DESCRIPTION OF MAP UNITS

	Description of materials	Distribution and thickness	Topography and drainage	Permafrost	Susceptibility to frost action	Suitability for construction	Special problems
Qal Alluvium	Generally well sorted, stratified to lenticular deposits of gravel, sand, and silt, generally becoming finer downstream. Gravel is subrounded to angular depending on its source; in marine and fluvial gravel subrounded, in broken and weathered bedrock angular. Silt and organic lenses common, particularly as overbank deposits on flood plain and low terrace alluvium. Representative lithologic types are graywacke, chert, diabase, sandstone, conglomerate, limestone, and quartz monzonite in Colville River valley, and sandstone, siltstone, chert, quartz, and coal in the coastal plain.	Includes floodplain and low terraces (less than 3 m above waterlevel) bordering streams. Thickness 1 to 10 m.	Forms terraced plain, part of which is occupied by stream channel and bars, the rest by terraces less than 3 m high. Drainage generally poor. Subject to seasonal flooding.	Perennially frozen except for a 2 to 6 m thick unfrozen layer beneath some of the larger river channels. Elsewhere active layer about 0.5 m thick. Ice content of permafrost in granular deposits probably less than in finer materials, even though ice wedges are well developed, especially on terraces. Ice content not known.	Overbank silt deposits and silty lenses in alluvial deposits are frost susceptible, but granular materials are not.	Provides good foundations in channel and bar areas, and moderately good foundations on silty overbank deposits that mantle older parts of floodplain and lowest terraces. Except where poorly graded in pit run, provides excellent source of gravel; gravel generally suitable for fill, base course, surface course, but presence of chert and coal limits its usefulness as aggregate.	Subject to river erosion, and on some streams, to burial by ice and channel shifts caused by icings (aufeis). Sandy alluvium subject to wind deflation if surface cover is stripped. Subject to flooding to depth of 3 to 5 meters.
Qgy Terrace deposits	Cobble gravel to medium and coarse sand; clasts well rounded to subrounded, generally 1 to 10 cm in diameter; rarely includes boulders as large as 20 cm in diameter, and are of local rock types--chert, graywacke, diabase, quartzite, quartz, arkose, limestone, and quartz monzonite. Well sorted, stratified, and includes minor beds and lenses of fine material, much of which forms the surface mantle.	Forms terrace remnants bordering the Utukok and Kokolik Rivers; from 3 m to as high as 25 m above the river; deposits mantled with 0.5 to 5 m of carbonaceous silt; organic-rich.	Flat to gently sloping terraces bounded by scarps. Would normally be well drained if not for permafrost. Lowermost surfaces 3-8 m above low water subject to periodic flooding.	Permafrost present throughout unit to within 0.5 m of surface. Ice content of permafrost in granular deposits probably less in finer materials, even though ice wedges are well developed, especially on terraces. Ice content not known.	Silt mantle and beds and lenses of silt are frost susceptible; granular material is not frost susceptible.	Provides good foundations if silt overburden is allowed for in design without upsetting thermal regime of any ice rich part of the deposit. Excellent source of gravel which is suitable for fill, base course, surface course, but unsatisfactory for aggregate because of chert and coal content.	Subject locally to stream erosion except where less than 8 m above low water.
Qgo High-level gravel	Chiefly sandy cobble and pebble gravel to 10 cm in diameter and sand beds and lenses. Clasts well rounded to subrounded and are 60 percent chert, 30 percent graywacke, and 10 percent quartzite, diabase, and quartz. Well sorted, stratified, and includes minor beds of silt; mantled with organic-rich silt.	Borders portions of the Colville, Utukok and Kokolik Rivers. Thickness 2 to 10 m. Terraces more than 25 m and more commonly 40-50 m above major rivers.	This unit more highly dissected than younger terraces. Flat to gently sloping terraces bounded by scarps. Would normally be drained if not for permafrost. Not subject to river flooding.	Permafrost present throughout unit to within 0.5 m of surface. Ice content and potential thaw settlement somewhat similar to Qgy unit.	Silt mantle and beds and lenses of silt within gravel are frost susceptible; granular material is not frost susceptible.	Provides good foundations if silt overburden is allowed for in design without upsetting thermal regime of any ice-rich part of the deposit. Excellent source of gravel which is suitable for fill, base course, and surface course (with proper grading) but unsatisfactory for aggregate because of chert content.	Subject locally to stream erosion above flood level.
Qsm Silt and muck	Silt, clay, and some sand; contains abundant peat and other organic material; stratified.	Occurs in low-lying areas scattered throughout the foothills area. Generally 1 to 10 m thick.	Flat to very gently sloping surface having poor drainage.	Well developed ice wedges indicated by polygonal ground; ice content unknown, but probably high in that at least 3.3 m of thaw settlement may be expected in areas unmodified by thaw lake activity. Active layer generally less than 0.5 m thick.	Fine materials are frost susceptible.	Not suitable for foundations because of excessive differential settlement on thaw of ice-rich permafrost; requires special design to prevent thaw of permafrost. Not suitable for binder because of excess organic material, nor for any other borrow material.	Easily eroded by running water when water channeled by construction activity or when surface vegetation removed.
Qds Debris slide deposits	Mixed sandy silt and clayey soil and boulders derived from bedrock. Unsorted, nonstratified. Deposits moved by slump, creep and soil flow. Contains organic debris.	Mapped as very small outcrops in surface. Scars or breaks in vegetation (8 slides). Thickness 1-3 m.	Deposits are lobate in plan with a hummocky surface. Scars or breaks in vegetation at uphill margin and piles of debris at the base are characteristic. Drainage good to poor depending on angle of slope.	Permafrost throughout unit; ice content variable. Active layer approximately 1.0 m thick.	Frost susceptible.	Generally unsuited for foundations.	Subject to slow downslope movement during summer when active layer is thickest and saturated with water. Slip surface is commonly the base of the active layer.
Qsf Solifluction mantle	Mixed sand, silt, clay, and boulders derived from upslope sources by sudden or slow gravity movements and to some extent by water transport. Poorly sorted; crudely bedded to nonstratified. Deposits moved by landslide, slump, debris flow, soil flow, and talus processes. Locally contains organic debris.	The deposits occur bordering the higher ridges in the south half of map. Small unmapped deposits are present throughout much of the foothill zone where slopes are 10 percent or higher. Drainage good or poor, depending on slope.	Deposits are lobate to irregular in plan and some have hummocky surface. Scars or breaks in vegetation identified by linear streamline concentrations of vegetation parallel to slope.	Permafrost underlying unit. Active layer approximately 0.5 m thick.	Frost susceptible.	Unsuitable for foundations because of potential for local differential settlement on thaw of ice-rich permafrost and because of slope instability.	Subject to slow movements during summer when active layer is thickest and saturated with water.
Qt Thaw lake deposits	Consists of sediment eroded from lake banks and redistributed by current and wave action; chiefly silt to fine sand in upland silt, clay and silt in areas of Nanushuk Group rocks. Contains retransported peat and sticks, as well as in situ peat beds and lenses. Commonly silty and organic rich.	Coalesced and individual thaw lake basins restricted to coastal plain, the northern half of map. Deposits generally less than 3 m thick.	Forms interlocking and overlapping basins with local relief of less than 5 m below residual surfaces. Depressions either undrained or connected by small meandering creeks; drainage generally poorly integrated.	In lakes less than 2 m deep and in adjacent marshes and meadows permafrost generally present beneath a thin active layer. Lakes deeper than 2 m may have a small thaw bulb between the bottom of active layer and permafrost table.	Thaw lake deposits in silty sand with admixed organic material probably frost susceptible; silt and clay deposits very frost susceptible.	Generally unsuitable source of materials because of silty organic materials and seasonal flooding by snow melt.	Thaw lake basins have potential for differential settlement upon thaw of permafrost that may require refrigerated foundations.
Qus Upland silt	Silt, silty sand, and fine sand, including some clay and scattered pebbles and granules of chert. Stratification indistinct, but locally indicated by thin interbeds of detrital wood and felted peat. Deposits are generally well sorted. Map unit includes wind blown silt, silt reworked in gullies by running water, and marine(?) silt.	Lies between 70 and 130 m above sea level on the coastal plain and the foothills. Deposit a few cm to more than 30 m thick; covers sand and fine gravel of fluvial origin in valleys carved in bedrock. May also lie directly on bedrock or on marine beach gravel.	Forms flat to gently rolling terrain broken by ravines, stream valleys, and thaw-lake basins. Drainage generally poor, except on steep slopes and hill crests.	Contains ice wedges and a very high volume of ice as small interstitial masses and lenses. In some areas, ground ice may approach 80 percent of the volume of subsurface materials, and excess ice (above volume of voids in soil) may persist to depths greater than 30 m below surface. Active layer 0.5 m to as much as 1.5 m thick at well drained sites. High thaw settlement when thawed.	Silt and sandy silt are frost susceptible.	Not suitable for foundations because of excessive differential settlement on thaw of ice-rich permafrost; requires special design to prevent thaw of permafrost. Not suitable for borrow except as binder material.	Easily gullied by running water when water channeled by construction or when surface vegetation is removed.
Qb Marine beach(?) deposits	Chiefly coarse to fine sand, granule and pebble gravel. Gravel well rounded, smooth, locally polished chert, quartz, quartzite. Generally contain less than 6 percent silt.	Mapped only in one general area primarily west of Kokolik River. Generally 2-4 m thick.	Forms nearly flat terrace with break in slope at lower boundary. Well drained.	Perennially frozen to within 0.5 m of the surface. Little thaw settlement.	Granular materials having generally less than 6 percent silt not susceptible to frost action.	Generally good foundations and source of borrow which generally requires binder or stabilization for use as fill, base course or surface course. Contains chert and coal fragments that are deleterious for use as concrete aggregate.	Small volume at inland sites.
Kn Nanushuk Group rocks	Includes graywacke, sandstone, siltstone, shale, and conglomerate in the foothills; and sandstone, clay, bituminous coal, shale, and siltstone, in the coastal plain.	Ubiquitous in foothills and part of coastal plain. Also present along the bluffs of the Utukok and Kokolik Rivers in the northern part of the quadrangle.	Exposed as west-northwest trending hills and valleys reflecting the broad, open folds in the rocks. Generally well drained.	Present to depths as great as 405 m (according to 1944-53 test well and temperature data). Ice content generally insignificant in hard, jointed rocks in which ice merely fills the cracks. Significantly high ice content in weathered zone and in near-surface siltstone, shale, clay, and other rock types.	Thin bedded and well bedded rocks susceptible to frost action. Frost may split apart even most durable rocks by expansion of water freezing along joint planes.	Normally makes good foundations. Individual beds may prove to be suitable source of construction material after appraisal by conventional tests and in terms of economics of site and development costs.	Stability of slopes would require some knowledge about dip of beds with respect to land slope.
Kt Torok shale	Predominantly shale, some wacke and conglomerate.	Present in elongated outcrop belts in southern part of map area where it is exposed in the center of breached anticlines.	Generally forms flat lowland topography due to the high content of easily eroded shale. Drainage generally poor.	Permafrost throughout. Contains ice wedges and high volume of ice as interstitial masses and lenses.	Frost susceptible.	Not suitable for foundations due to high ice content.	

To Accompany

ENGINEERING - GEOLOGIC MAPS OF NORTHERN ALASKA, UTUKOK RIVER QUADRANGLE

by

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1984

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