Surficial Aquifer Potential Map of Connecticut

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DATA SOURCES

Surficial Materials from 1:24,000 scale digital data published by the U.S. Geological Survey and the Connecticut Geological and Natural History Survey, State of Connecticut, Department of Environmental Protection (Stone et al 1992). Compiled by the Connecticut Geological and Natural History Survey, Department of Environmental Protection, 1995.

Glacial deposit Thickness from 1:125,000 scale digital data published by the U.S. Geological Survey and the Connecticut Geological and Natural History Survey, State of Connecticut, Department of Environmental Protection (Stone et al 1998). Compiled by the Connecticut Geological and Natural History Survey, State of Connecticut,Department of Environmental Protection in cooperation with the U.S. Geological Survey, 2000

Surface Elevations from 1:100,000 scale digital data published by the Long Island Sound Resource Center, a partnership between the State of Connecticut, Department of Environmental Protection and the University of Connecticut. Compiled by the U.S. Geological Survey, National Mapping Program, 2004

Roads from 1:100,000 scale digital data published by the State of Connecticut Department of Environmental Protection and the University of Connecticut Center for Geographic Information and Analysis. Compiled by the U.S. Department of Commerce, U.S. Census Bureau, Geography Division, 2003.

CT Political Boundary from 1:24,000 scale digital data edited and published by The State of Connecticut, Department of Environmental Protection. Compiled by the U.S. Geological Survey, National Mapping Program, 1994.

Towns from 1:125,000 scale digital data edited and published by The State of Connecticut, Department of Environmental Protection. Compiled by the U.S. Geological Survey, National Mapping Program, 1986.

Regional Drainage Basins from 1:24,000 scale digital data compiled and edited by The State of Connecticut, Department of Environmental Protection and the U.S. Geological Survey, Connecticut Office, 1978-1988. Published by the Connecticut Department of Environmental Protection 1988.

Water from 1:24,000 scale digital data edited and published by The State of Connecticut, Department of Environmental Protection. Compiled by the U.S. Geological Survey, National Mapping Program, 1999.

All information compiled for this map is available as digital data from the Connecticut Department of Environmental Protection. http://ct.gov/dep

Aquifer Textures from Surficial Materials

Surficial materials textures (Stone et al, 1992) used to compile map units of the Surficial Aquifer Potential Map

Coarse-Grained Deposits	Fine-Grained Deposits overlying Coarse-Grained Deposits
gravel	fines overlying gravel
gravel overlying sand	fines overlying sand
gravel overlying sand & gravel	fines overlying sand & gravel
gravel overlying sand & gravel overlying sand	
sand	sand overlying fines overlying sand & gravel
sand overlying gravel	sand & gravel overlying fines overlying sand & gravel
sand overlying sand & gravel	
	swamp overlying fines overlying sand
sand & gravel	
sand & gravel overlying sand	alluvium overlying fines overlying gravel
sand & gravel overlying sand overlying sand & gravel	alluvium overlying fines overlying sand
	alluvium overlying fines overlying sand & gravel
alluvium overlying sand	
alluvium overlying sand overlying sand & gravel	
alluvium overlying sand & gravel	
alluvium overlying sand & gravel overlying sand	
swamp overlying sand	
swamp overlying sand overlying sand & gravel	
swamp overlying sand & gravel	

SURFICIAL AQUIFER POTENTIAL MAP PARTICLE SIZE DIAMETER DEFINITIONS
(Stone et al 1992, modified from Wentworth, 1922)

in.	10	2.5	.16	.08	.04	.02	.01	.005	.0025	.00015	
mm.	256	64	4	2	1	.5	.25	.125	.068	.004	
Boulders	Cobbles	Pebbles	Granules	Very Coarse	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	
Gravel Particles				Sand Particles					Fine Particles		
COARSE									FINE		

N W E S

1:150,000

0 1 2 3 4 6 8 Miles
0 2.5 5 10 15 20 Kilometers

CONTOUR INTERVAL 20 METERS
DATUM IS MEAN SEA LEVEL

SURFICIAL AQUIFER POTENTIAL

Thicker coarse-grained deposits have a higher potential yield.
Thicknesses are mapped for the entire surficial deposit.

Coarse-Grained Deposits Thickness (feet)
- 300-400
- 200-300
- 100-200
- 50-100
- 0-50

Fines over Coarse-Grained Deposits Thickness (feet)
- 200-300
- 100-200
- 50-100
- 0-50

Increasing Potential for Water Supply Development

- Other Glacial Meltwater Deposits with lower potential yield
- Water
- Swamp or Salt Marsh
- Roads
- Surface Elevation Contour (20 meter contour interval)
- Regional Drainage Basin
- Towns

BACKGROUND

The Surficial Aquifer Potential Map was prepared by the Connecticut Geological Survey at the request of the Water Protection and Land Reuse Bureau of the Department of Environmental Protection. A statewide view of surficial aquifer resources is necessary to facilitate proactive aquifer protection and water supply planning. Previous statewide groundwater availability (Meade 1978) and ground water yields mapping (Mazzaferro 1986) provided excellent planning documents at the time of publication. The compilation presented here incorporates geologic mapping and interpretations of Stone et al (1992; 1998; 2005) unavailable in the earlier treatments. Notably, the Surficial Materials Map of Connecticut (Stone et al 1992), used in this compilation, provides detailed 1:24,000 scale mapping which delineates larger and more numerous areas of coarse-grained deposits than previously known.

EXPLANATION

Connecticut citizens rely on a readily available water supply, derived from both surface and ground water sources. Ground water occurs in the pore spaces of unconsolidated materials overlying the bedrock, and within bedrock fracture systems. Any geologic formations (sediment or rock) capable of yielding a sufficient quantity of ground water to wells are called aquifers.

The amount of ground water available from an aquifer depends on many factors, including: the physical properties of the aquifer (how permeable and well-connected the pore spaces or fractures are), the size and composition of the watershed, climate, connection to surface water bodies, the amount of runoff due to impervious surfaces, and other water uses in the basin. In general, coarse-grained surficial aquifers (unconsolidated sediments overlying bedrock) have more, better connected pore spaces and are more productive than bedrock aquifers.

Surface water reservoirs and surficial aquifers serve most of Connecticut's urban areas. Bedrock aquifers have smaller to more moderate yields, but are also an important source of ground water, particularly in the upland areas of Eastern and Western Connecticut, away from urban population centers.

The Surficial Aquifer Potential Map delineates areas considered to have the greatest potential for ground water yield. The thicker and coarser-grained deposits have higher potential for water supply development. The most productive surficial aquifers in Connecticut are sand and gravel deposits originating from glacial meltwaters. These deposits are mapped where they occur at the surface and where they occur beneath fine-grained deposits. The map shows total estimated surficial deposit thickness. This includes the combined thickness of fine and coarse-grained portions of the surficial aquifer for units designated as such. Other glacial meltwater deposits are shown on the map to display the full extent of the surficial aquifers, but these fine-grained deposits have significantly lower potential yields. The white areas of the map are areas of till and shallow rock. Till is generally a thin, very poorly sorted glacial deposit with low potential yields. Potential bedrock yields were not included in this compilation.

The surficial aquifer potential areas are mapped based upon their geologic features, without regard to possible natural or man-made water quality issues that may exist. For example, coastal and estuarine aquifers may have naturally impaired water quality due to unacceptable levels of salinity. In some urbanized or industrialized areas, chemical contamination may impair ground water quality. Water quality was not considered in constructing this map, but would be critical in determining if the potential aquifer is viable as a water supply.

DISCUSSION

Coarse-grained glacial deposits have the greatest potential to both store and transmit water. The locations and thickness of these aquifers are of utmost importance for water management. Coarse-grained deposits of thicknesses greater than 50' are considered to have the greatest long term potential ground water yields, particularly where they occur near large rivers and streams. Where coarse-grained deposits have a water saturated thickness of 10' or greater, moderate to very large ground water yields of 50-2000 gallons per minute have been documented. The saturated thickness of these deposits has not been mapped statewide. Therefore, the overall thickness of these deposits may be used as a proxy for saturated thickness in that, given equal recharge, a greater coarse grained deposit thickness would have a higher potential of containing a greater volume of saturated material.

Detailed mapping of the surficial materials thickness at 1:24,000 scale is available for only 15% of the State. A wealth of historic hydrogeologic data is available for major watersheds of the State from the USGS Water Resources Bulletins (1968-1975). Generalized thickness estimates for coarse-grained deposits were assigned by geologic region for volume calculations conducted at 1:250,000 scale by DiGiacomo-Cohen and Quarrier (1992). Nevertheless, the most useful statewide compilation of surficial materials thickness became available recently as an element of the Quaternary Geologic Map of Connecticut and Long Island Sound Basin (Stone et al, 1998; 2005).

The compilation of surficial aquifer potential presented here is suitable for statewide and regional environmental planning, however there are several mapping enhancements that may be explored. These include evaluation of additional sources of information relative to potential yields and saturated thickness of surficial aquifers. Additional work regarding the nature and impact of bedrock fractures relative to regional ground water flow may reveal a systematic effect on the quantity of available ground water to surficial aquifers. Additional work toward detailed surficial thickness estimates would refine current surficial aquifer potential mapping units. Also, consideration of known water quality threats of both natural and man-made origins would further support assessments of potential surficial aquifer use for water supply.

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