ALASKA DIVISION OF GEOLOGICAL &
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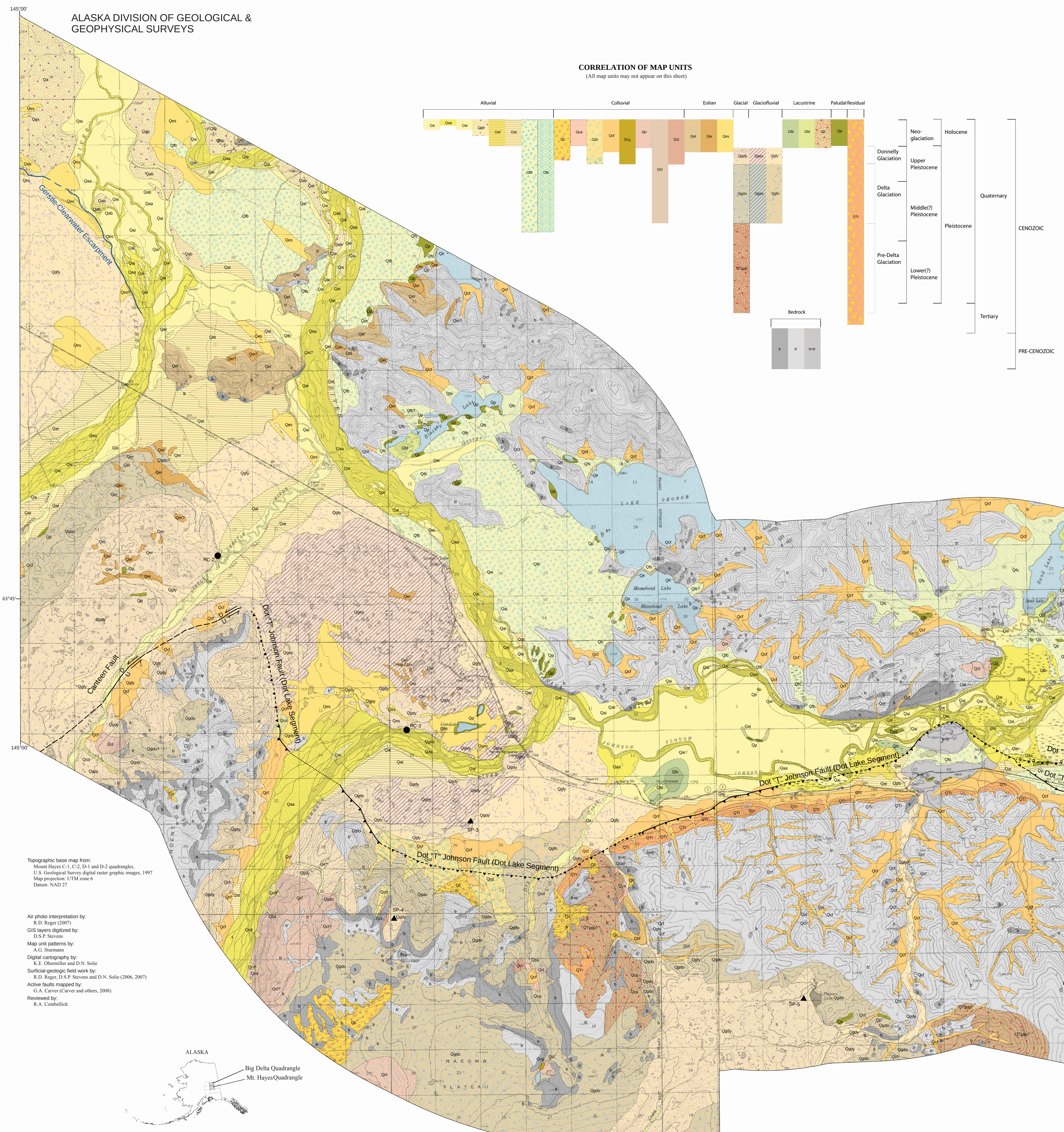
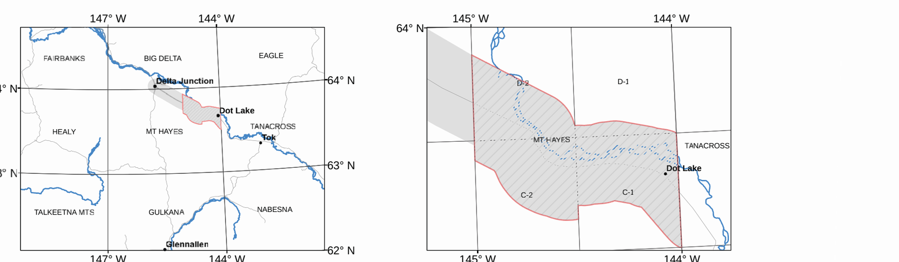
PRELIMINARY INTERPRETIVE REPORT 2008-3a
Reger and others (2008)
SHEET 2 of 2
Explanatory text accompanies map




Maps Showing Location of Study Area

# SURFICIAL-GEOLOGIC MAP, ALASKA HIGHWAY CORRIDOR, DELTA JUNCTION TO DOT LAKE, ALASKA

by
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## DESCRIPTION OF SURFICIAL-GEOLOGIC MAP UNITS
(All map units may not appear on this sheet)

The accompanying map shows the distribution of unconsolidated deposits and undifferentiated bedrock exposed at the surface in the western segment of the corridor straddling the Alaska Highway through the Big Delta and Mt. Hayes quadrangles. Deposits were mapped by interpretation of false-color infrared 1:65,000-scale aerial photographs taken in July 1978, August 1980, and August 1981 and verified by field checking in 2006 and 2007.

### UNCONSOLIDATED DEPOSITS[1]

#### ALLUVIAL DEPOSITS

Oa — UNDIFFERENTIATED FLOODPLAIN ALLUVIUM—Chiefly well-sorted and well-stratified polymictic pebble gravel, sand, and silt comprising channel and overbank deposits of generally small streams; unfrozen to discontinuously frozen with low to moderate ice contents

Qaa — ACTIVE-FLOODPLAIN ALLUVIUM—Chiefly well-sorted and well-stratified layers and lenses of polymictic pebble gravel, sand, and silt with rare to scattered cobbles comprising river bars subject to recurrent inundation by streams every 5 yr or less (Chapin and others, 2006); mapped extent is a function of river level (stage) and reflects the transitory extent of exposed river bars at the time the photographs were taken; in braided and anastomosing reaches, active channels typically shift positions from year to year and present channel locations may differ from locations on the August 1980 photography on which the deposits were mapped; active alluvium underlies upper stream bank and active stream channels and includes point-bar and meander-scroll deposits (Brakenridge, 1988); composed dominantly of gravel and sand where stream is braided and anastomosing (Emmett and others, 1978; Burrows and others, 1979; Burrows and Harrold, 1983) and sand and silt bars and cover deposits where meandering; prone to earthquake-induced liquefaction where fine grained and unfrozen; where braided, subject to formation of extensive, thick seasonal-stream icings (aufeis); generally unfrozen, except seasonally frozen to depth of frost penetration; shallow water table

Qai — INACTIVE-FLOODPLAIN ALLUVIUM—Chiefly 2 to 20 ft (0.6 to 6 m) of overbank silty sand and sandy silt overlying gravelly, polymictic riverbed sand and sandy gravel beneath surfaces subject to flooding at least once or twice every century (Mason and Begét, 1991; Chapin and others, 2006); may include more than one terrace level; overbank sequences include flood-related features, like natural levees, crevasse splays near channels, and fine-grained back-levee swale deposits farther from channels (Brakenridge, 1988; Mann and others, 1995); surface peat generally absent; generally unfrozen in younger areas and discontinuously frozen in older areas with low to moderate ice contents; active channels may be floored by 5 to 20 ft (1.5 to 6 m) of generally unfrozen sand and silty sand; fills of inactive channels may include 7 to 12 ft (2.1 to 3.7 m) of discontinuously frozen organic sand and silt with moderate to high ice contents over sand and gravelly sand

Qab — ABANDONED-FLOODPLAIN ALLUVIUM—Chiefly 10 to 20 ft (3 to 6 m) of overbank sandy silt and silty sand overlying sandy, polymictic riverbed gravel beneath surfaces with widespread cover of lowland loess and local sand dunes and subject to stream flooding about once every 500 to 1,000 yr (Mann and others, 1995); may include several terrace levels; overbank sequences include flood-related features, like natural levees and crevasse splays near channels and fine-grained, peaty back-levee swale deposits farther from channels (Brakenridge, 1988; Mann and others, 1995); may contain organic-silt channel fills 7 to 20 ft (2.1 to 6 m) thick; surface peat generally discontinuous to widespread in backwater areas away from channels; generally frozen with low to moderate ice contents

Qaf — ALLUVIAL-FAN DEPOSITS—Fan-shaped deposits of nonsorted to well-sorted gravel, sand, and silt with numerous cobbles and boulders in proximal zone; lithologies reflect bedrock of source area; in general, size of clasts decreases and degree of sorting increases downfan; typically mixed with debris-flow deposits in proximal part of fans; unfrozen to discontinuously frozen, except in fine-grained distal deposits where permafrost may be shallow and continuous; ice contents low to moderate

Qat — STREAM-TERRACE ALLUVIUM—Chiefly 4 to >20 ft (1.2 to >6 m) of organic sandy silt and silty sand overlying well-sorted, polymictic sand and gravel beneath stream terrace treads no longer subject to inundations by the stream that deposited the alluvium (Kreig and Reger, 1982); may include several levels and incorporate outwash alluvium of Donnelly age in highest terraces; locally covered by ≤15 ft (≤4.5 m) of lowland loess and eolian-sand blanket and dunes complexes, particularly close to active sediment sources; other surface features, like expansion fans and bars, crevasse splays, and pebbly sand waves and dunes, relate to deposition and erosion during jökulhlaups of probable Delta and Donnelly ages; includes granitic flood boulders enclosed in pebble–cobble gravels on strath terraces of Donnelly age; locally subject to seasonal stream icings where buildup of aufeis in stream channels diverts subsequent drainage and spreads aufeis and meltwater across terrace treads that would not otherwise be flooded (Springer and others, 1976; Sloan and others, 1976); continuously to discontinuously frozen with low to moderate ice contents

Qfb — JÖKULHLAUP DEPOSITS—Large expansion fans, crevasse-splay complexes, pendant bars, and linear bars fanning away from the modern floodplain of Tanana River on terraces along the southern margin of the Yukon–Tanana Upland; [illegible]

SLACKWATER FLOOD DEPOSITS—[illegible]

#### COLLUVIAL DEPOSITS

UNDIFFERENTIATED COLLUVIUM—[illegible]

SNOW-AVALANCHE DEPOSIT—[illegible]

DEBRIS-FLOW DEPOSIT—[illegible] ... fragments (particularly ...); deposited primarily ... upland silt (loess) and complexly mixed with ... sites, and fine-grained ... surface fairly smooth ... seasonal stream and ... [illegible]

MIXED COLLUVIUM AND ALLUVIAL DEPOSITS—[illegible]

ROCK-GLACIER DEPOSIT—[illegible]

LANDSLIDE DEPOSIT—[illegible]

ROCK-FALL DEPOSIT—[illegible]

TALUS—[illegible]

#### EOLIAN DEPOSITS

LOESS—[illegible]

RETRANSPORTED SILT AND SAND AND LOWLAND LOESS—[illegible]

EOLIAN SAND—[illegible]

#### GLACIAL DEPOSITS

##### DONNELLY GLACIATION

TILL AND ASSOCIATED MORAINAL DEPOSITS OF DONNELLY GLACIATION—[illegible]

##### DELTA GLACIATION

TILL AND ASSOCIATED MORAINAL DEPOSITS OF DELTA GLACIATION—[illegible]

##### PRE-DELTA GLACIATION(S)

QTgdp — UNDIFFERENTIATED GLACIAL DRIFT OF PRE-DELTA GLACIATION(S)—Thin, discontinuous to continuous sheets of heterogeneous pebble gravel, sand, and silt with rare to numerous cobbles, boulders, and blocks up to 8 ft (2.4 m) in diameter deposited directly from melting glacial ice and reworked by meltwater streams; includes drift of Darling Creek and perhaps other pre-Delta glaciations on alpine surfaces and lower mountain slopes south of Tanana River; sandy matrix weathered pale brown (10YR6/3) to brown (10YR5/3); surface morphology extensively modified by mass-movement processes; unfrozen to discontinuously frozen with low to moderate ice contents (Péwé and Reger, 1983a; Weber, 1986; Duk-Rodkin and others, 2004)

#### GLACIOFLUVIAL DEPOSITS

##### DONNELLY GLACIATION

Qgey — ESKER–KAME COMPLEX OF DONNELLY GLACIATION—Complex mixtures of sand, pebble gravel with some sand and silt, and diamicton deposited in holes, tunnels, and narrow ice-walled valleys in stagnant glacial ice by sediment-charged meltwater streams and by debris flows generated by melting glacial ice; subangular to rounded cobbles and boulders range from rare to numerous; well to poorly sorted; thin to massive bedded; locally crossbedded; surface has high relief and is characterized by discontinuous, sinuous, anastomosing and bifurcating, steep-sided ridges (eskers) typically associated with small, steep-sided hills (kames); unfrozen

Qgfy — OUTWASH OF DONNELLY GLACIATION—Massive to well-sorted, polymictic pebble gravel with some sand and scattered to numerous subrounded to subangular cobbles and boulders ≤7 ft (≤2.1 m) in diameter in proximal zones; surface weathering profiles ≤3 ft (≤0.9 m) deep; sand matrix color varies from pale brown (10YR6/3) to brown (10YR5/3); 5 to 10 percent of foliated tillstones are typically split into plates by frost action and granitic tillstones are fresh to slightly weathered in weathered profiles, except locally, where foliated tillstones are shattered to small, platy fragments and granitic clasts are reduced to crumbly remnants by the growth of calcite (caliche) in the upper 3–4 ft (0.9–1.2 m) of the outwash deposit; silt caps 0.08 to 0.12 in (2 to 3 mm) and discontinuous; cover sands discontinuous and up to ~10 ft (~3 m) thick; average loess cover ~0.4 ft (~12 cm) thick and generally weathered light yellowish brown (10YR6/4) to brown (10YR5/3), except red (2.5YR5/6) where strongly oxidized after repeated wildfires (Ping and others, 2006); ventifacts exhibit slight to moderate surface polish and pitting but no facets or keels in lags developed beneath loess covers; ice-wedge casts generally rare, but locally common and ≤3 ft (≤0.9 m) wide (Péwé and Reger, 1983a, p. 62–66); deformed wedge fillings composed of brown to greenish-gray silt with trace to some pebble gravel and scattered cobbles; unfrozen to discontinuously frozen with low ice contents

##### DELTA GLACIATION

Qgeo — ESKER–KAME COMPLEX OF DELTA GLACIATION—Complex mixture of sand, pebble gravel with some sand and silt, and diamicton deposited in holes, tunnels, and narrow ice-walled valleys in stagnant glacial ice by sediment-charged meltwater streams and by debris flows generated by melting glacial ice; well modified with subdued relief compared to esker–kame complexes of Donnelly age but distinctive sinuous, bifurcated morphology clearly recognizable; unfrozen

Qgfo — OUTWASH OF DELTA GLACIATION— Massive to well-sorted, polymictic pebble gravel with some sand and numerous subrounded to subangular cobbles and boulders ≤3.5 ft (≤1.1 m) in diameter; coarser in proximal zones and finer where distal; surface weathering profiles ≥12 ft (≥3.6 m) deep; sand matrix color varies from pale brown (10YR6/3) to very pale brown (10YR7/4); ~50 percent of foliated and granitic clasts in weathered profile are rotten; silt caps on clasts in weathered profile ≤0.08 in (≤2 mm) thick; cover sands discontinuous and up to ~10 ft (~3 m) thick; loess cover typically 1 to 2 ft (0.3 to 0.6 m) thick; well-formed faceted and keeled ventifacts common in surface lags beneath loess covers; quartz pebbles in lags stained yellowish brown (10YR5/4) to very pale brown (10YR7/4); ice-wedge casts scattered to numerous and ≤3.5 ft (≤1.1 m) wide; deformed wedge fillings are typically eolian sand with trace to some silt and pebble gravel and may include scattered pebble ventifacts; unfrozen to discontinuously frozen with low ice contents

#### LACUSTRINE DEPOSITS

Olb — LAKE-BOTTOM DEPOSITS—Chiefly silt and clay with some sand and organic material deposited in ephemeral lakes in backwater areas of inactive floodplains and behind ice-shoved ramparts in large lakes; discontinuously to continuously frozen with moderate to high ice contents

Old — DELTA DEPOSITS—Chiefly sand and silt with some organic material deposited in a lake basin by a stream entering the lake; during floods of the Tanana River, streams normally draining the lake into the river reverse directions and carry floodwaters and sediments into the lake basin; discontinuously frozen with moderate to high ice contents

Olr — DEPOSITS OF ICE-SHOVED RIDGES—Single or multiple 3- to 5-ft-high (0.9- to 1.5-m-high) ridges parallel to and 2 to 15 ft (0.6 to 4.5 m) above modern lake shorelines; composed of overturned and severely and complexly deformed [illegible]

#### PALUDAL DEPOSITS

SWAMP DEPOSIT—[illegible]

#### RESIDUAL DEPOSITS

BLOCK RUBBLE—[illegible]

[1] [illegible] ... of 2 ft (0.6 m); 'scattered' implies that drilling would encounter two cobbles or boulders in an interval of 10 to 15 ft (3 to 4.5 m); 'rare' implies that drilling would encounter two cobbles or boulders in an interval of >15 ft (>4.5 m). These numbers are field estimates only, based on surface observations, and may vary widely.

### BEDROCK

b — UNDIFFERENTIATED BEDROCK—Outcrops of igneous, metamorphic, and sedimentary rocks; linear and curvilinear shallow troughs and linear changes of surface vegetation indicate the presence of planar bedrock structures

b' — THINLY COVERED BEDROCK—Subcrops with <3 ft (<0.9 m) of loess cover; bedrock structures visible through thin veneer of surficial debris

b+b' — Bedrock outcrops and thinly buried subcrops that cannot be mapped separately

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