5 ft Org; 0.5-2 ft SiSa; 2-25 ft Sa w/sSi; 25-79.5 ft Sa w/tr-sSi; 79.5-90 ft ClSi w/occ lenses Sa,part Org. Fr 5.5-90 ft. [8-20-87]. (Shannon and Wilson, 1987; BH B-6).

Reference

Shannon and Wilson Geotechnical Consultants, 1987, Bore-hole logs for the State of Alaska Superconducting Super Collider, Nenana, Alaska: in State of Alaska, 1987, The Denali Site, v. 3, geology and tunneling, proposal to the U.S. Department of Energy.

PHOTOINTERPRETIVE MAP OF PERMAFROST, FAIRBANKS B-6 QUADRANGLE, ALASKA (SHEET 3 OF 4)

Permafrost, or permanently frozen ground, is rock or soil that has remained continuously colder than 32° F (0° C) for 2 yr or longer and it represents the most widespread deleterious soil condition in interior Alaska. Although it causes freezing of unprotected utility lines and water wells, the most important aspect of permafrost affecting construction is its ground-ice content (Muller, 1947; Péwé, 1966, 1982). Disturbance and subsequent thawing of ice-rich permafrost result in differential ground settlement and problems of slope instability and excessive sedimentation (Ferrians and others, 1969). Undisturbed, ice-bearing permafrost is practically impermeable, which inhibits infiltration of surface waters and promotes problems related to seasonal frost and seriously limiting the effectiveness of modern sewage-disposal systems.

This permafrost map illustrates the inferred extent and estimated ice content of permafrost between the ground surface and about 20 ft below the surface in the Fairbanks B-6 Quadrangle. This map was prepared by interpreting 1:65,000-scale color-infrared photographs. The presence or former presence of permafrost and its ground-ice content are inferred from several indicators: vegetation, slope and aspect, landform, soil type, local drainage, and terrain microfeatures such as polygonal ground and thermokarst pits, gullies, and ponds (Kreig and Reger, 1982). The user is cautioned that this permafrost map is not verified by field observations, although the interpreter has had experience in similar quadrangles, and during the interpretation, referred to all ground data available in published and unpublished reports. Physical properties of map units are from previous reports and are extrapolated from similar deposits in the area.

Legend

Symbols indicate the continuity of permafrost in upper-case letters and the estimated ice content in lower-case letters. For example, "Dm" indicates the presence of discontinuous permafrost with a low to moderate ice content. The compound symbol "Dr/Dl" indicates that discontinuous permafrost with a moderate to high ice content overlies discontinuous permafrost with a low ice content.

Symbols	Descriptions
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---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 warm to temperatures above 0^{o} C at least once during 2 yr.
r	MODERATE TO HIGH ICE CONTENT---Inferred to typically contain 50 to more than 1,000 percent soil moisture relative to dry weight.
m	LOW TO MODERATE ICE CONTENT---Inferred to typically contain 25 to 50 percent soil moisture relative to dry weight.
l	LOW ICE CONTENT---Inferred to typically contain 6 to 25 percent soil moisture relative to dry weight.
d	DRY FROZEN---Inferred to typically contain less than 6 percent soil moisture relative to dry weight.

Symbols

------ Approximate contact

.^{n} Location of subsurface data
(see descriptions on sheet 2)

References

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

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 and 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.

Péwé, T.L., 1982, Geologic hazards of the Fairbanks area, Alaska: Alaska Division of Geological and Geophysical Surveys Special Report 15, 109 p.

PHOTOINTERPRETIVE MAP OF WETLANDS CLASSIFICATION, FAIRBANKS B-6 QUADRANGLE, ALASKA (SHEET 4 OF 4)

Wetlands are habitats dominated to varying degrees by water. In these areas, water table is at, or above the land surface long enough each year to influence the types of plants growing or soils developed on that surface (Cowardin and others, 1979). As a result of frequent flooding, vegetation may even be lacking or soils undeveloped. Wetlands provide highly productive habitats for wildlife, especially waterfoul and fish, as well as important sources of surface water for domestic and commercial uses, public recreation, and navigatable waterways.

This map illustrates types and extents of wetlands in the Fairbanks B-6 Quadrangle. This map was prepared by interpreting 1:65,000-scale color-infrared and black-and-white aerial photographs. Each wetland class is interpreted from several indicators: landform, vegetation, and photo color or tone. For example, certain landforms typically are frequently flooded or contain shallow permafrost that promotes saturation of soils and lush development of vegetation in the active layer. The user is cautioned that this wetlands-classification map is not based on water-level records and has not been verified by field observations. Water conditions attributed to each wetlands class are extrapolated from known conditions elsewhere in interior Alaska and may be revised as a result of field observations.

Legend

symbols	Descriptions
R	RIVERINE---All wetlands and permanent-water habitats contained within stream channels that are bounded by uplands or by wetlands dominated by trees, shrubs, persistent emergent plants, nonaquatic mosses or lichens; water is usually, but not always, flowing.
Rb	UNCONSOLIDATED OR ROCK BOTTOM---All rivers and other streams permanently containing water; characterized by water and aquatic grasses, mosses, and algae.
Rs	UNCONSOLIDATED SHORE---Frequently flooded active flood plains and linear phases of inactive flood plains (Weber and Péwé, 1961, 1970) between average and highest flood levels; mostly barren, but where vegetated is characterized by scouring rushes, carices, extensive willows, small balsam poplar and spruce, and uncommon alders (Viereck, 1970a, b).

Re — EMERGENT RIVERINE---Seasonally to semipermanently flooded modified linear and coalescent flood-plain phases (Weber and Péwé, 1961, 1970); vegetated by scouring rushes, extensive willows, dense alder clumps, small balsam poplar and spruce, shrub birch, and a ground cover of sphagnum moss up to 12 in. thick (Viereck, 1970a, b).

P — PALUSTRINE---Ponds, marshes, swamps, bogs, and fens not affected by wave action or wind or stream erosion, except during flooding, and dominated by trees, shrubs, persistent emergent plants, and nonaquatic mosses or lichens; may occur in isolated small thermokarst basins or on slopes, especially in areas underlain by permafrost; bounded by uplands and streams but not by lakes; may comprise very slow-flowing segments of stream courses.

Pe — EMERGENT PALUSTRINE---Seasonally flooded and permanently or semipermanently saturated bogs, fens, tundra, and herbaceous wetlands not bounded by lakes; less than 30 percent of the plant cover is shrubs and small trees.

Ps — SCRUB/SHRUB PALUSTRINE---Temporarily flooded phases of abandoned flood plains vegetated by numerous to dense (more than 30 percent of the vegetation cover) low shrubs of birch and willows, by scattered black spruce, larch, and birch trees more than 20 ft tall, and by clumps of these small trees, all growing on boggy ground.

Pf — FOREST PALUSTRINE---Temporarily flooded phases of abandoned flood plains vegetated more than 30 percent by numerous to dense black spruce, birch, and larch trees more than 20 ft tall and growing on boggy ground.

L — LACUSTRINE---Wetlands and permanent open-water habitats situated in topographic depressions or dammed stream channels and commonly affected by wave action; bounded by uplands and palustrine habitats; less than 30 percent of the plant cover is trees, shrubs, persistent emergent plants, and nonaquatic mosses or lichens.

Lw — LIMNETIC LACUSTRINE---All permanent lakes and ponds, including ox-bow lakes and ponds on inactive flood plains; vegetated by hydrophytic plants such as aquatic mosses and grasses, pond and water lilies, reeds, rushes, and floating organic mats.

Ls — LITTORAL LACUSTRINE---Seasonally or semipermanently flooded, generally treeless, peaty and grassy lake and pond margins between low and high water levels, including seasonally flooded sloughs, or parts of sloughs on inactive flood plains.

U	UPLAND---Well-drained surfaces very rarely or never flooded and saturated only for short periods of time; vegetated by deciduous, mixed deciduous and coniferous, and coniferous forest or woodland, or both.

Symbol

------ Approximate boundary

References

Cowardin, L.M., Carter, Virginia, Golet, F.C. and LaRoe, E.T., 1979, Classification of wetlands and deepwater habitats of the United States: U.S. Fish and Wildlife Service Biological Services Report FWS/OBS-79/31, 103 p.

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