

KINGWOOD TOWNSHIP ENVIRONMENTAL COMMITTEE

April 27, 2010

Ground Water in Kingwood Township

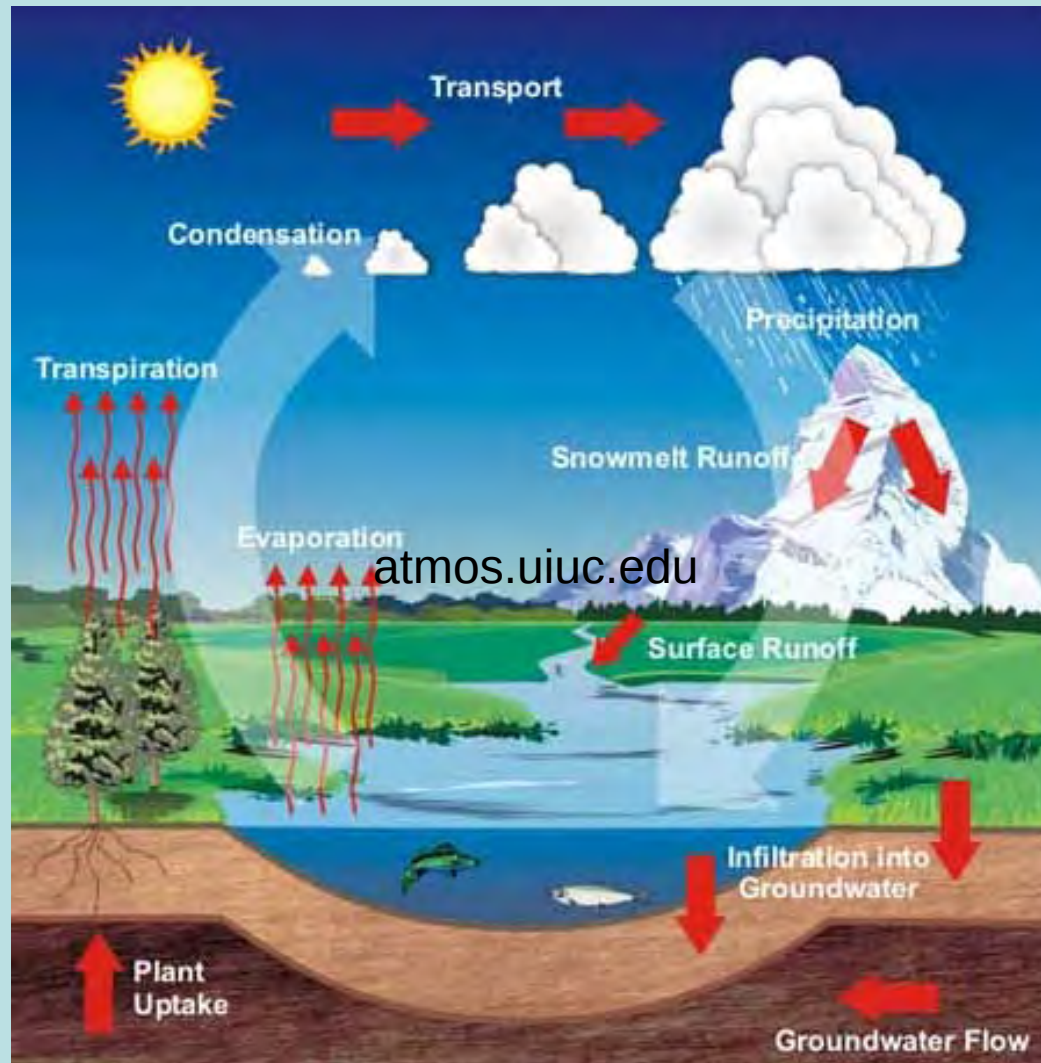
Gail Ashley
Debbie Kratzer

Information source, unless otherwise noted:
Environmental Resource Inventory for Kingwood Township, January 2009.
By D.J. Kratzer, Kratzer Environmental Services.

Goals of this presentation:

- Describe the hydrogeology of Kingwood Township.
- Describe the source of arsenic in the bedrock.
- Encourage residents to test their well water for arsenic.
- Provide resources for more information about arsenic and what to do if you find your well water exceeds the NJ arsenic standard.

Hydrologic Cycle



http://www.atmos.uiuc.edu/earths_atmosphere/water_cycle.html

Rivers, wetlands and groundwater are all part of the cycle

Bedrock Geology

Kingwood is in the piedmont province

Physiographic Provinces

Kingwood Township (within Piedmont)

- SEDIMENTARY ROCKS

CENOZOIC

Holocene: beach and estuarine deposits

Tertiary: sand, silt, clay

MESOZOIC

Cretaceous: sand, silt, clay

Jurassic: siltstone, shale, sandstone, conglomerate

Triassic: siltstone, shale, sandstone, conglomerate

PALEOZOIC

Devonian: conglomerate, sandstone, shale, limestone

Silurian: conglomerate, sandstone, shale, limestone

Ordovician: shale, limestone

Cambrian: limestone, sandstone

IGNEOUS AND METAMORPHIC ROCKS

MESOZOIC

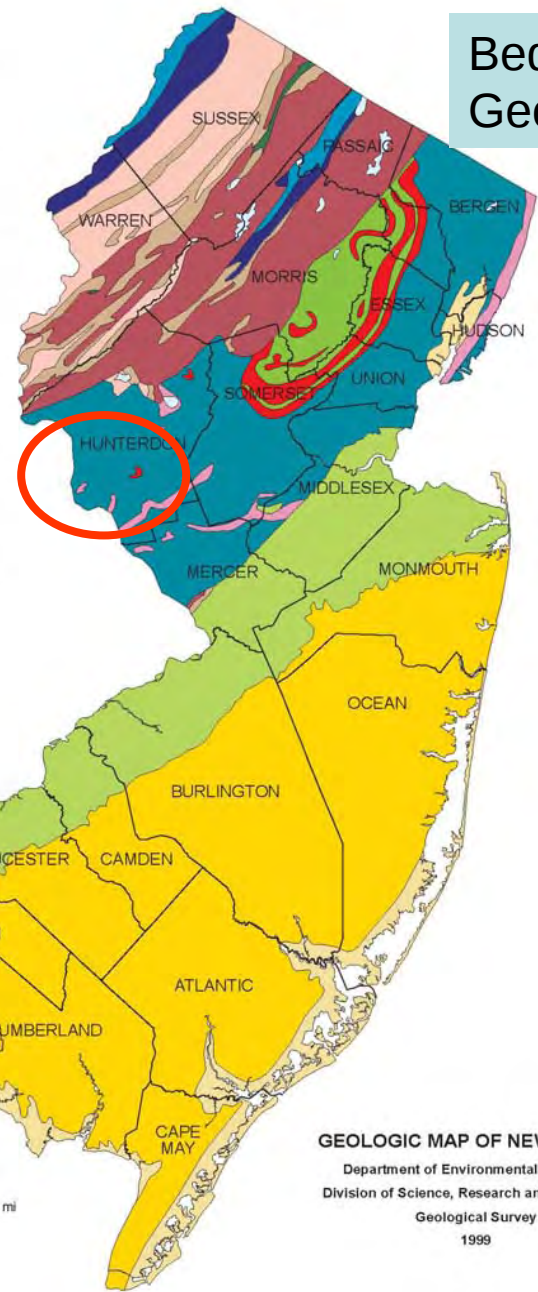
Jurassic: basalt

Jurassic: diabase

PRECAMBRIAN

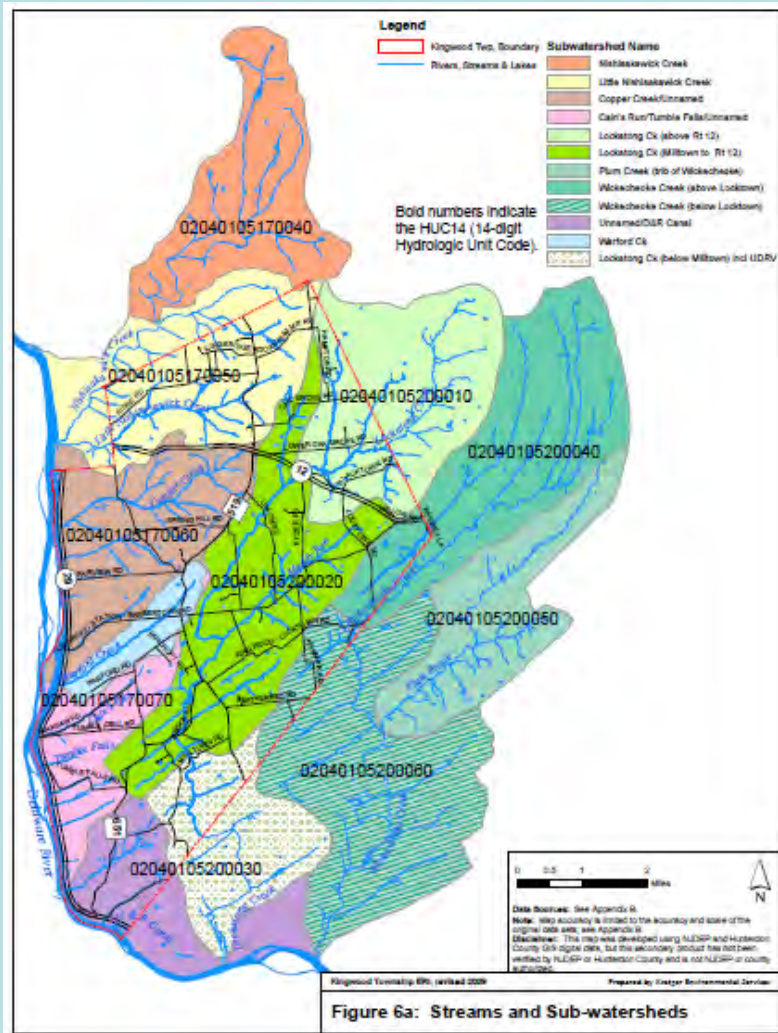
marble

gneiss, granite

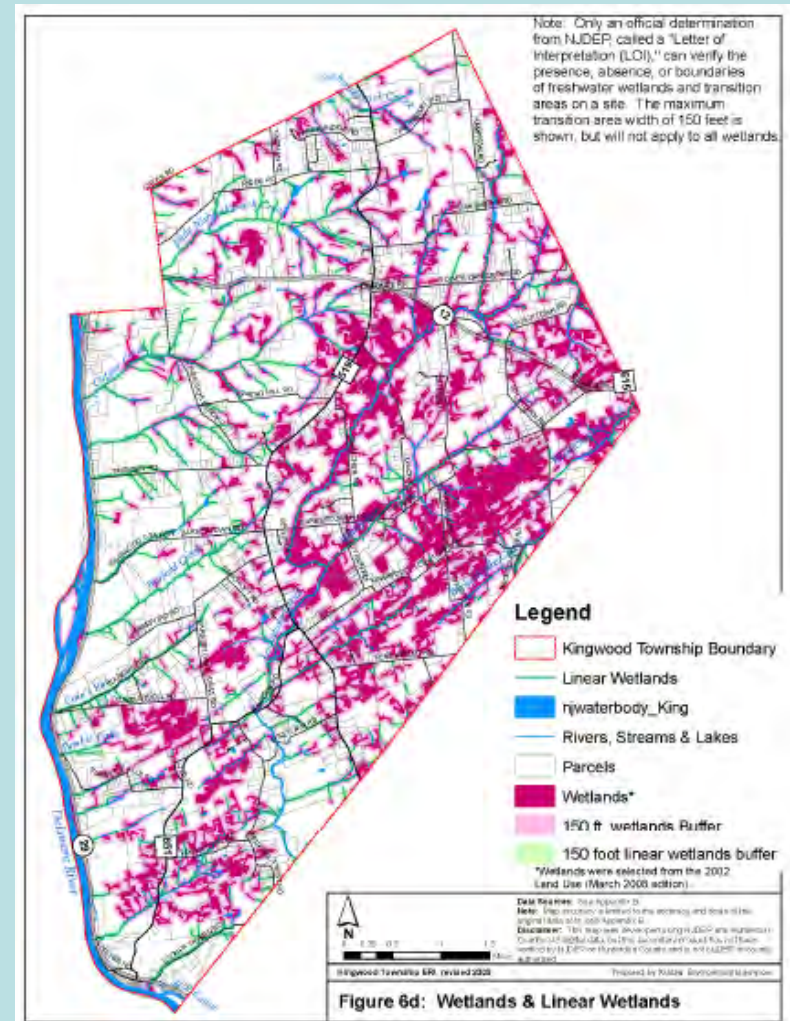


GEOLOGIC MAP OF NEW JERSEY
 Department of Environmental Protection
 Division of Science, Research and Technology
 Geological Survey
 1999

Surface Hydrology



Watersheds and streams



Wetlands

The information in this map is interpreted by the SSURGO soils data version 5 (12/07/06), indicating the dominant soil condition but does not eliminate the need for onsite investigation.

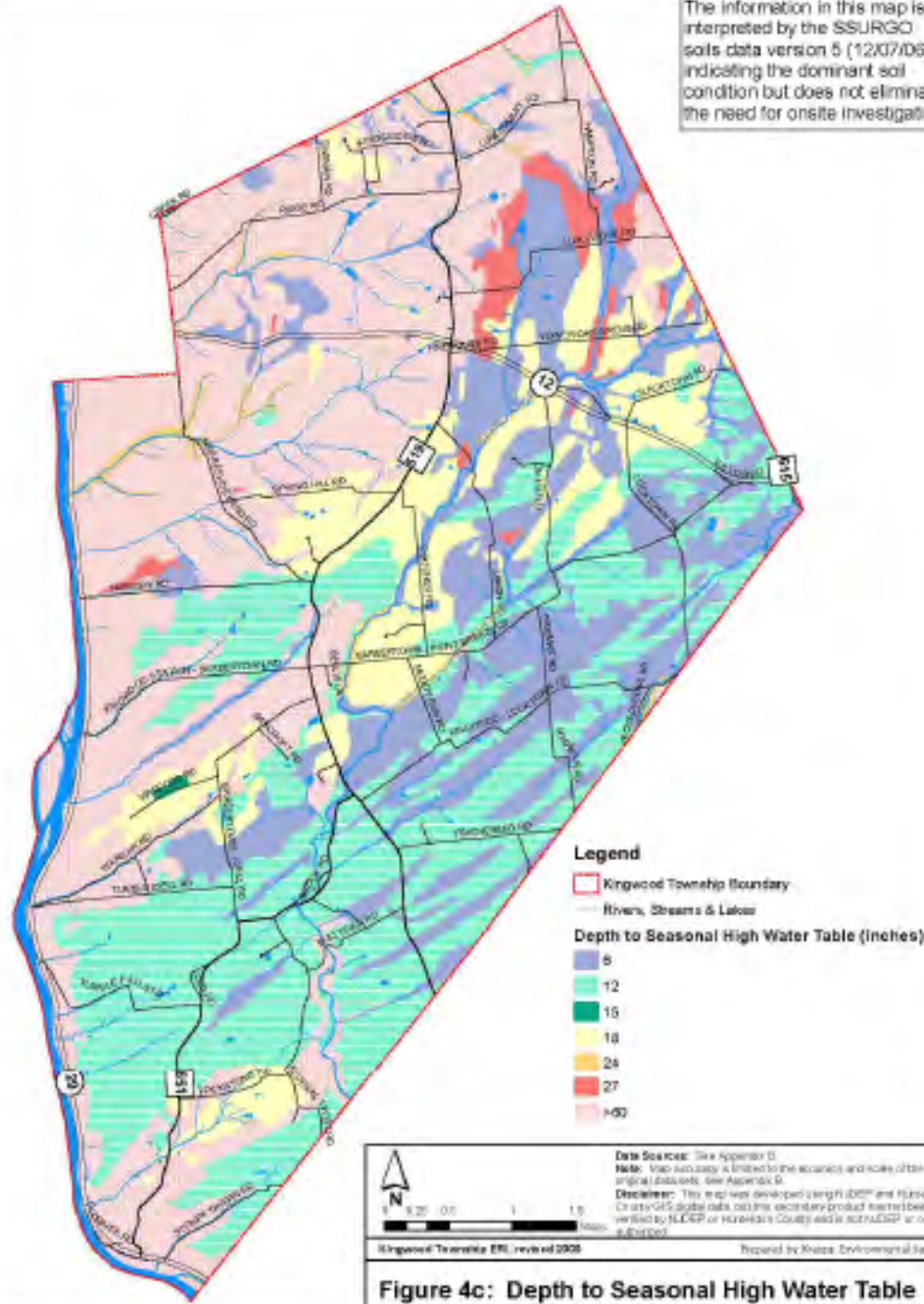
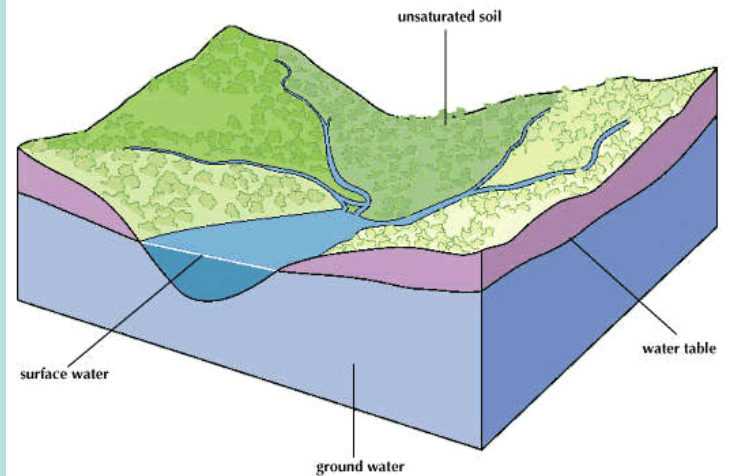
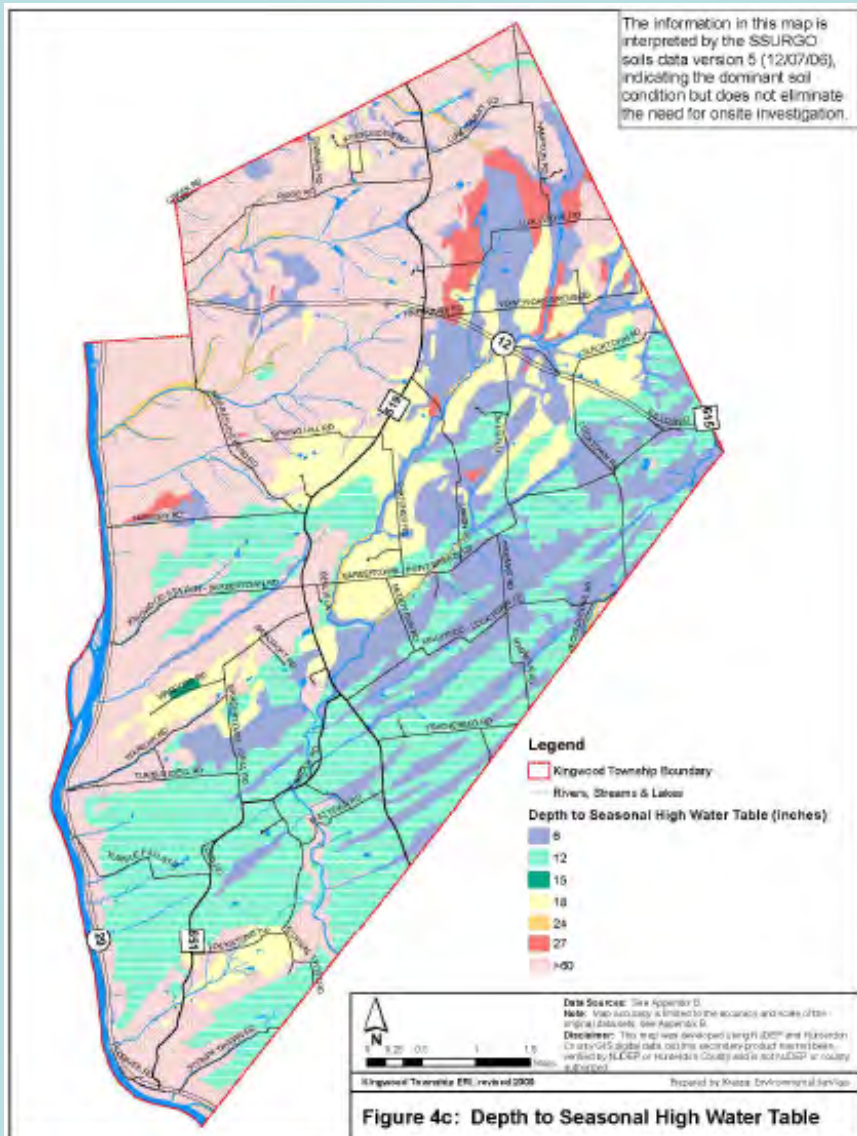


Figure 4c: Depth to Seasonal High Water Table

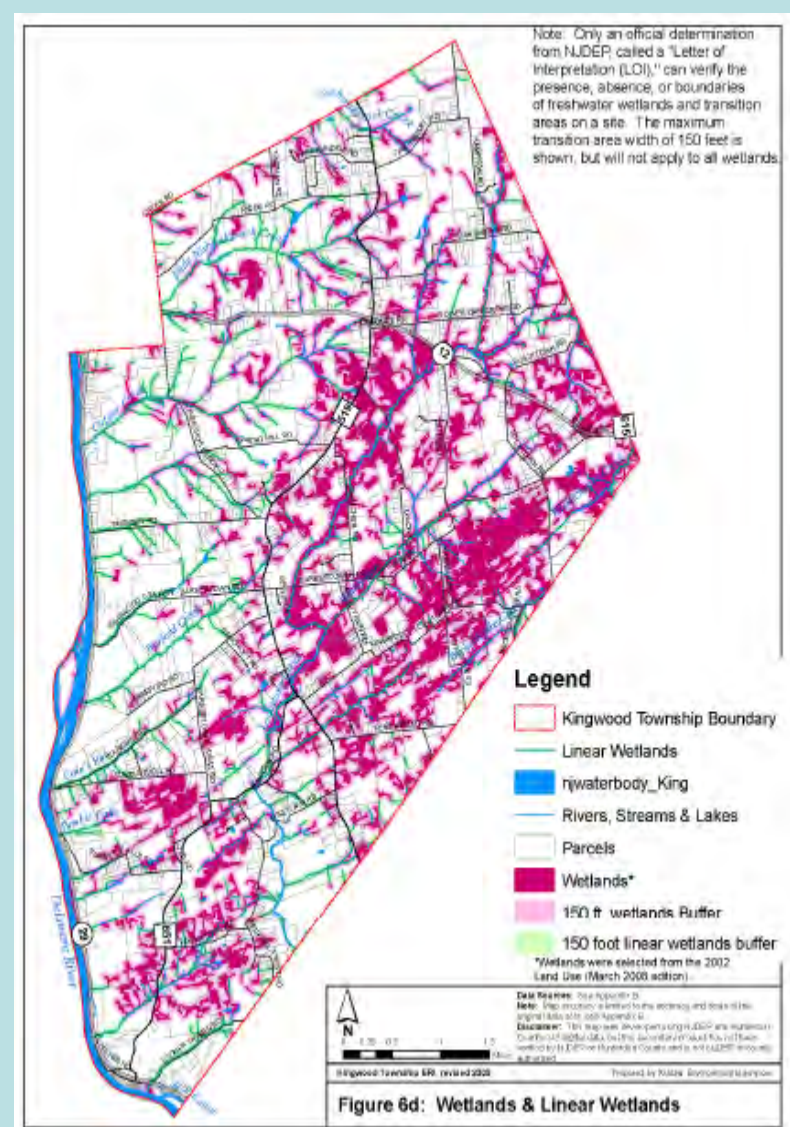
Depth to water table

How the Water Table Looks in a Cross Section of Land





The depth to seasonal high water table is as little as 6"- 12" in south and southeast part of Township



Wetlands are found where the water table is high

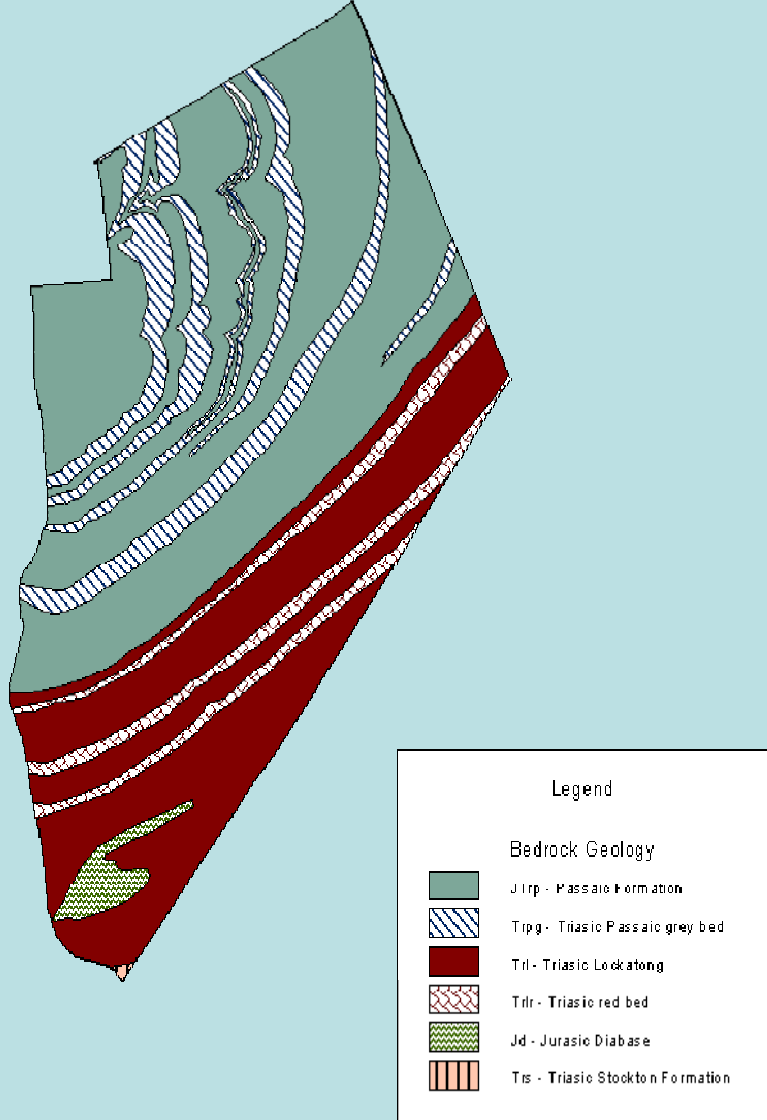
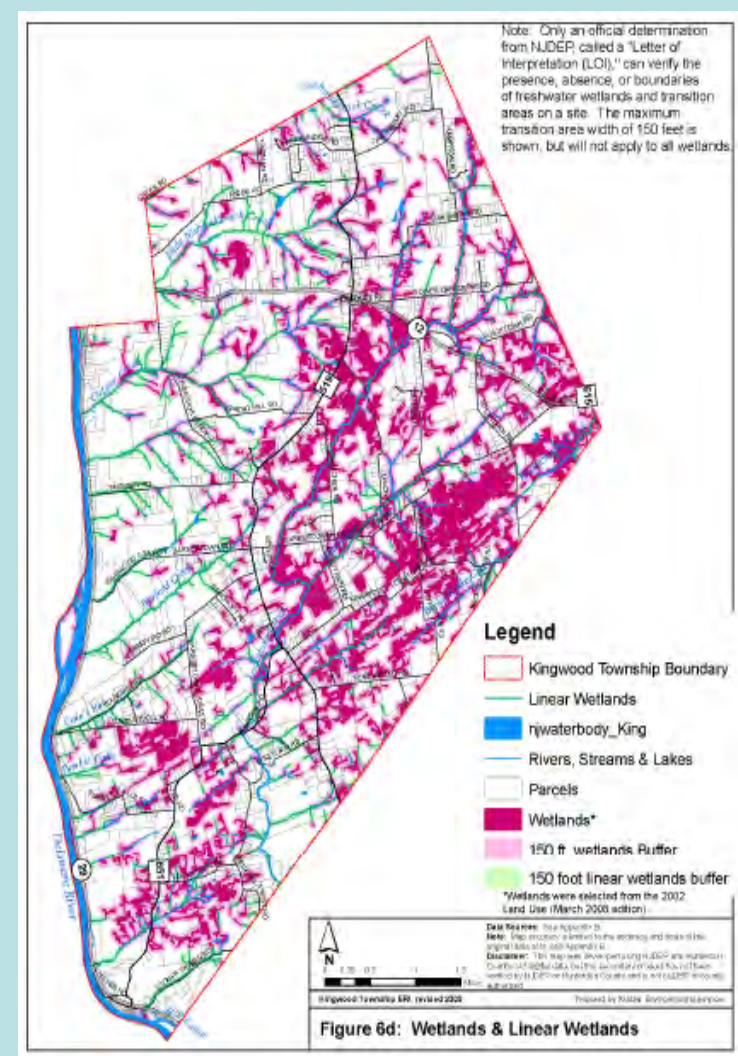


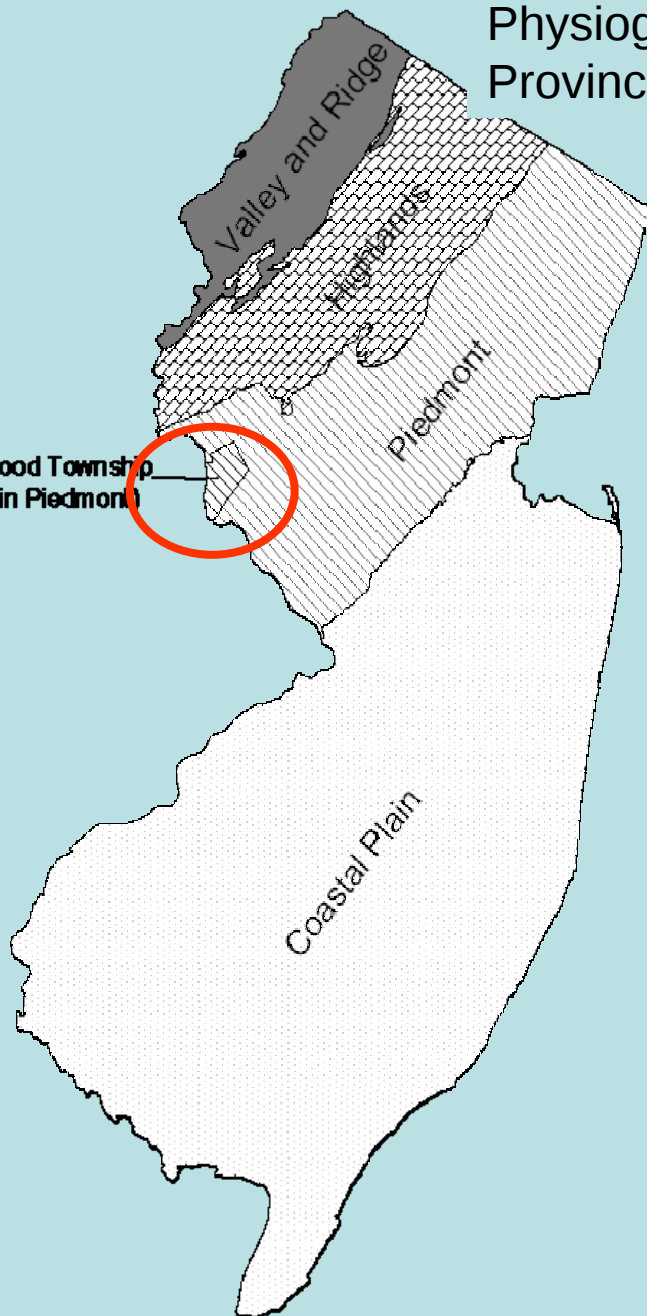
Figure 2a: Bedrock Geology of Kingwood Township



Wetlands are more common where Lockatong Fm bedrock occurs (in south and southeast Part of Township)

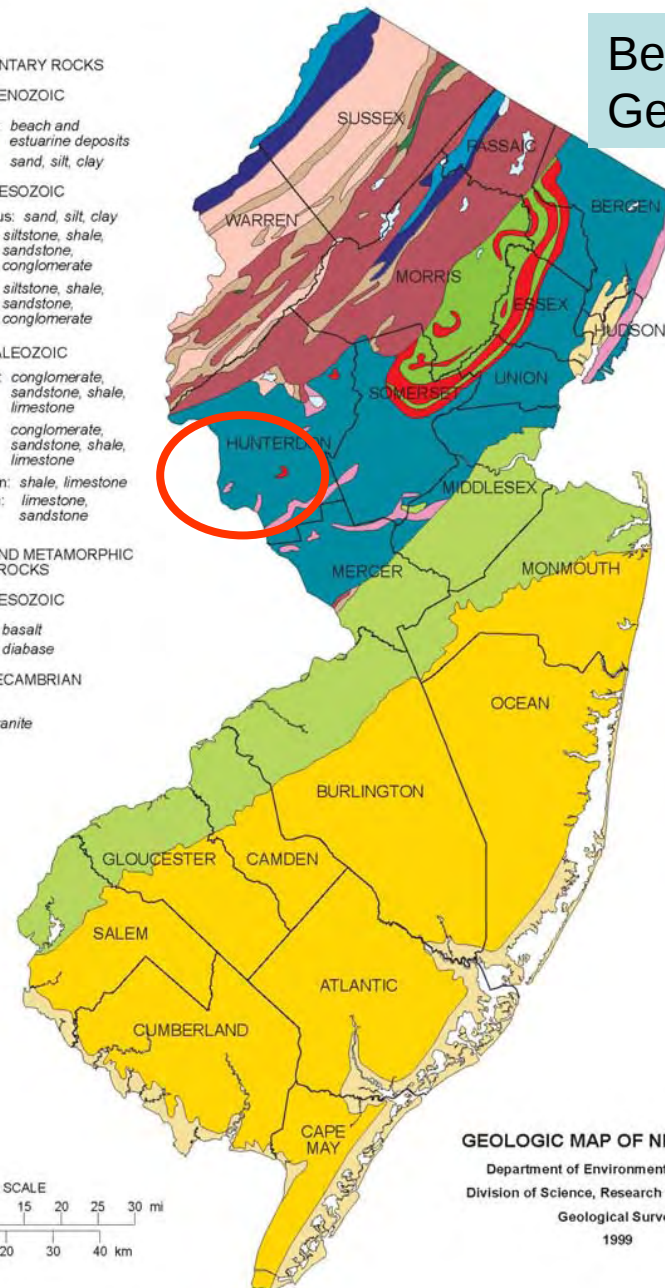
Physiographic Provinces

Kingwood Township
(within Piedmont)



Bedrock Geology

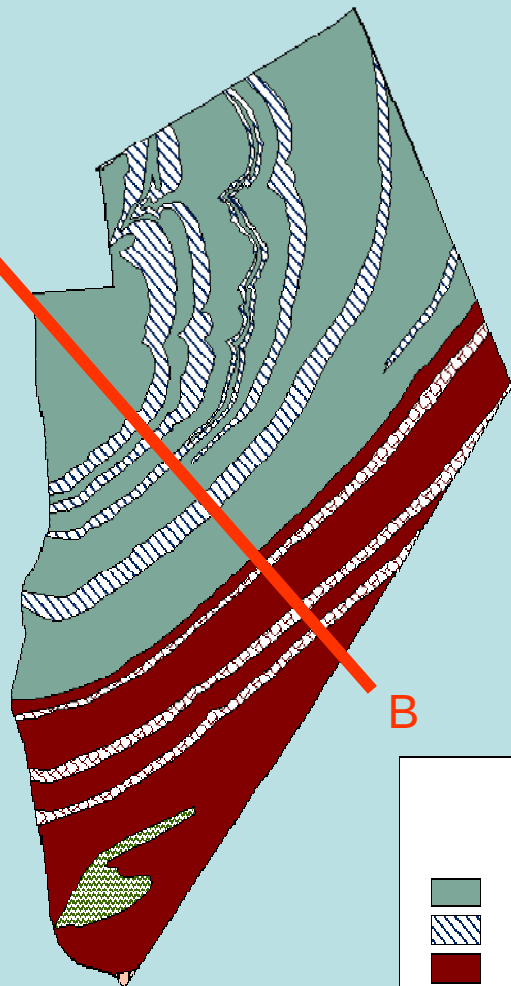
- SEDIMENTARY ROCKS**
- CENOZOIC**
- Holocene: beach and estuarine deposits
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- IGNEOUS AND METAMORPHIC ROCKS**
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- Jurassic: basalt
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- PRECAMBRIAN**
- marble
 - gneiss, granite



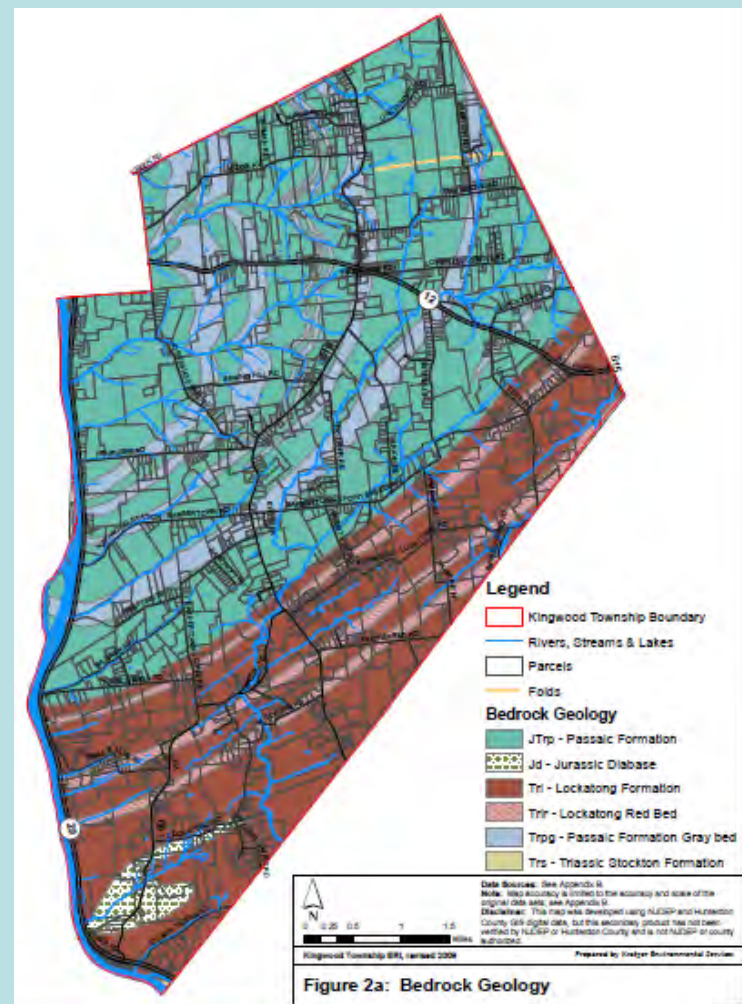
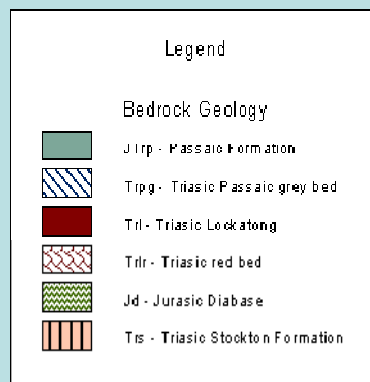
GEOLOGIC MAP OF NEW JERSEY

Department of Environmental Protection
Division of Science, Research and Technology
Geological Survey
1999

A



B



Data Source: Geology of Kingwood Township
 Scale: 1:100,000

Note: Map accuracy is limited to the accuracy of the scale of the original data sets.
 Disclaimer: This map was developed using NGLSP digital data, but the secondary product has not been verified by NGLSP or Hurstville County and is not NGLSP or county authorized.

0 2 4 Miles

Scale: 1:100,000
 Map Projection: NAD83



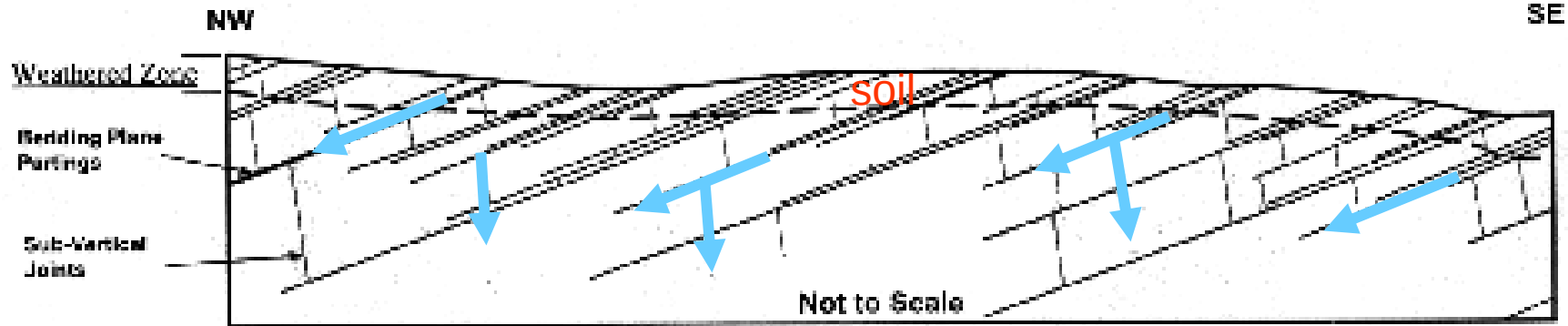
Kingwood Township GIS, 2009
 Prepared by: Geology Environmental Services

Figure 2a: Bedrock Geology of Kingwood Township

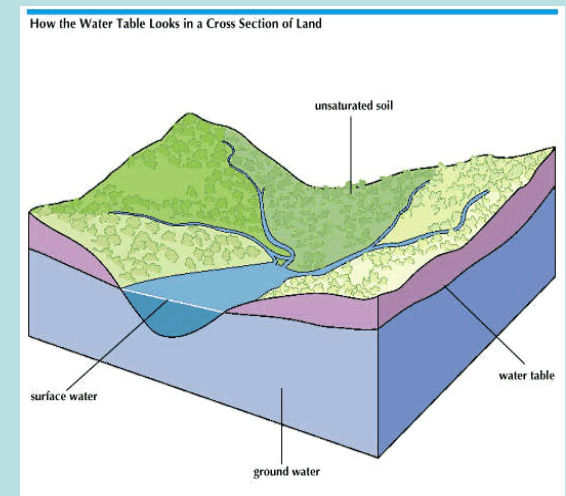
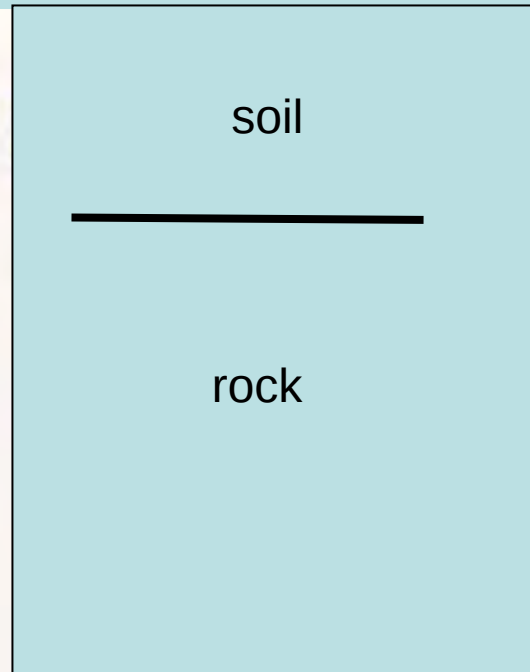
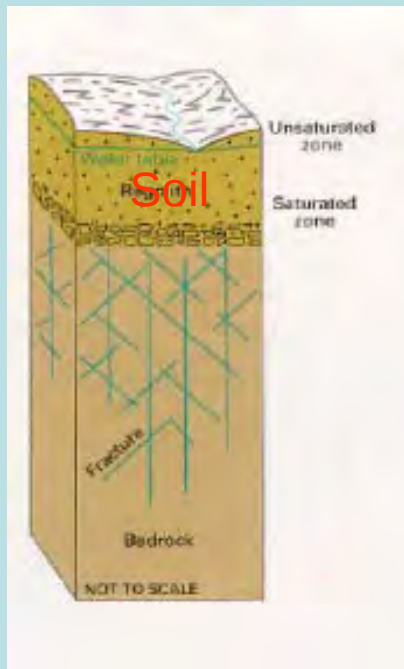
Water moves from surface along a tortuous path following bedding and fractures in the bedrock

B

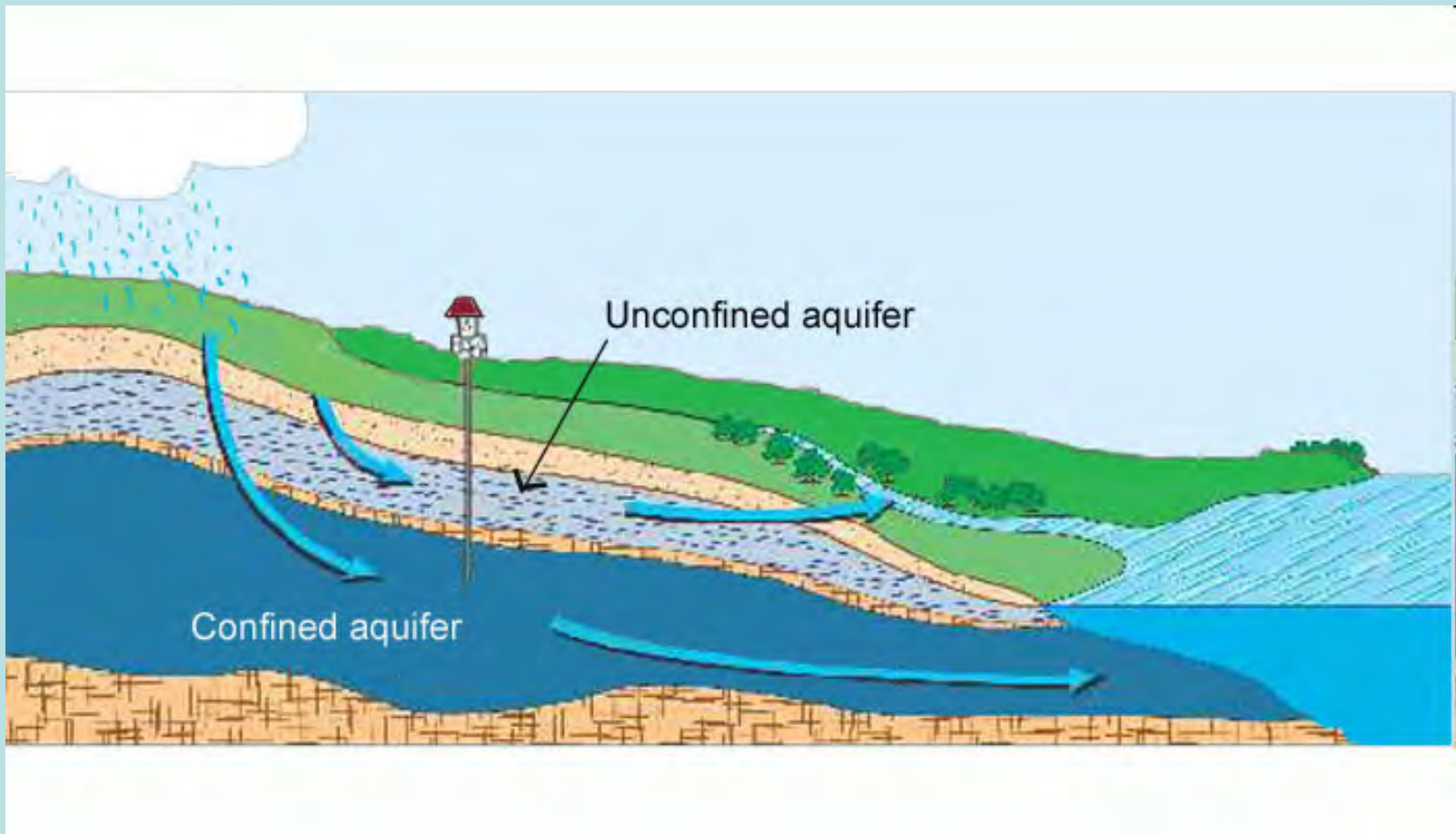
A



Fan et al. 2007



- An **aquifer** is a water-bearing rock or rock formation where water is present in usable quantities.



Illustrationsource:http://www.learner.org/courses/envsci/visual/visual.php?shortname=confined_unconfined_aquifer

The Aquifers of Kingwood Township

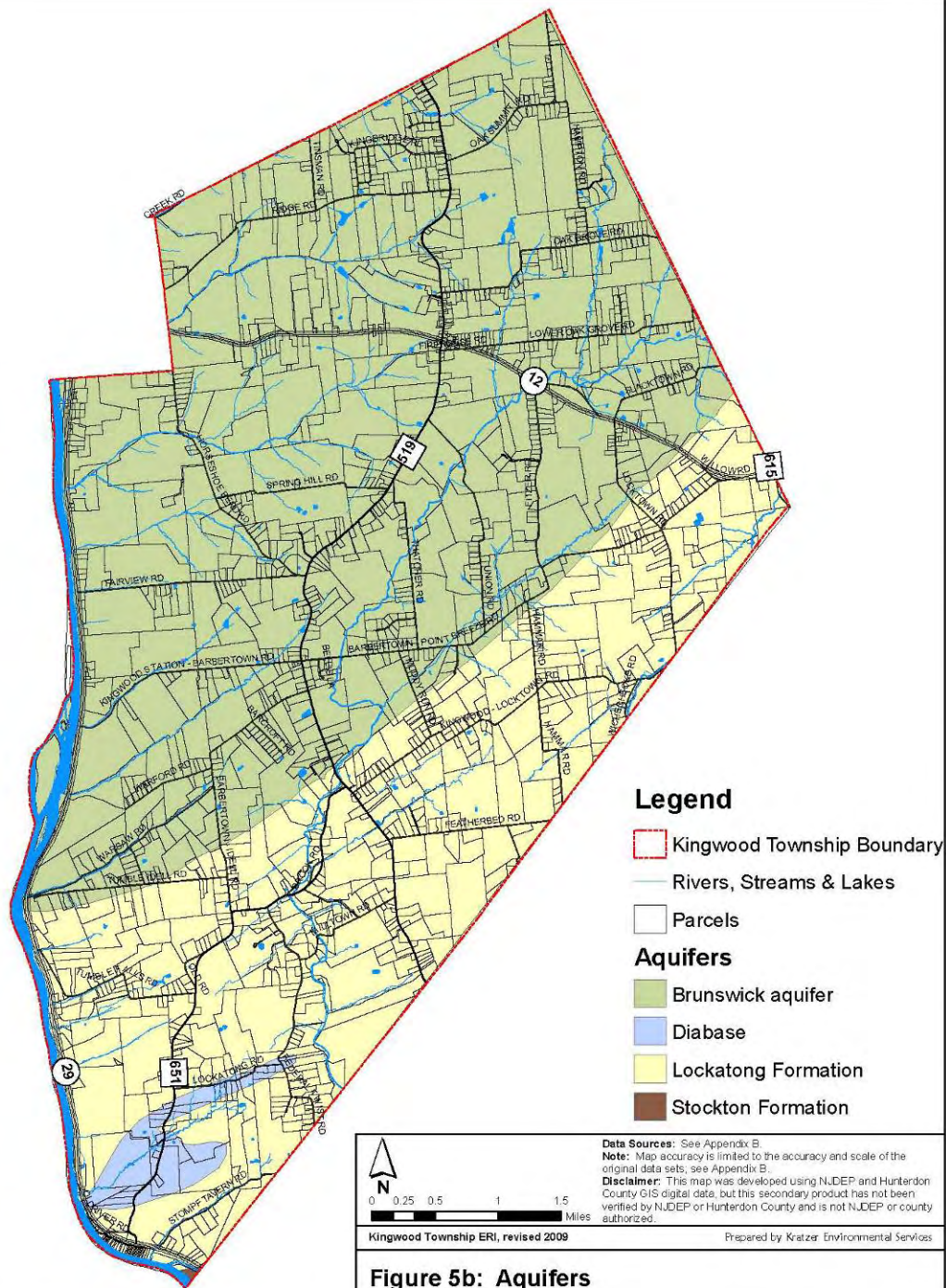


Figure 5b: Aquifers

Brunswick Aquifer

- Water stored and transmitted in fractures
- State Rank “C” for yield (on a scale of A through E, and A yielding the most water and E the least)

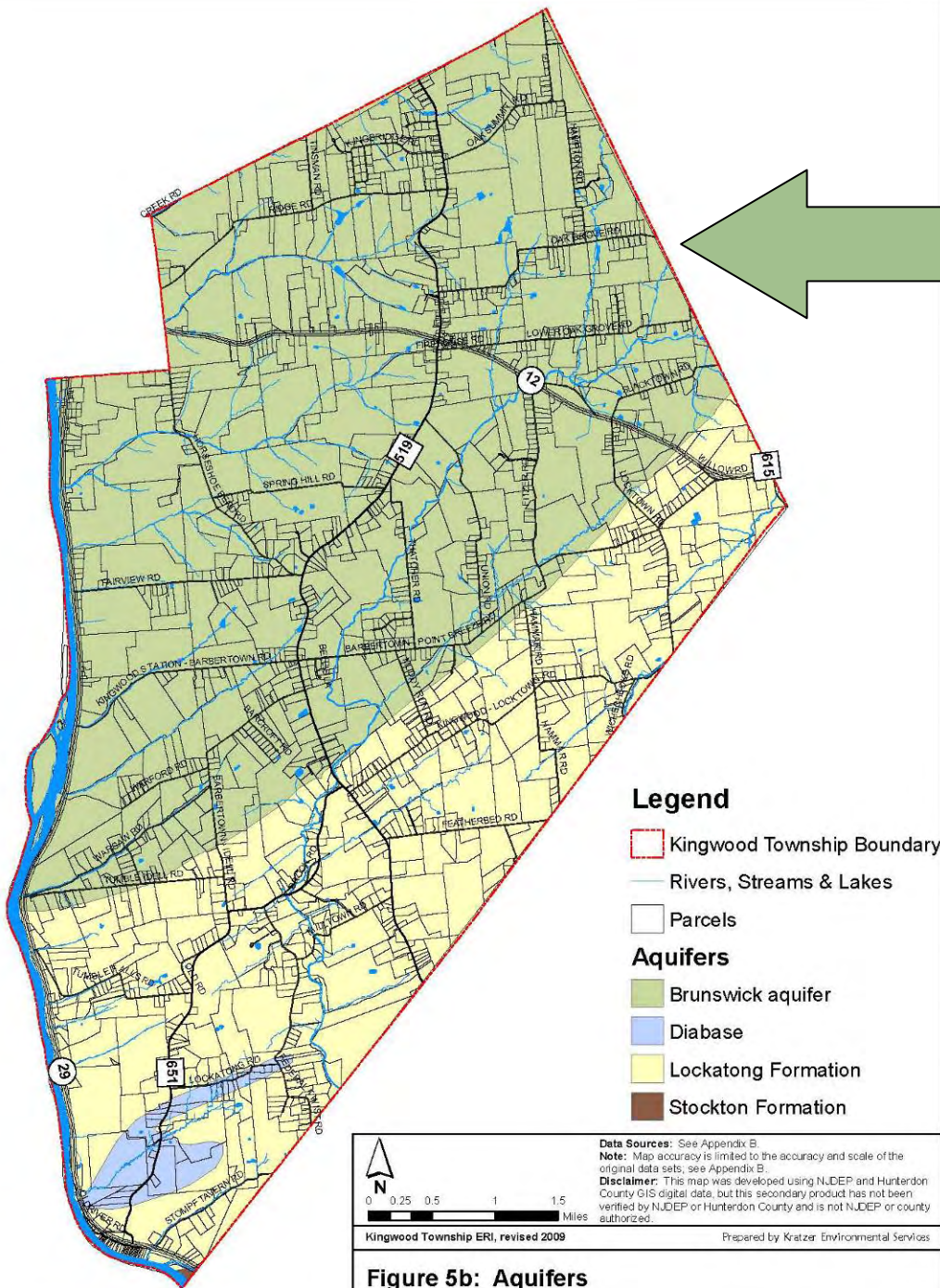


Figure 5b: Aquifers

Lockatong Aquifer

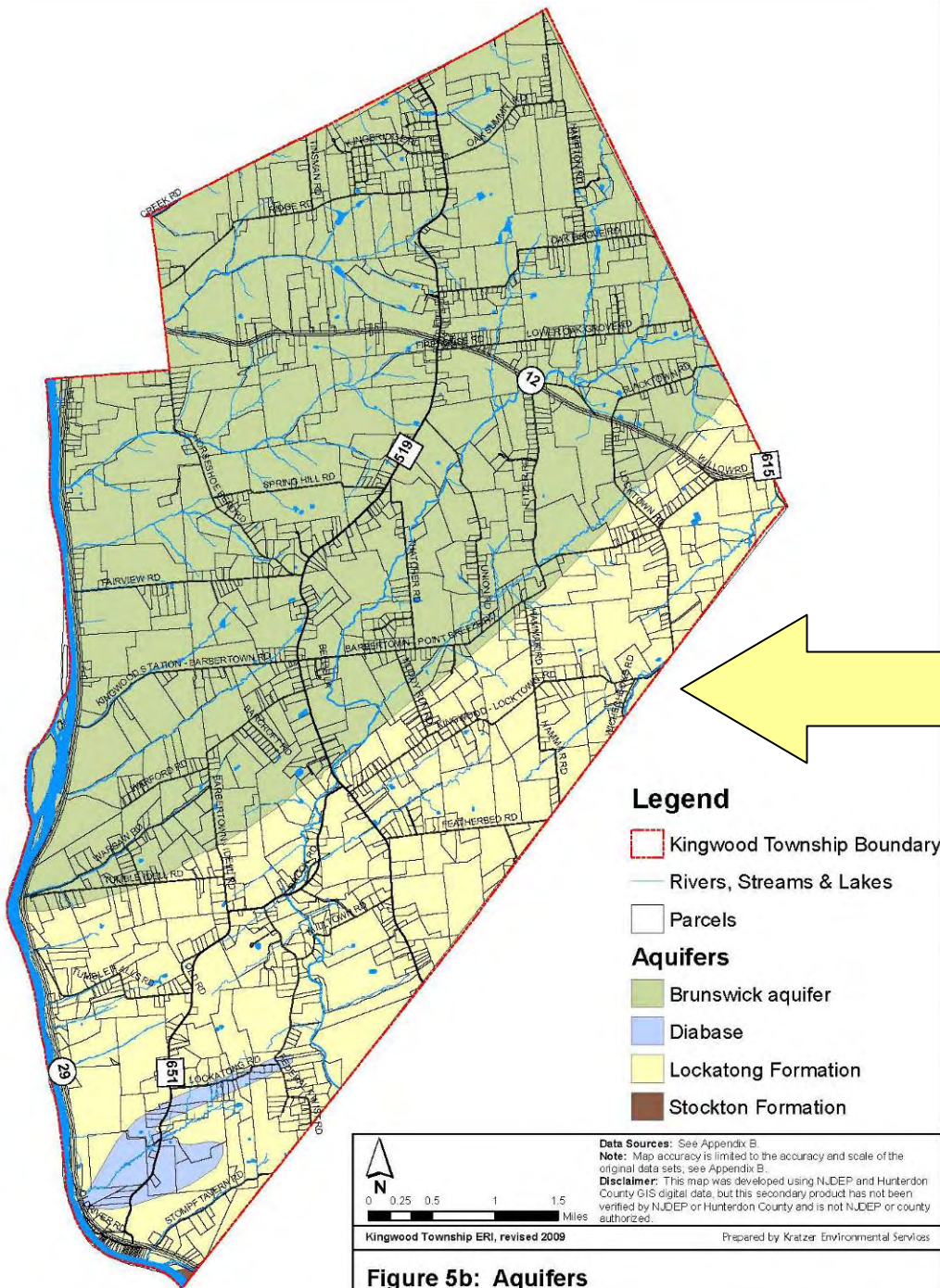
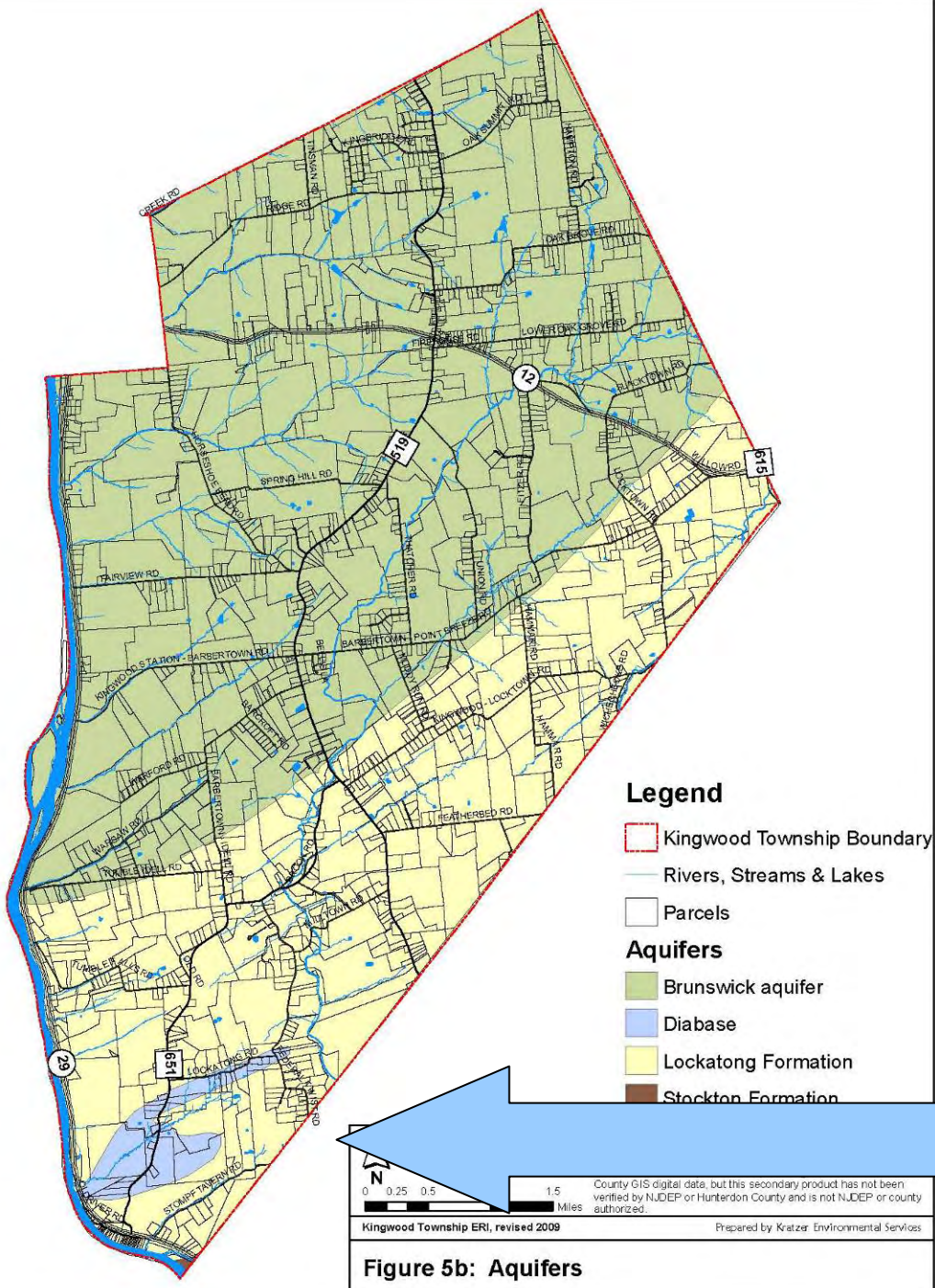


Figure 5b: Aquifers

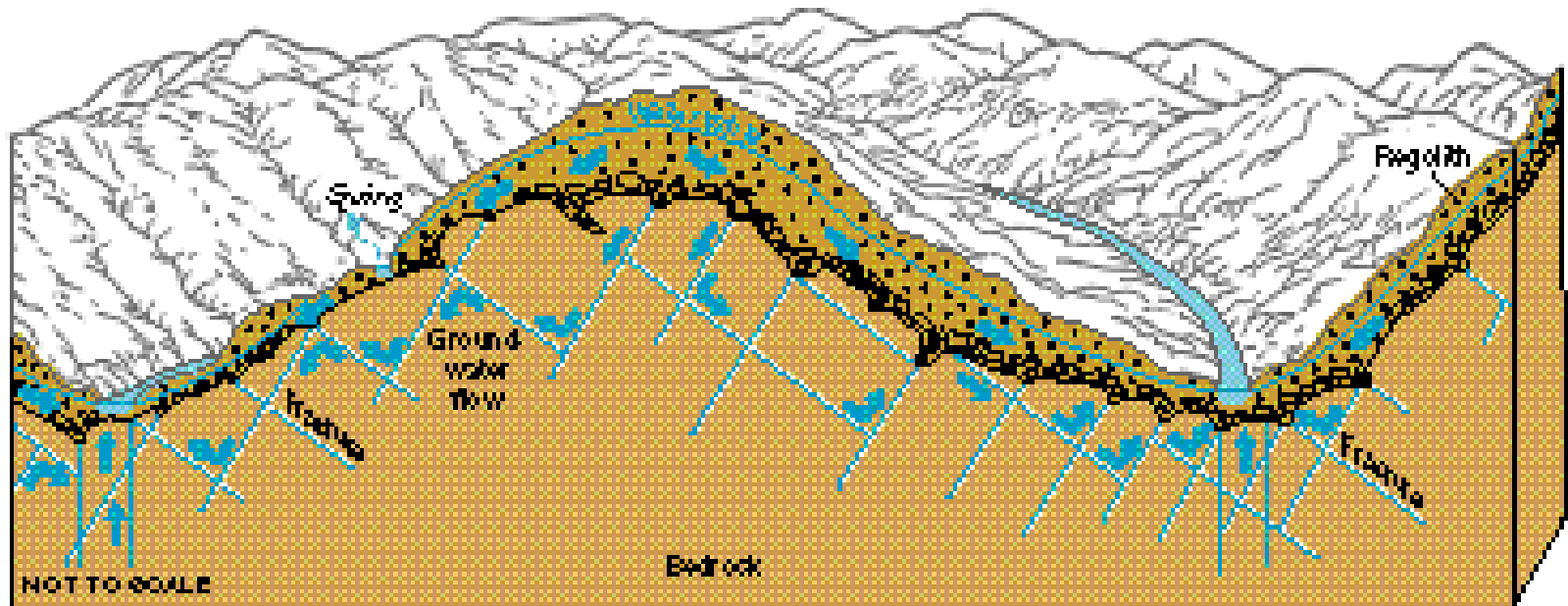
- Water stored and transmitted in fractures
- State Rank “D” for yield

Diabase

- Hard and dense igneous rock
- Water stored and transmitted in fractures, which are sparse
- State Rank “E” for yield

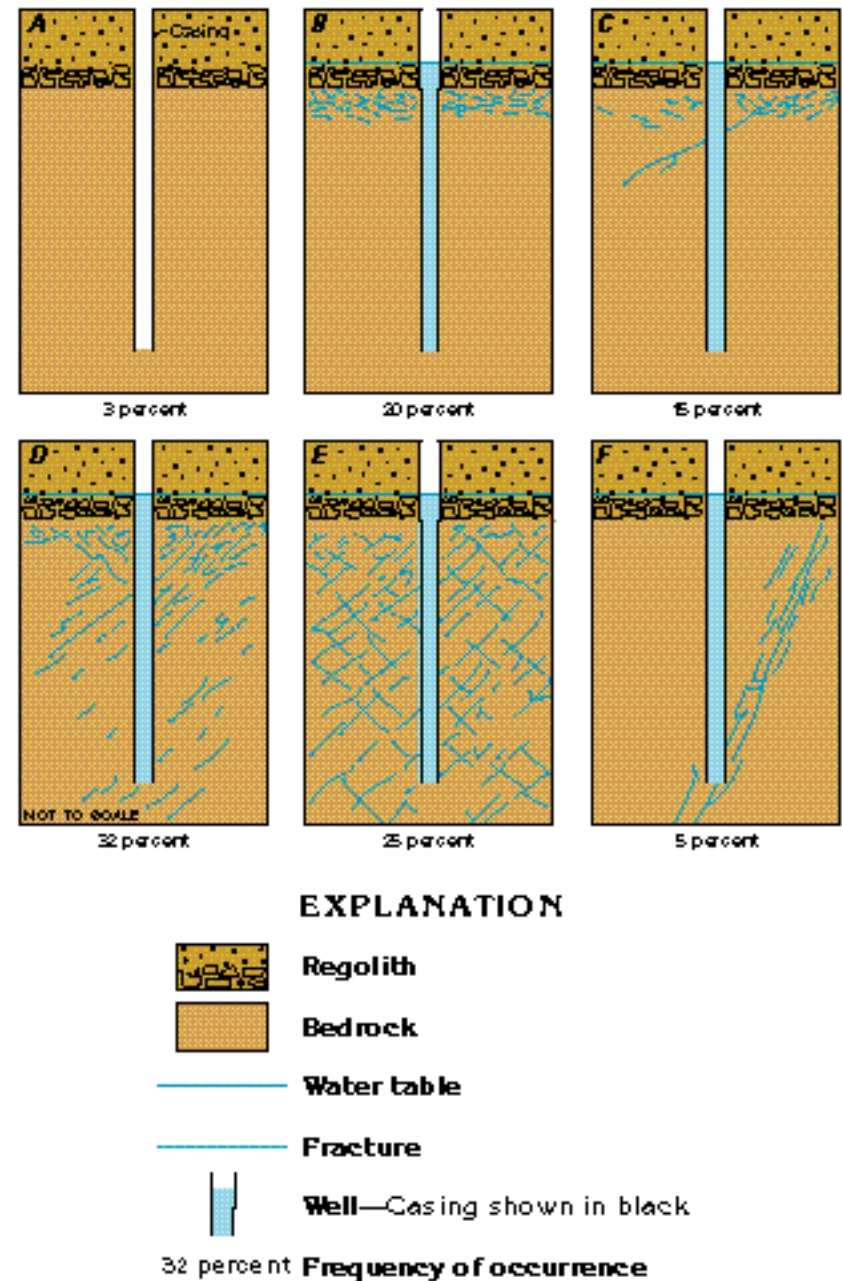


In fractured bedrock aquifers, water percolates through the ground to fractures in the bedrock, then flows underground to discharge points, such as streams.



Modified from Heath, R.C., 1980, Basic elements of ground-water hydrology with reference to conditions in North Carolina: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-44, 86 p.

In fractured
bedrock
aquifers, wells
might intercept
many, a few, or
no fractures.



Roadside outcrop reveals the bedding and fractures that occur in the subsurface



Water moving through the rocks dissolves elements in the minerals. Drinking water from wells in Kingwood Township contains abundant naturally occurring elements, like arsenic, iron, calcium, magnesium, manganese, sulfur and sodium.

Arsenic is naturally occurring in the bedrock

Arsenic is being released from minerals in the rocks by weathering



sandstones and shales



Rocks are ~ 200 million years old and were formed in lakes, swamps and rivers during age of dinosaurs

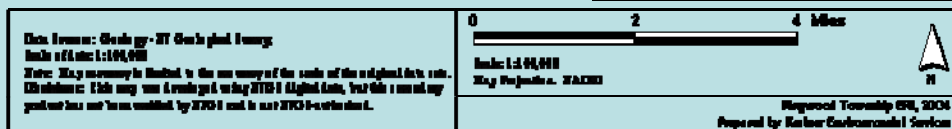
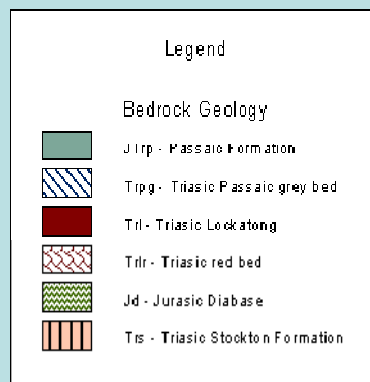
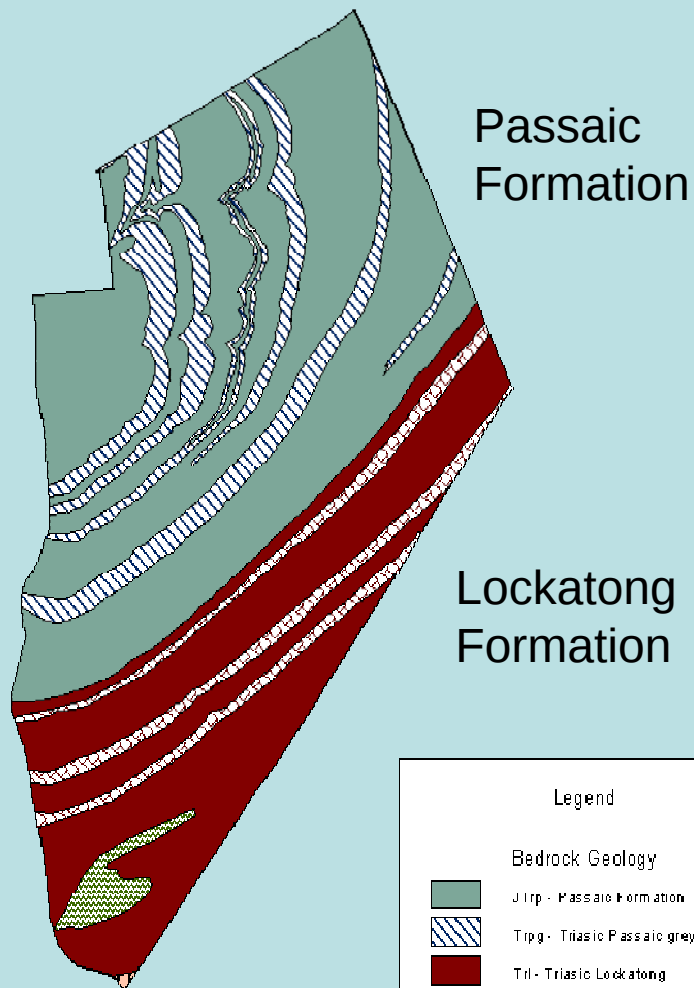


Figure 2a: Bedrock Geology of Klingwood Township

EXPLANATION
Physiographic Province



Arsenic concentration,
in micrograms per liter

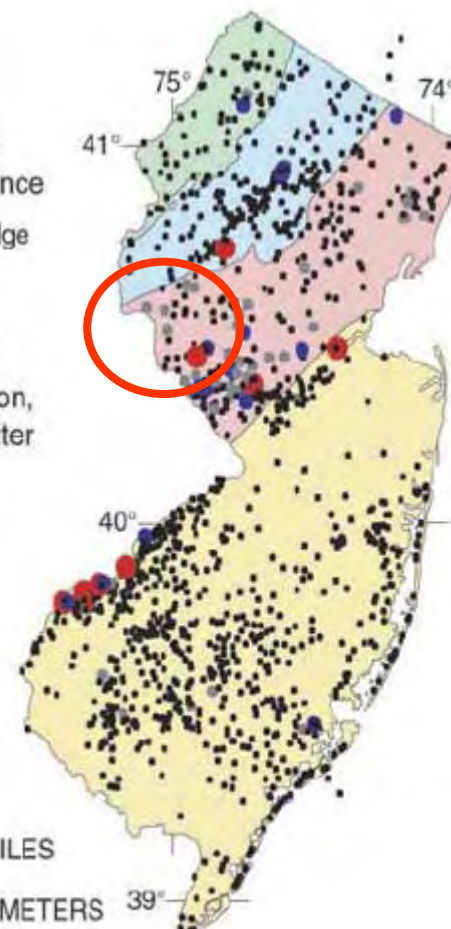
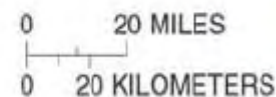


Figure 3. Distribution of concentrations of dissolved arsenic in ground water in New Jersey, by physiographic province. (Data from U.S. Geological Survey National Water Information System database)



Types of environments that the sedimentary rocks were formed in...

Passaic Formation

Lake margin, vegetated and dry playa mudflats

Arsenic is in hematite coatings on clay minerals

(Mostly oxic...red)



Lockatong Formation

Deep lake/shallow saline lake/ saline mudflat

Arsenic in pyrite

(Mostly anoxic...black/gray rock)



unoxidized pyrite

+ O₂ +



Thiobacillus
Ferrooxidans



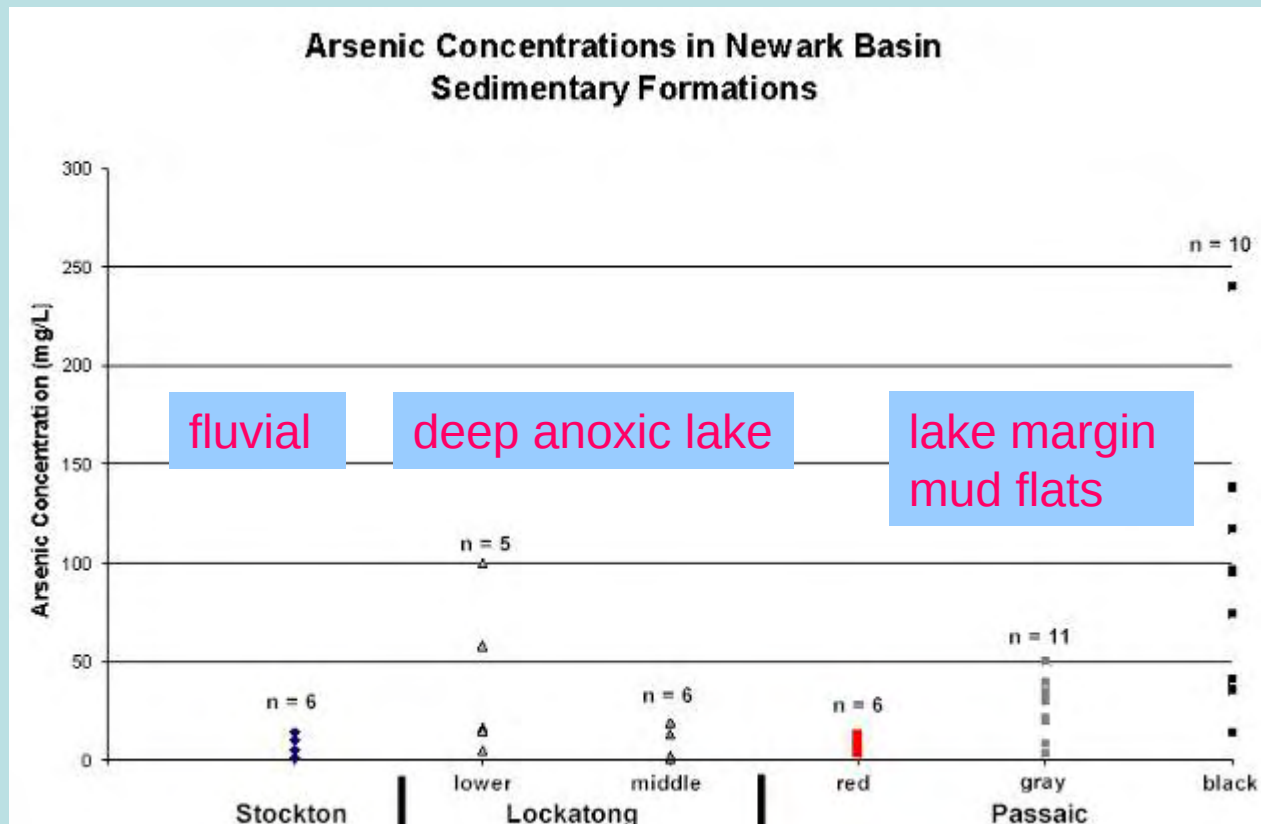
oxidized pyrite

As (H₃AsO₃⁰)
and
other
elements
mobilized

ARSENIC as a HEALTH ISSUE

EPA lowered drinking water standards
from 50 ug/l to 10 ug/l effective Jan 2006

NJDEP lowered standards to 5 ug/l



- NJ standard for drinking water = 5 $\mu\text{g/l}$ (5 micrograms per liter = 5 parts per billion)
- The New Jersey Private Well Testing Act (PWTA) requires mandatory statewide private well testing upon the sale of a house.
- Private Well Testing Act Data from 2002-2007 results for Kingwood:
 - 194 wells were tested
 - 79 exceeded 5 $\mu\text{g/l}$
 - 41% of wells tested exceeded safe drinking water standards

- Because arsenic standards are frequently exceeded in Kingwood Township, the Kingwood Environmental Commission encourages residents to test their well water for arsenic.

- Check the township website at <http://kingwoodtownship.com> for information about discount water tests.

Summary:

Arsenic is a toxic element that can be naturally present in local ground water. These links provide a wealth of information about what this means and what you can do about it:

[Arsenic in New Jersey's Ground Water](http://www.njgeology.org/enviroed/infocirc/arsenic.pdf): An information circular from the NJ Geological Survey (pdf document):

<http://www.njgeology.org/enviroed/infocirc/arsenic.pdf>

[Arsenic Water Treatment for Residential Wells in NJ](http://www.state.nj.us/dep/pwta/Arsenic_Treatment.pdf): An information circular from the NJ Geological Survey (pdf document):

http://www.state.nj.us/dep/pwta/Arsenic_Treatment.pdf

[A Homeowner's Guide to Arsenic in Drinking Water](http://www.state.nj.us/dep/dsr/arsenic/guide.htm) (NJDEP Division of Science, Research & Technology):

<http://www.state.nj.us/dep/dsr/arsenic/guide.htm>