

9/11 MEMORIAL

UNIT: History of the World Trade Center

GRADE LEVEL/S: 9-12

TIME NEEDED: 1-2 sessions

TEACHER: Reba Petraitis

LESSON TITLE: GEOLOGY AND THE WORLD TRADE CENTER

Common Core Standards

R 7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

W 7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

W 8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

Key Questions/ Issues Addressed

How has geology helped dictate the location and structures of the World Trade Center?

How did the clean-up efforts after 9/11 pose specific challenges?

Lesson Goals/ Objectives

Students will study the World Trade Center through the lens of geology.

Students will analyze geological maps and published articles to understand the role geology and geography have played at the World Trade Center.

Key Terms

Bedrock, Manhattan or mica schist, Slurry wall

Materials

Access to a computer

9/11 Memorial Museum website: www.911memorial.org/wtc-history

Pinsker, Lisa M. "Applying Geology at World Trade Center Site" (Geotimes, November 2001). www.geotimes.org/nov01/NNwtc.html

Geologic Map of NYC: <http://pbisotopes.ess.sunysb.edu/reports/ny-city/full-map.pdf>

Manhattan Schist background:

www.nycgovparks.org/about/history/historical-signs/listings?id=12369

Background for lesson

The articles in the lesson can also be read as homework, with a discussion of the resonant themes taking place during the class period.

Instructional Activity/ Procedures

1. Ask students to research Manhattan Schist and answer the following questions:
 - a. What kind of rock is it? What is it made of? How and when was it formed?
 - b. Where can it be found in New York City?
2. Direct students to the 9/11 Memorial Museum webpage on artifacts from the World Trade Center in the collection: www.911memorial.org/wtc-history. Scroll down to the section on Manhattan Schist and answer the following question:
 - a. What is the connection between the geology of New York City and the Manhattan skyline?
3. Have students access the Geologic Maps of New York City, found at: <http://pbisotopes.ess.sunysb.edu/reports/ny-city/full-map.pdf> and www.nycgovparks.org/about/history/historical-signs/listings?id=12369 and answer the following questions based on the maps:
 - a. What is the symbol for Manhattan Schist?
 - b. During which geologic period did Manhattan Schist form? How long ago was this period?
 - c. Where are the deposits of Manhattan and Hartland Schist located in Manhattan?
4. Read the article, “[Applying Geology at World Trade Center Site](http://www.geotimes.org/nov01/NNwtc.html)” by Lisa M. Pinsker. www.geotimes.org/nov01/NNwtc.html. Answer the following questions based on her article:
 - a. How many tons of material had to be removed from the destroyed World Trade Center after 9/11?
 - b. What is the slurry wall and why was it built?
 - c. What concerns did engineers have concerning the slurry wall in the aftermath of 9/11?
 - d. How has the Hudson River’s shoreline changed over time?
 - e. How deep does Manhattan Schist lie below lower Manhattan?
 - f. How has the depth of the schist below ground impacted the location of skyscrapers in New York City?
5. Assign students an essay, synthesizing the studied information, examining the influence of geography and geology on the construction of the original World Trade Center.

Evidence of Understanding

Students will display understanding through their classroom participation and final essay

Extension Activities

Research and write a paper about the influence of geology on a) other areas and developments within New York City or b) specific neighborhoods in your own city or town.