Map Unit Properties Table

Age	Unit Name (Symbol)	Features and Description	Erosion Resistance	Suitability for Development	Hazards	Potential Paleontologic Resources	Potential Cultural Resources	Mineral Specimens	Mineral Resources	Habitat	Recreation Potential	Global Significance
QUATERNARY	Alluvium (Qal)	Assorted silts, sands, gravels and clays typically present along Moores Creek as floodplain and river deposits	Very low	Unconsolidated deposits could fail if water saturated; should not be used for waste facilities and large structures, especially if on a slope; wetland areas should be avoided	Slumps, slides, flash flooding, gullying, and debris flows	Modern specimens possible	Valley fills on present land surface, ancient campsites, battle relics, earthworks	None	Sand, gravel, clay	Pine savanna wetlands abundant	Good for all uses unless site of a wetland	Correlation between battle and geology; hosts rare wetland habitat
QUATERNARY	Holocene deposits (Qh)	Holocene sediments are confined to major drainages. Small dunes are widespread on most flood plains. Sediments vary in thickness from a feather edge to 15 m. Fluvial sediments are typically interbedded dark clays and light sand, commonly containing a thin gravel layer at the base. Clays are mostly dark gray to dark green and micaceous. Major clay minerals are illite- smectite with lesser amounts of kaolinite. Quartz and feldspar are the major sand components.	Very low to low	Unconsolidated deposits could fail if water saturated; should not be used for waste facilities and large structures, especially if on a slope; wetland areas should be avoided	Slumps, slides, flash flooding, gullying, and debris flows	Woody debris common throughout; large logs locally	Ancient relics such as pottery shards and arrowheads; bullets, other battle items	None	Sand, gravel, clay	Wetlands habitat for flora and fauna	Good for all uses unless on a slope; avoid wetland areas	Correlation between battle and geology, hosts rare wetland habitat
QUATERNARY	Wando Formation (Qwa)	Formation consists of sandy deposits that form a single barrier. Lower part of barrier contains massive to crudely bedded, very shelly strata. Surrounding sand is stained a deep orange to rust- brown. The upper part of barrier consists of thick to thin, humate- cemented sands. Quartz is the major component of sands. Feldspar (mostly K- feldspar) ranges from 1 to 6 % of sand fraction. Hornblende, epidote, and lesser amounts of garnet, are abundant in the sand in upper 1.5 m of the surface.	Very low to low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads	Slumps, slides, flash flooding, gullying, and debris flows	Some bleached shell beds; small amounts of wood; *Crassostrea virginica* (oyster), foraminifera	None documented	Garnet, hornblende, and epidote detritus	Sand, gravel, clay	Coastal wetlands and riverine environments	Good for all uses unless on a slope or unit is undercut creating an unstable surface	Dates uplift along Cape Fear Arch; records marine transgression
QUATERNARY	Socastee Formation (Qs)	Formation has both marine and non- marine facies. Surface is characterized by a well- developed ridge- and- swale topography. Ridges, or barriers, are closely spaced. The base commonly consists of 0.3 to 1 m of reworked shells, fine gravel, coarse sand, and, occasionally, woody fragments; remainder consists of interbedded sands and clays. The clay layers rich in peat. Sands are often clayey and poorly sorted, ranging from massive to well cross- stratified. Quartz is major component with feldspar (mostly K- feldspar) less than 15 % of sand fraction. Heavy mineral assemblages contain significant concentrations of hornblende and epidote.	Low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads	Slumps, slides, flash flooding, gullying, and debris flows	Vertical tree trunks, woody fragments; *Crassostrea virginica* (oyster), *Callianassa* (crab), *Tagelus plebeius*, *Mulinia lateralis* (clams), *Nassarius obsoletus* (gastropod), *Memeneria merceneria (bivalve)*	Ancient relics such as pottery shards, arrowheads; bullets, other battle items	Epidote and hornblende detritus	Sand, gravel, clay	Ridge- and- swale topography provides variety of habitat	Good for all uses unless on a slope creating loose, unstable, surface	Correlation between battle and geology. Dates uplift along Cape Fear Arch; records marine transgression
QUATERNARY	Penholoway Formation (Qph)	Formation is largely a barrier and backbarrier system. Barrier sands are thin, typically about 3 to 4.5 m thick. Sand is mainly quartz with less than 10 % feldspar. Heavy mineral assemblages typically have high concentrations of resistant minerals: staurolite, sillimanite, kyanite, zircon, tourmaline, and rutile. Base of back- barrier facies typically has a thin reworked sediment zone. Most of back- barrier sediments are interbedded clay, clayey sand, and sand. Beds downdip are mostly sand, with fine gravel dispersed throughout. Epidote and hornblende locally major constituents in the backbarrier beds.	Low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads	Slumps, slides, flash flooding, gullying, and debris flows	Shells, wood, sharks teeth, vertebrate remains	None documented	Staurolite, sillimanite, kyanite, zircon, tourmaline, rutile, epidote, hornblende	Sand, gravel, clay	None documented	Good for all uses unless on a slope creating loose, unstable, surface	Dates uplift along Cape Fear Arch; records marine transgression

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QUATERNARY	Waccamaw Formation (Qw)	Formation is largely a barrier and backbarrier sequence that crops out 21 to 30 m above sea level. Barriers are commonly fine to coarse interbeds of poorly to well- sorted sands. Lower few meters are commonly reworked sediments from underlying units. The barrier sands are mostly quartz; feldspars are present only in the base of the barrier sands. Southwest barriers are characterized by large amounts of staurolite, sillimanite, and kyanite, with epidote occurring locally. In general, the backbarrier facies are interbeds of clayey silts and clayey sands, which may have reworked shells at the base. Clays in the backbarriers are mostly illite- smectite and small amounts of kaolinite.	Low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads; locally high clay concentrations are unsuitable for building roads, trails or structures.	Clay units can be very unstable on slopes resulting in slumps, slides, flash flooding, gullying, and debris flows.	Mulinia-dominated shell assemblages; logs in backbarrier facies; peat; Ostrea *sculpturata* (oyster), *Noetia limula* (bivalve), *Mulinia lateralis*, pollen (clam)	None documented	Staurolite, sillimanite, kyanite, and epidote detritus	Sand, gravel, clay	Terraced landform with unconsolidated deposits for burrows, and a variety of habitats	Good for all uses unless on a slope creating an unstable, unconsolidated surface	Dates uplift along Cape Fear Arch; records marine transgression
TERTIARY	Bear Bluff Formation (Tb)	The marine facies consists of a basal shelly horizon. These beds occur locally in deep narrow trenches, particularly in the downdip areas. These entrenched shelly beds are commonly leached and cemented by calcite into hard masses. The shell beds in most areas grade up into thick beds of bluish- green to dark gray, very clayey silt - a complex intercalations of sand and silty clay beds. The barrier facies is very thin and averages about 4.5 m thick. Laminated to thin-bedded, burrowed tidal- flat deposits locally overlie cross- bedded sands of tidal inlet deposits . Minerals in the sand fraction of the barriers are varied; the less weathered deposits have 15- 35% feldspar content. The opaque heavy minerals are dominated by the weathering products of ilmenite, pseudorutile, and leucoxene. The non- opaque heavy minerals are mostly zircon, tourmaline, rutile, staurolite, sillimanite, and kyanite. The fluvial facies has abundant silt beds overlying a very gravelly unit. Sand fraction is mostly quartz and feldspar. The non- opaque heavy minerals contain high concentrations of epidote. Monazite is notably abundant in the extreme updip areas. Interfingering of the fluvial, barrier and backbarrier facies of the Bear Bluff is evident in boreholes.	Moderately low to low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads	Slumps, slides, flash flooding, gullying, and debris flows	Shells, wood fragments, *Ophiomorpha* burrows (shrimp), *Noetia limula* (bivalve), *Anadara improcera* (mollusk), *Ostrea sculpturata* (oyster)	None documented	Zircon, tourmaline, rutile, staurolite, sillimanite, kyanite, and epidote detritus	Limestone, sand, gravel, clay	None documented	Good for all uses unless on a slope creating an unstable, unconsolidated surface	Dates uplift along Cape Fear Arch; records marine transgression
TERTIARY	Duplin Formation (Td)	Formation is about 21.3 m thick; basal beds of gravelly sand are typically about 3 to 4.5 m thick. Gravelly beds are capped locally by interbedded, thin, dark-gray clay and silt and light yellow sand. Sands typically are poorly exposed. The sandy facies are very deeply weathered. Kaolinite is the major clay mineral. The local mineral indicators of intense weathering, gibbsite and vermiculite, are well developed, but they are absent in most profiles. Heavy minerals in the sandy facies have only the resistant zircon- tourmaline- rutile and staurolite- sillimanite- kyanite mineral suites.	Low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads; locally high clay concentrations are unsuitable for building roads, trails or structures.	Slumps, slides, flash flooding, gullying, and debris flows	Pollen, dinoflagellates, shells, scattered *Ophiomorpha, Ostrea raveneli* (oyster), *Noetia rigintinaria* (bivalve), *Glucemeris subovata, G. Americana* (mollusks), *Paracytheridea mucra, Murrayina barclayi* (ostracodes)	None documented	Kaolinite, vermiculite, resistant minerals	Sand, gravel, clay	None documented	Good for all uses unless on a slope creating an unstable, unconsolidated surface	Oldest marine terrace locally, dates timing of uplift along Cape Fear Arch and records a marine transgression
CRETACEOUS	Cretaceous, undivided (Ku)	Undifferentiated Cretaceous sedimentary rocks	Low	None documented	None documented	None documented	None documented	None documented	None documented	None documented	None documented	None documented

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CRETACEOUS	Peedee Formation (Kpd)	Unit is a massive to thick- bedded, dark gray to gray- green, slightly to very clayey, micaceous, calcareous, glauconitic quartz sand. Deposits extensively bioturbated. Locally, thin (30- 100 cm) ledges of impure limestone are present. Most of the glauconite- rich beds are massive, some are locally cross- bedded. The Peedee is separated from the underlying unit by a reworked zone containing abundant phosphatic pebbles and phosphatic organic remains; light sand fraction mostly quartz. Feldspars typically less than 10 %. Non- opaque heavy mineral assemblages have moderate concentrations of zircon, tourmaline, rutile, staurolite, and kyanite and unusually high concentration of garnet. The clay minerals are principally illite- smectite, and kaolinite.	Moderate to low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads; locally high clay concentrations are unsuitable for building roads, trails or structures.	Slumps, slides, flash flooding, gullying, and debris flows	*Exogyra costata* (oyster), *Belemnitella Americana* (cephalopod), *Globotruncana ganserri, Globotruncana aegyptiaca* (forams), *Rugoglobigerina macrocephala, Heterolhelix glabrans* (forams), *Haustator bilira* (mollusk)	None documented	Zircon, tourmaline, rutile, staurolite, kyanite, and garnet detritus	Sand, gravel, clay	Limestone ledges may provide local bird habitat	Good for all uses unless on a slope creating an unstable, unconsolidated surface	Records provenance of sediments of Atlantic Coastal Plain
CRETACEOUS	Donoho (Creek) Formation (Kdc)	Formation is a massive, fossiliferous sand deposit. The base of this massive unit is marked by a thin zone of small reworked quartz and phosphate pebbles. Deposits in the Cape Fear River valley are largely dark gray, medium- grained sands. Much of the formation has a mottled appearance from bioturbation. The non- opaque heavy minerals mostly zircon, tourmaline, rutile, staurolite, and kyanite. Accessory minerals are garnet, chloritoid, and, to a lesser extent, epidote and monazite. Ilmenite is most abundant opaque mineral, and its weathering products, pseudorutile and leucoxene. Quartz is most abundant light mineral; feldspar less than 5%. Illite- smectite principal clay fraction, with lesser kaolinite.	Low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads; locally high clay concentrations are unsuitable for building roads, trails or structures.	Slumps, slides, flash flooding, gullying, and debris flows	Invertebrate remains, shells, *Exogyra cancellata* (oyster)	None documented	Garnet, epidote, zircon, tourmaline, rutile, staurolite, and kyanite detritus	Sand, gravel, clay	None documented	Good for all uses unless on a slope creating an unstable, unconsolidated surface	Records provenance of sediments of Atlantic Coastal Plain
CRETACEOUS	Bladen Formation (Kb)	Formation consists of the intercalated sand- clay sequences about 44 m thick. The basal beds consist of thin intercalated sand and clay beds with woody fragments, some burrows, and coarse mica flakes. Some cross- bedded sand and massive black clay beds locally present . The mostly quartz sand, with feldspar comprising up to 15%. The non- opaque heavy minerals are zircon, tourmaline, rutile, staurolite, and kyanite. Garnet is present locally in moderate amounts and epidote in lesser amounts. Chloritoid, monazite, and andalusite accessory minerals.	Low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads	Slumps, slides, flash flooding, gullying, and debris flows	Burrows, woody fragments, lignitic logs, *Ophiomorpha*, invertebrate remains, *Exogyra ponderosa* (oyster)	None documented	Zircon, tourmaline, rutile, staurolite, kyanite, andalusite, epidote, and garnet detritus	Sand, gravel, clay	None documented	Good for all uses unless on a slope creating an unstable, unconsolidated surface	Records provenance of sediments of Atlantic Coastal Plain
CRETACEOUS	Tar Heel Formation (Kth)	Many facies within unit including thin- to thick- bedded, black clays and thin to thick, light- colored sand beds. Carbonaceous matter ranges from finely dispersed grains through log- sized fragments. The sands are massive to cross- bedded and micaceous. In Cape Fear valley, strata are more characteristic of a delta front. Locally beds contain marine fossils and glauconite intercalated with thin- bedded, clay- sand sequences. A heavy- mineral assemblage characterized by resistant minerals (zircon and others) and, locally, large concentrations of garnet. The clay mineral suites are mixtures of illite- smectite and kaolinite in fresh samples. Where weathered, kaolinite is the only major clay mineral.	Moderately low to low	Suitable for most development unless unit is water saturated, exposed on a steep slope or undercut by rivers, trails or roads; locally high clay concentrations are unsuitable for building roads, trails or structures.	Slumps, slides, flash flooding, gullying, and debris flows	Marine fossils, woody fragments, logs, dinoflagellates, ostracodes	None documented	Glauconite, kaolinite, and garnet detritus	Sand, gravel, clay	None documented	Good for all uses unless on a slope creating an unstable, unconsolidated surface	Records provenance of sediments of Atlantic Coastal Plain