New Jersey Department of Environmental Protection
Division of Water Resources

New Jersey Geological Survey
Information Circular 1
1990

Generalized Stratigraphic Table for New Jersey

Era	System	Series	Stratigraphic unit	Predominant lithology	Aquifer name or hydrogeologic characteristics
CENOZOIC	Quaternary	Holocene	alluvial, coastal, marsh, and eolian deposits	sand, gravel, silt, mud, and peat	Under water-table conditions at most locations
		Pleistocene	COASTAL AREAS: Wisconsinan alluvium, Cape May Formation, colluvium INLAND, NORTHERN NEW JERSEY: Wisconsinan and pre-Wisconsinan alluvial, colluvial, glacial, lacustrine, and eolian deposits	sand, gravel, silt, clay (statewide), till and till-like deposits (northern New Jersey)	Includes glacial buried-valley aquifers and Cape May aquifer system/Holly Beach aquifer
	Tertiary	Miocene	Pensauken Formation	sand, clayey silt	Under water-table conditions at most locations
			Bridgeton Formation		
			Beacon Hill Gravel	gravel, sand	
			Cohansey Sand	sand, some clayey silt	Kirkwood-Cohansey aquifer system
			Kirkwood Formation	sand, gravel, clayey silt	confining unit Rio Grande water-bearing zone confining unit Atlantic City 800-foot sand
		Oligocene	ACGS beta unit	sand, some glauconitic sand	composite confining unit: Piney Point aquifer
			Mays Landing unit		composite confining unit
		Eocene	Shark River Formation	clayey silt, fine quartz sand, glauconitic sand	composite confining unit
			Manasquan Formation		composite confining unit
		Paleocene	Vincentown Formation	sand, clayey silt, glauconite sand, calcarenite	composite confining unit: Vincentown aquifer
			Hornerstown Formation	glauconitic sand	composite confining unit
MESOZOIC	Cretaceous	Upper Cretaceous	Tinton Sand	sand, glauconitic sand	composite confining unit
			Red Bank Sand	sand, clayey silt, some glauconite sand	composite confining unit: Red Bank Sand
			Navesink Formation	glauconite sand	composite confining unit
			Mount Laurel Sand	sand	Wenonah-Mount Laurel aquifer
			Wenonah Formation	silty sand, some glauconite	Marshalltown-Wenonah confining unit
			Marshalltown Formation	clayey silt, glauconitic sand	
			Englishtown Formation	sand, clayey silt	Englishtown aquifer system
			Woodbury Clay	clayey silt	Merchantville-Woodbury confining unit
			Merchantville Formation	clayey silt, glauconitic sand	
			Magothy Formation	sand, clayey silt	Potomac-Raritan-Magothy aquifer system: upper aquifer confining unit
			Raritan Formation		Potomac-Raritan-Magothy aquifer system: middle aquifer confining unit
		Lower Cretaceous	Potomac Group	gravel, sand, silt, clay	Potomac-Raritan-Magothy aquifer system: lower aquifer
	Jurassic	Lower Jurassic	Newark Supergroup, Brunswick Group: Boonton Formation	sandstone, siltstone, shale, conglomerate	Ground water occurs along bedding surfaces, joints, faults, intergranular spaces, and other openings
			Newark Supergroup, Brunswick Group: Hook Mountain Basalt	basalt	
			Newark Supergroup, Brunswick Group: Towaco Formation	sandstone, siltstone, shale, conglomerate	
			Newark Supergroup, Brunswick Group: Preakness Basalt	basalt, intercalated sedimentary rock	
			Newark Supergroup, Brunswick Group: Feltville Formation	sandstone, siltstone, shale, conglomerate, limestone	
			Newark Supergroup, Brunswick Group: Orange Mountain Basalt; diabase intrusives	basalt; diabase	
	Triassic	Upper Triassic	Newark Supergroup, Brunswick Group: Passaic Formation	sandstone, siltstone, shale, conglomerate	
			Newark Supergroup: Lockatong Formation	siltstone, mudstone, sandstone, shale	
			Newark Supergroup: Stockton Formation	arkosic sandstone, siltstone, shale, conglomerate	

VALLEY AND RIDGE

Era	System	Series	Stratigraphic unit	Predominant lithology
PALEOZOIC	Devonian		Marcellus Shale	shale, siltstone
			Buttermilk Falls Limestone	argillaceous limestone
			Schoharie Formation	calcareous siltstone
			Esopus Formation	siltstone, sandstone
		Oriskany Group	Ridgely Sandstone	sandstone, calcareous conglomerate
			Shriver Chert	shale, siltstone, chert
			Glenerie Formation	limestone
		Helderburg Group	Port Ewen Shale	calcareous shale, siltstone
			Minisink Limestone	limestone, calcareous shale
			New Scotland Formation	calcareous silty shale
			Coeymans Formation	limestone, sandstone, conglomerate
			Rondout Formation	limestone, calcareous shale, dolomite
	Silurian		Decker Formation	calcareous sandstone, sandy limestone
			Bossardville Limestone	argillaceous, partly dolomitic limestone
			Poxono Island Formation	calcareous shale, dolomite
			Bloomsburg Red Beds	shale, siltstone, sandstone
			Shawangunk Formation	conglomeratic quartzite

GREEN POND MOUNTAIN REGION

Stratigraphic unit	Predominant lithology
Skunnemunk Conglomerate	conglomerate
Bellvale Sandstone	sandstone, siltstone, shale
Cornwall Shale	shale, siltstone
Kanouse Sandstone	conglomeratic sandstone, siltstone
Esopus Formation	siltstone, sandstone
Connelly Conglomerate	conglomeratic quartzite
Berkshire Valley Formation	calcareous siltstone, silty dolomite, sandstone
Poxono Island Formation	calcareous shale, dolomite
Longwood Shale	shale, siltstone
Green Pond Conglomerate	conglomeratic quartzite, siltstone

Hydrogeologic characteristics: Ground water occurs along bedding surfaces, joints, faults, intergranular spaces, solution cavities, and other openings

Era	System	Series	Stratigraphic unit	Predominant lithology	Hydrogeologic characteristics
PALEOZOIC	Ordovician	Upper Ordovician	Beemerville intrusive complex	nepheline syenite, intrusive alkalic igneous rocks	Ground water occurs along bedding surfaces, joints, faults, solution cavities, intergranular spaces, and other openings
			Martinsburg Formation	slate, siltstone, graywacke	
		Middle Ordovician	Jacksonburg Limestone	limestone, argillaceous limestone	
		Lower Ordovician	Kittatinny Supergroup, Beekmantown Group: Ontelaunee Formation	dolomite, limestone (Ontelaunee, Epler)	
			Kittatinny Supergroup, Beekmantown Group: Epler Formation		
			Kittatinny Supergroup, Beekmantown Group: Rickenbach Dolomite	sandy dolomite (Rickenbach)	
			Jutland klippe units (not part of Kittatinny Supergroup)	shale, limestone, chert (Jutland)	
	Cambrian	Upper Cambrian	Kittatinny Supergroup: Allentown Dolomite	dolomite, calcareous sandstone	
		Middle Cambrian	Kittatinny Supergroup: Leithsville Formation	dolomite, calcareous shale	
		Lower Cambrian	Hardyston Quartzite	arkosic quartzite, conglomerate (Hardyston)	
?	Ordovician (?) Cambrian (?) Late Proterozoic (?)		Manhattan Schist, Wissahickon Formation, serpentinite, Chickies Quartzite	sillimanite-garnet-muscovite-biotite schist (Manhattan); schist, metagraywacke, amphibolite, altered ultramafics (Wissahickon); highly sheared serpentinite preserving few original igneous structures; quartz-sericite schist, conglomerate (Chickies)	Ground water occurs in joints, faults, foliation surfaces, solution cavities, and other openings
PROTEROZOIC	Late Proterozoic (?)		Chestnut Hill Formation	greenschist-grade metasedimentary and metavolcanic (?) rock	
	Middle Proterozoic		Byram Intrusive Suite, Lake Hopatcong Intrusive Suite, Mount Eve Granite	granite, quartz syenite, syenite, quartz monzonite, monzonite, and granodiorite	
			metasedimentary rocks	quartzofeldspathic and calcareous metasedimentary rocks including the Franklin and Wildcat Marbles	
			Losee Metamorphic Suite	highly sodic gneissic and granitoid rocks; amphibolite	

This table is a generalized guide to stratigraphic and aquifer nomenclature in common usage in New Jersey as of 1990. Due to space limitations, it does not include member names, facies names, or less commonly used aquifer names. In addition, it does not include stratigraphic terms and concepts to be introduced as part of the NJ Geological Survey/US Geological Survey COGEOMAP project. The discussion on the back provides a very brief geographic and tectonic context. References were chosen favoring detail specific to New Jersey and recent publication rather than original work. For this reason, informal publications and summary papers are included.

Discussion of Generalized Stratigraphic Table

New Jersey stratigraphic units are commonly grouped into surficial sediments resulting from coastal, alluvial, glacial, and periglacial processes of the past 15 million years (fig. 1) and older, generally thicker units within structural and physiographic regions resulting from major tectonic events of the past 1.6 billion years (fig. 2).

The oldest rocks in New Jersey are granulite-facies metamorphic and granitic igneous rocks exposed in the Reading and Trenton prongs (Drake, 1984; Volkert and Drake, 1986). These form the crystalline basement northwest of the limit of highly metamorphosed Paleozoic rocks (fig. 3). They are part of the Grenville terrane, which accreted to older rocks during the Grenville orogeny (table 1) to form the North American craton.

Unconformably above the Grenville rocks are sedimentary rocks of the Iapetus Ocean, which opened in the Late Precambrian and closed during the Taconic orogeny. Stratigraphic units shown here are from Lyttle and Epstein (1987), and Markewicz and Dalton (1980).

Rocks of the western margin of Iapetus are exposed in the Valley and Ridge and in linear belts within the Reading prong. The Hardyston Quartzite shows initial clastic sedimentation. Subsequent development of a carbonate platform resulted in deposition of the Kittatinny Supergroup. Contemporaneous deeper-water continental margin and oceanic environments are represented to the east by the Jutland sedimentary units and metasedimentary and metaigneous rocks within the Manhattan and Trenton prongs (Perissoratis and others, 1979; Lyttle and Epstein, 1987).

Change from a trailing margin to a convergent margin in the late Early Ordovician led first to uplift and unconformity, then to submergence and deposition of the shallow marine and submarine slope Jacksonburg and deeper-water Martinsburg. The Taconic orogeny led to closing of the Martinsburg foreland basin, uplift, low-grade metamorphism in northwestern New Jersey, amphibolite facies metamorphism to the east, and folding and northwestward thrusting.

From the Taconic orogeny into the Middle Devonian, shallow marine sediments and alluvial clastics indicate that northwestern New Jersey was near the eastern margin of a shifting interior sea. Middle Paleozoic units shown here are from Lyttle and Epstein (1987) and Herman and Mitchell (in press). Above these units is an unconformity representing Middle Devonian to Upper Triassic time.

The late Paleozoic Alleghanian orogeny, the result of collision between the North American and African continental plates, was expressed in New Jersey through uplift and renewed faulting and folding of Taconic structures (Herman and Monteverde, 1989).

Triassic and Jurassic crustal extension and shearing associated with early stages of the formation of the Atlantic Ocean created continental fault-block basins. The Newark basin was filled with clastic fluvial and lacustrine sediments, and basalt and diabase magma. During final separation of the North American and African continental plates, the Newark Supergroup rocks were tilted to roughly their present attitude (Manspeizer and Cousiminier, 1988).

Coastal Plain sediments, predominantly deltaic, shallow marine, and continental shelf clastics, record several major transgressive cycles. Units are generally thicker and reflect deeper water to the southeast. The units shown here are from Lyttle and Epstein (1987), and Johnson (1950).

Surficial deposits of New Jersey are generally no more than a few feet, rarely as much as 300 feet, thick. The Bridgeton and Pensauken reflect a persistent drainage pattern: to the southwest along the inner margin of the Coastal Plain, then to the southeast parallel to the Delaware River (Owens and Minard, 1979).

Pleistocene and Holocene deposits record fluctuating conditions related to cyclic glaciation. Alluvial, coastal and estuarine deposits of the Cape May Formation record rise and fall of sea level due to changes in global ice volume (Newell and others, 1988). Northern New Jersey glacial deposits record at least three ice advances. Colluvial, residual and eolian deposits formed most rapidly under periglacial conditions, but also date from interglacial and postglacial times.

Postglacial sediments include lake and marsh deposits (most extensive in areas of glacially-disrupted drainage), estuarine and shoreline deposits postdating rapid sea-level rise, alluvial sands and gravels, and anthropogenic materials.

ERA	PERIOD	TIME (millions of years before present)	GEOLOGIC EVENTS
CENOZOIC	Holocene	present-0.016	Postglacial rise of sea level; shoreline, alluvial, and marsh sedimentation
	Pleistocene	0.016-1.0	Cyclic glaciation, associated rise and fall of sea level
	Pliocene	1.0-5.3	
	Miocene	5.3-23.7	Alluvial sedimentation (Beacon Hill, Bridgeton, Pensauken)
	Oligocene	23.7-36.6	Sedimentation on subsiding Atlantic continental margin
	Eocene	36.6-57.8	
	Paleocene	57.8-66.4	
MESOZOIC	Cretaceous	66.4-144	
	Jurassic	144-208	Rifting, deformation of Newark basin, opening of Atlantic Ocean basin; unconformity; Basaltic magmatism, sedimentation (Newark Supergroup)
	Triassic	208-245	Shear and extension prior to opening of Atlantic, clastic sedimentation (Newark Supergroup)
PALEOZOIC	Permian	245-286	
	Pennsylvanian	286-320	unconformity; Alleghanian orogeny
	Mississippian	320-360	
	Devonian	360-408	
	Silurian	408-438	Epicontinental sea to west; clastic sedimentation from east
	Ordovician	438-505	unconformity; Taconic orogeny; Submergence of continental margin; carbonate sedimentation (Jacksonburg) followed by deeper-water clastic deposition (Martinsburg); unconformity; Iapetus continental margin changes from passive to convergent
	Cambrian	505-570	Continental margin sedimentation in west (Hardyston, Kittatinny), deeper-water and oceanic sedimentation to east (Jutland, protoliths of Manhattan and Wissahickon)
PRECAMBRIAN	Late Proterozoic	570-900	unconformity; Sedimentation, volcanism (?) (Chestnut Hill)
	Middle Proterozoic	900-1600	unconformity; Grenville Orogeny (metamorphism, plutonism, several phases of tectonism, post-kinematic emplacement of Mount Eve Granite); Emplacement of protoliths of layered metasedimentary rocks (graywacke, arkose and carbonate); unconformity; Emplacement of Losee protolith (probably dacite, keratophyre and spilite)

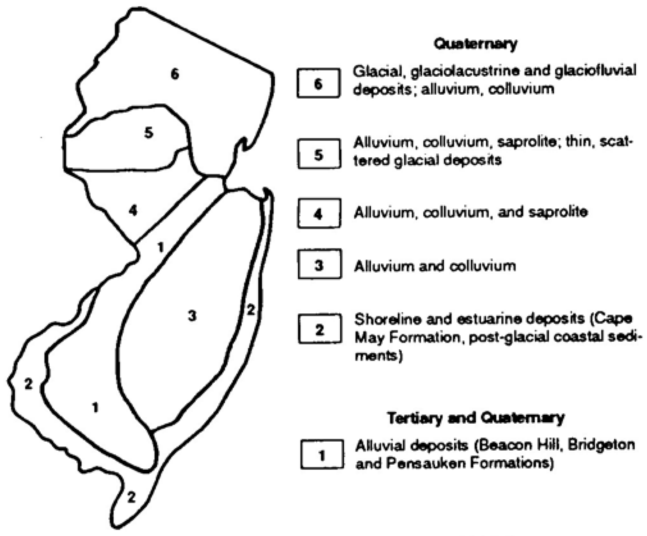

Figure 1. **PREDOMINANT SURFICIAL MATERIALS**

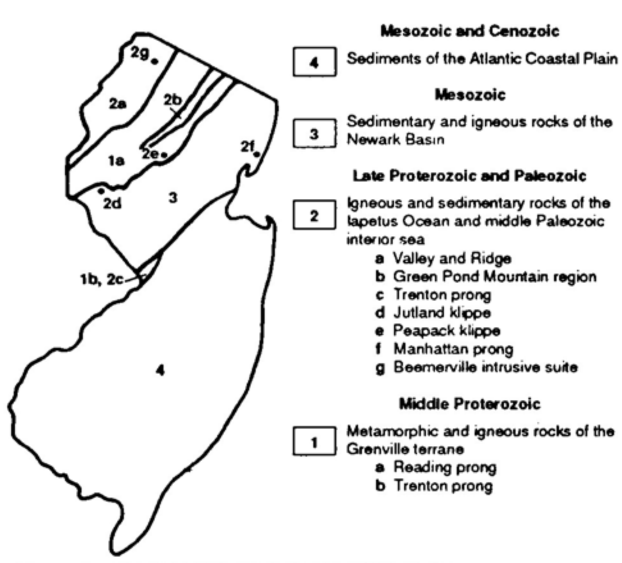

Figure 2. **DIAGRAMMATIC GEOLOGIC MAP**

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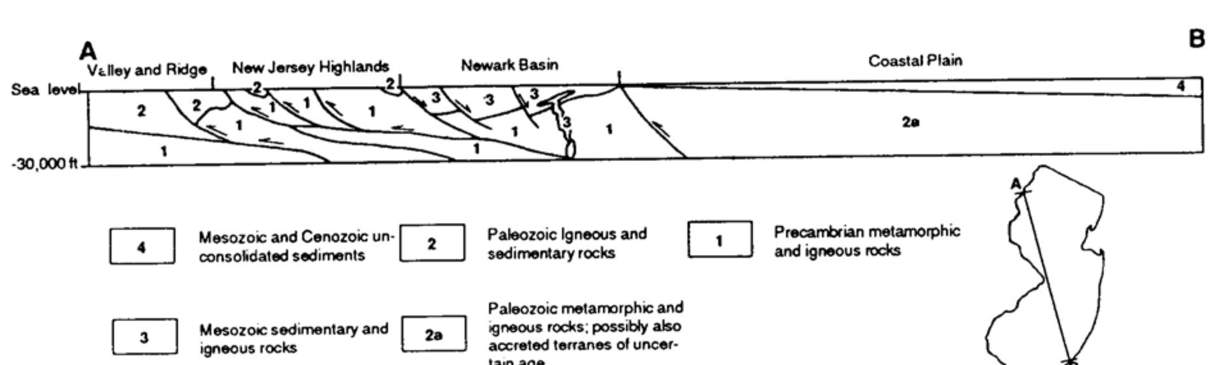

Figure 3. **DIAGRAMMATIC GEOLOGIC CROSS SECTION THROUGH NEW JERSEY**