



GEOLOGIC SECTIONS AND ENGINEERING CHARACTERISTICS OF QUATERNARY UNITS

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TABLE 5.—Engineering characteristics of Quaternary geological units

Geologic units	Variability of materials	Workability	Slope stability	Foundation conditions	Permeability	Drainage	Susceptibility to frost heaving	Shrink-swell potential	Comorbidity	Suggestions for land use
Oa, Oad	Variable; patchy in occurrence and thickness; organic soils generally underlain by lean clay and silt, reclaimed marshes overlain by fill	Will not support heavy equipment; clays may be sticky and hard to handle if wet; excavations may fill with water	Unstable; ravels when dry, flows when wet	Very low bearing strength; high compressibility, poor consolidation	Low to moderate	Generally poor; perched water tables common	High	Moderate ¹	High ¹ , especially if water table fluctuates	Open space, wetlands, wildlife habitat. Avoid construction and waste disposal
Oi	May grade into marsh deposits (Oa). Commonly modified by chert and beach improvements overlain by fill	Noncohesive, free-running; water-saturated at lake level	Noncohesive, easily eroded. All slopes need protection	Good con-lined bearing strength; low compressibility, low shear strength	Usually high	Free-draining, but generally saturated condition	Low if drained	Low	Low if drained	Open space, recreation areas. Avoid construction and waste disposal
Oj	Highly variable, depending on local source of colluvial material directly up slope	Generally easy to excavate but may contain boulders and rock debris	Fragile soils near or at angle of natural slope stability; excavation may oversteepen natural slopes and accelerate erosion	Generally high bearing strength when confined, but sites on slopes subject to differential settlement, creep, landslides and erosion	Variable, generally high	Natural water courses frequently discharge at heads of fans, but material drains well; springs and seeps common	Variable, generally low	Generally low	Generally low	Slopes provide topographic amenities. Reserve for open space and recreation. Restrict traffic and vehicles to prepared roads and paths
Oas	Somewhat variable laterally due to lensing and intertonguing; more variable vertically due to interbedding with clays, silt and loams	Generally good with local areas of incoherent and intertonguing; more variable vertically due to interbedding with clays, silt and loams	Varies from running sand to compact silty loam. General-ly easily eroded	Sands possess moderate to high bearing strength, if confined. May vary due to clay lenses	Moderate to good. Variable from layer to layer	Commonly in channels and flood plains; subject to flooding and high water	Variable; low in sands, moderate to high if clays are near or at surface	Generally low	Variable; generally low in sands, high if clays are interbedded in sands near surface	Floodplain areas not protected from flooding may be dedicated to open space and recreation. Otherwise, general urban and light industrial use. Poor for sub-surface construction. Avoid waste disposal and underground construction
Oac	Variable; associated with bog and marsh deposits; grades laterally and interfingers with unit Oas	Poor; high water table, excavations may fill with water. Difficult to compact, sticky	Poor; generally unstable, low shear strength	Low bearing strength	Low	Poor, high water table, subject to flooding	Moderate to high ¹	Moderate ¹	High ¹	Open-space recreation areas. Structures with light, evenly spaced loading or pile foundations. Subject to flooding. Avoid waste disposal and underground construction
Omq, Omq, Omv	Homogeneous sandy soils	Easily excavated. Makes good, compactible fill if not too sandy	Good on moderate slopes but susceptible to erosion	Generally high bearing strength where confined. Low to moderate consolidation	High	Good	Low to moderate	Low	Low to moderate	General urban development. Suitable for earth-retained and underground construction above water table. Avoid waste disposal
Omu	Variable; fat clay, associated with bog and marsh organic deposits. Overlain by variable amounts of fill	May be sticky and hard to handle if excessively wet; difficult to compact	Poor; clay and organic deposits possess low shear strengths	Poor; fat clay has high bearing strength if dry, low bearing strength if wet. Piling or excavation and back-filling recommended	Very low	Drainage principally by surface runoff. Units occupy depressions which may have high, perched water tables	Moderate ¹	High to very high	High ¹	Open space, wetlands, recreation areas, parking. Avoid under-ground construction, waste disposal and residential construction
Omw	Variable; sands contain boggy zones and interbedded silts and clays	Generally easy to excavate, however unit may contain numerous boulders near contact with Oav	Sandy and gravelly layers may be easily eroded	Generally possesses moderate to high bearing strength. Abundant ground water below water table	Moderate to high	Generally good	Low; fine grained layers are generally below foot line	Low	Generally low	General urban development. Avoid basements below water table and waste disposal. Potential gravel resources now largely pre-empted by development
Ov	Textures of thin soils overlying bedrock are extremely variable. Artificial fill is widespread	Shallow bedrock at variable depth makes excavation difficult	Variable in thin shallow soils	Foundations generally go to bedrock	Variable	Variable; presence of marsh deposits indicates local zones of poor drainage, and perched water tables	Variable	Variable	Variable	General urban development and heavy construction. Utility ditches frequently encounter bedrock for foundations. Avoid waste disposal and underground construction. Avoid basements below water table and waste disposal
Owx	Poorly sorted material. Texture ranges from all-silt to boulders	Excavation difficult; numerous large slabs of limestone	Moderately stable if dry	Moderate to high bearing strength but uneven compaction	Moderate to high	Drainage is good	Low	Low	Low	General urban development. Problems relate to frequency of boulders and large limestone slabs

¹Presence of a thick layer of artificial fill may alter these engineering characteristics.

