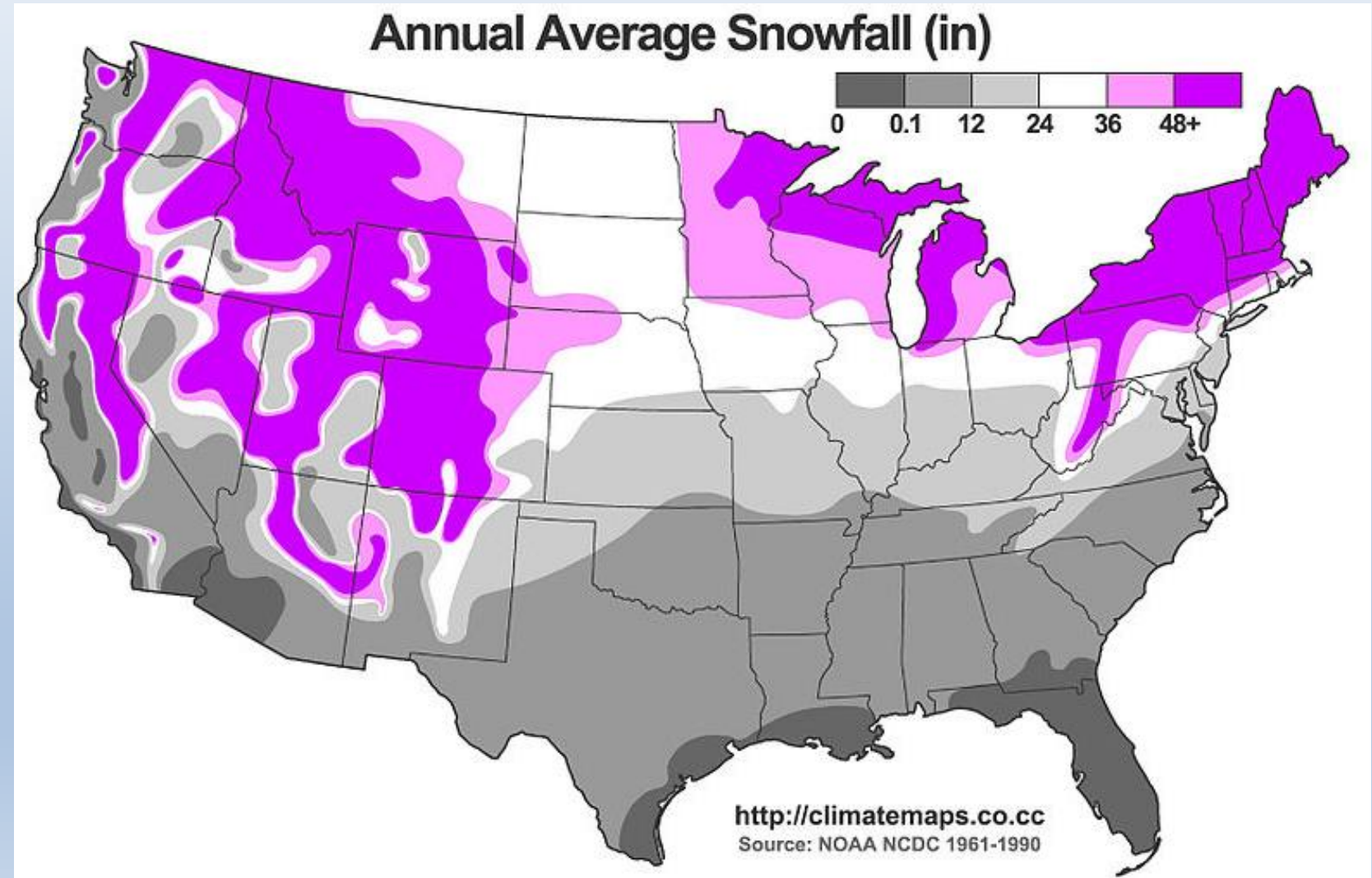


Example Weather Report Map

- This map shows the average annual 1961-1990 snowfall in the U.S. (in inches)
- A graphic like this helps you visualize, see patterns and understand lots of data *at a glance!*

How are maps like this created?



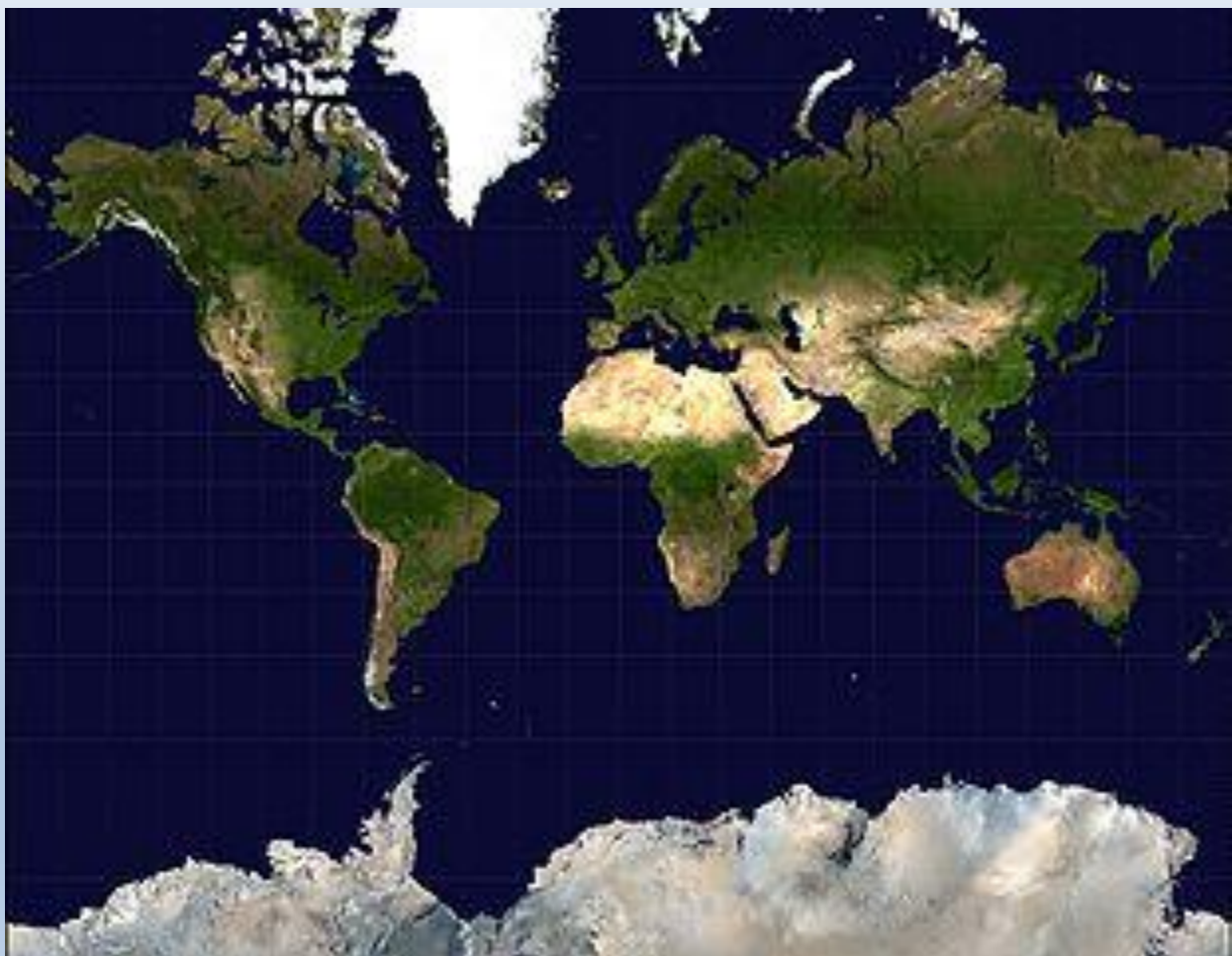
GIS

Maps

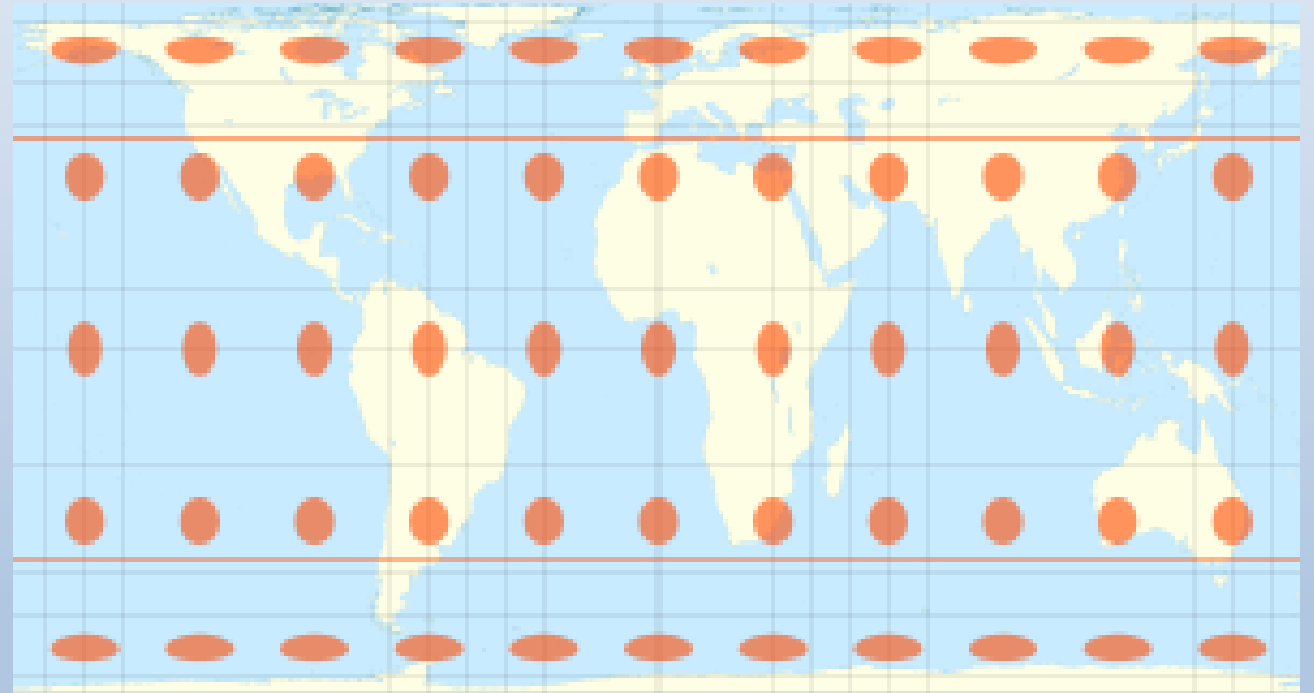
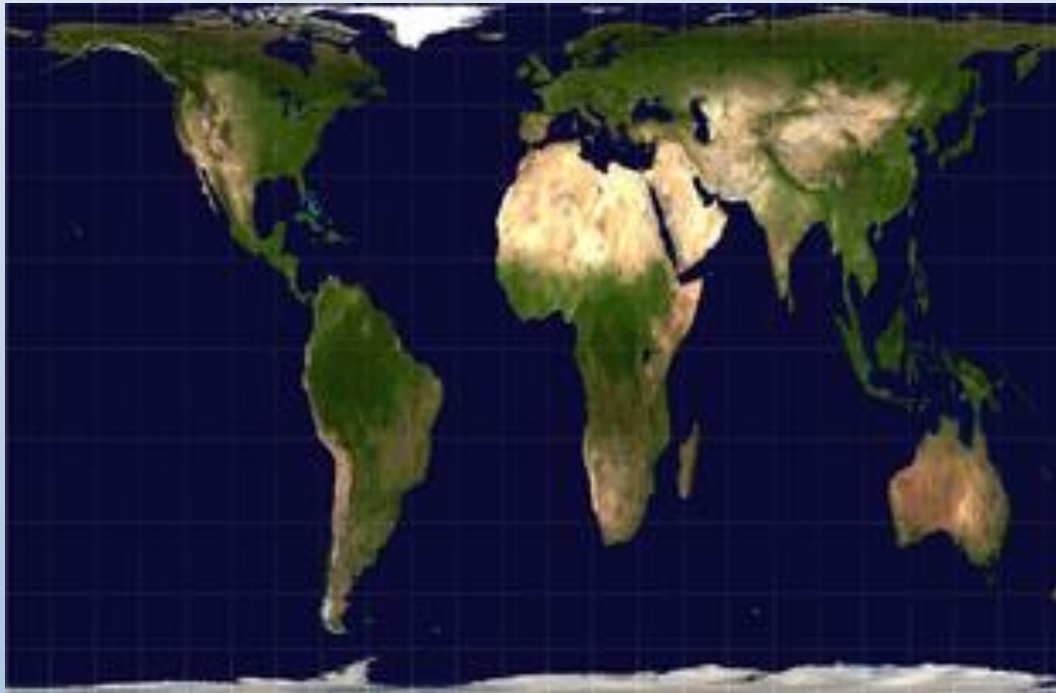
- What map is commonly used today?
 - Mercator projection
- Is the Mercator projection accurate?
 - [Show 4-min video](#)



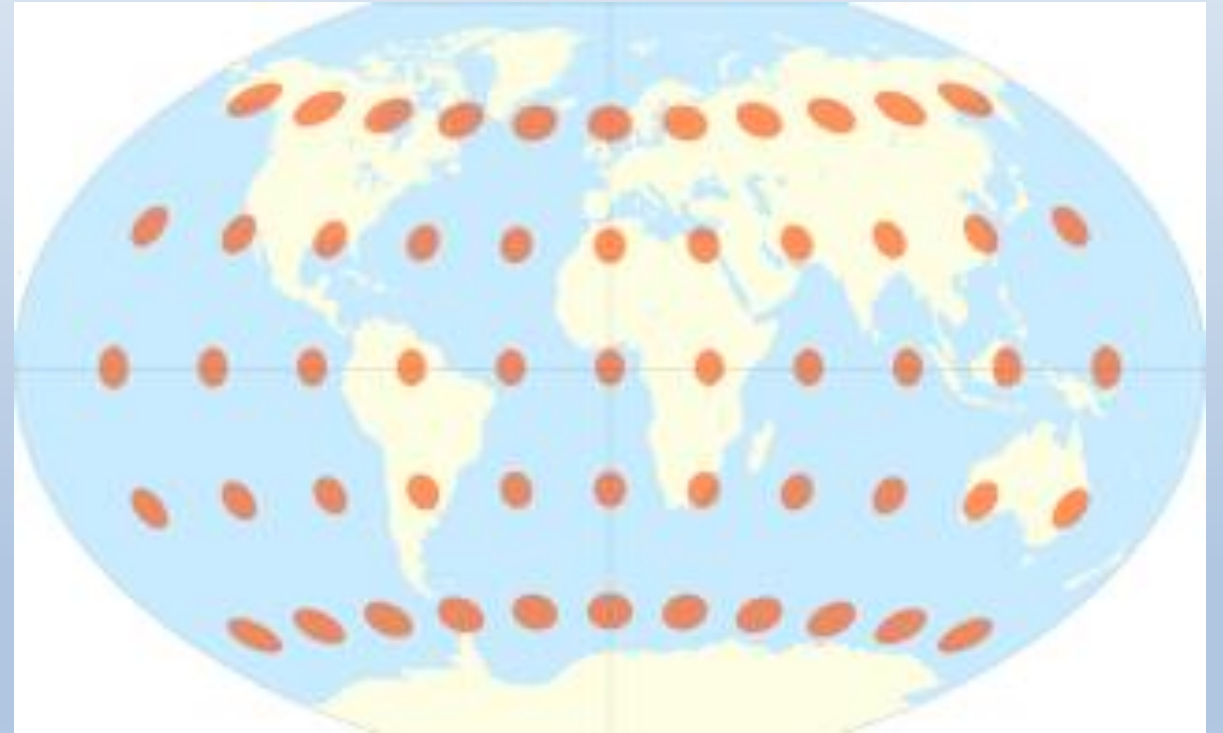
Mercator Projection



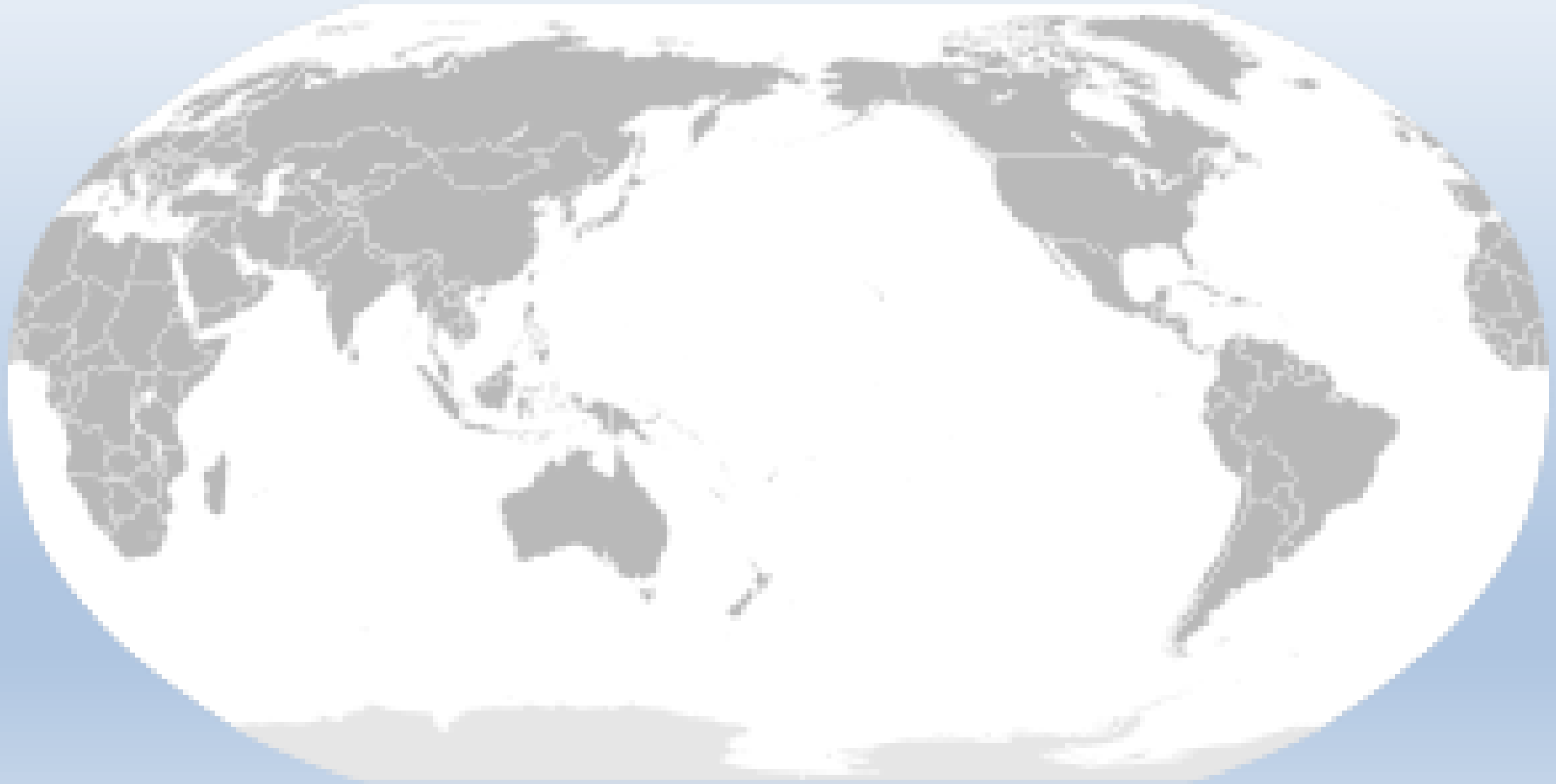
Gall-Peters Projection



Winkel Tripel Projection



South-Oriented Map



GPS

GPS = **global positioning system**

- A satellite-based radio navigation system
- Composed of 32 satellites that continuously orbit the Earth
- The satellites broadcast time and position signals
- GPS receivers on the ground (like this navigation device in a car) use the signal data from multiple satellites to calculate the exact receiver position (to tell you where you are!)
 - Location data is calculated by measuring the distance to the satellites based on the time it takes for the device to receive the signals



GIS

GIS = **geographic information system**

- A software system that captures, stores, manipulates, analyzes, manages and presents spatial or geographic data—which is data related to physical locations on the Earth's surface (like GPS data)
- Countless GIS application tools enable us to examine and geographically represent location-based data for many purposes
- GIS example: **A U.S. map shows the distribution of Starbucks and Dunkin' Donuts**
<http://www.businessinsider.com/dunkin-donuts-vs-starbucks-map-2015-1>

More about GIS

GIS software is designed to use all kinds of data (such as GPS data) to accomplish many things. Examples:

- A computerized tool for solving geographic problems
- A spatial decision-support system
- A method to examine lots of geographic information data so as to reveal patterns and processes
- A way to extend and deepen the way that maps are used to explore geographic-based issues
- **What might you use GIS for?**

...**to map** the spread of diseases, air quality, power consumption, temperature and weather data, invasive plant/animal species locations, genealogical migration, demographics + more...

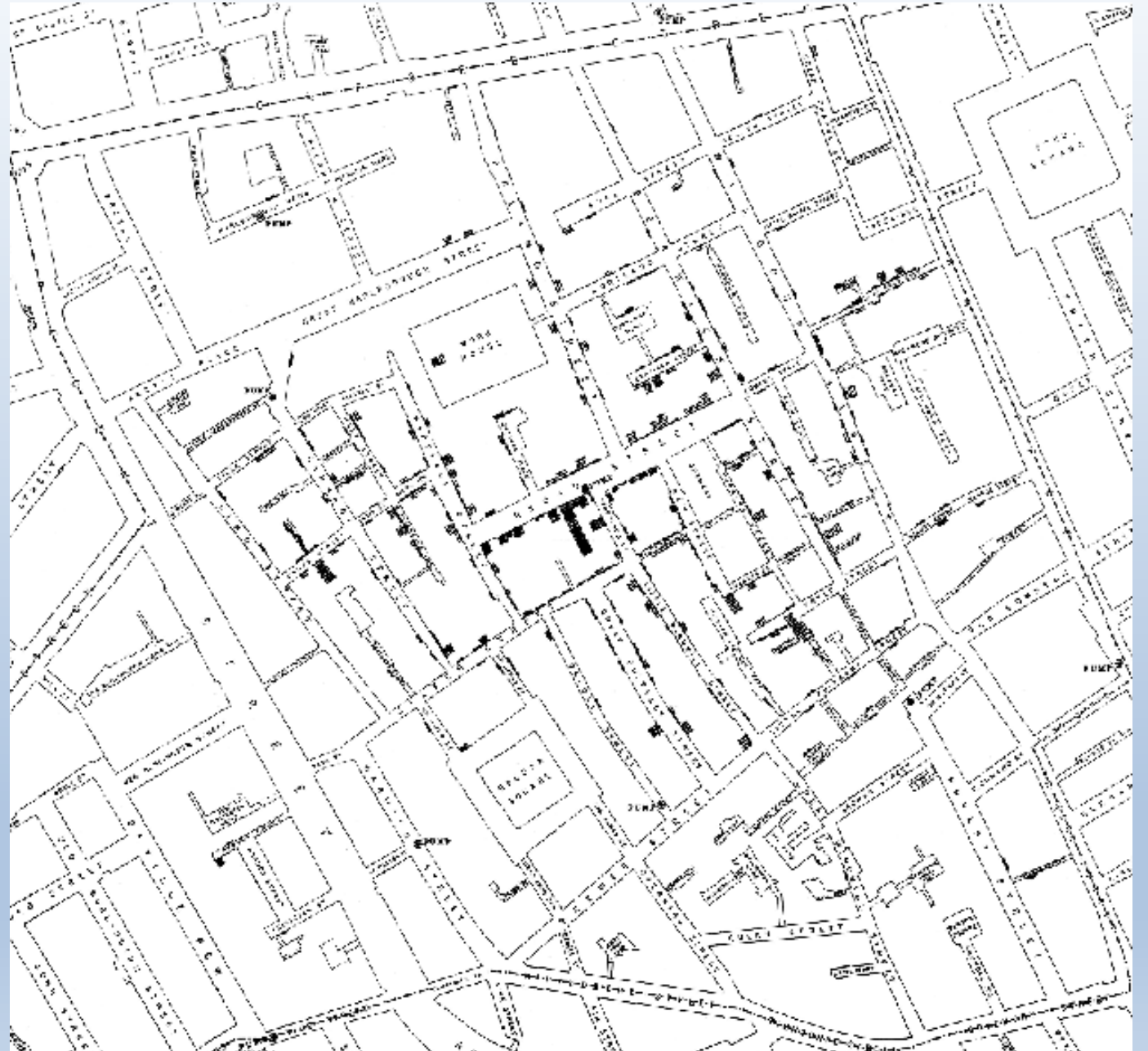
John Snow “Father of Modern Epidemiology”

GIS History

- A physician in London in the 1850s
- In 1849, published an essay stating that diseases such as the bubonic plague and cholera were not caused by bad air
- After the 1854 cholera outbreak, he suggested a relationship between the cholera cases and a nearby water source
- As a result, local council deactivated the pump that was the source of the cholera
- Considered an early use of map-based **geographical or spatial analysis—or GIS**

SOHO London Map by John Snow, 1854

After the 1854 cholera outbreak, he **plotted points on a map where cholera victims lived** and suggested a relationship between the cases and a nearby water source



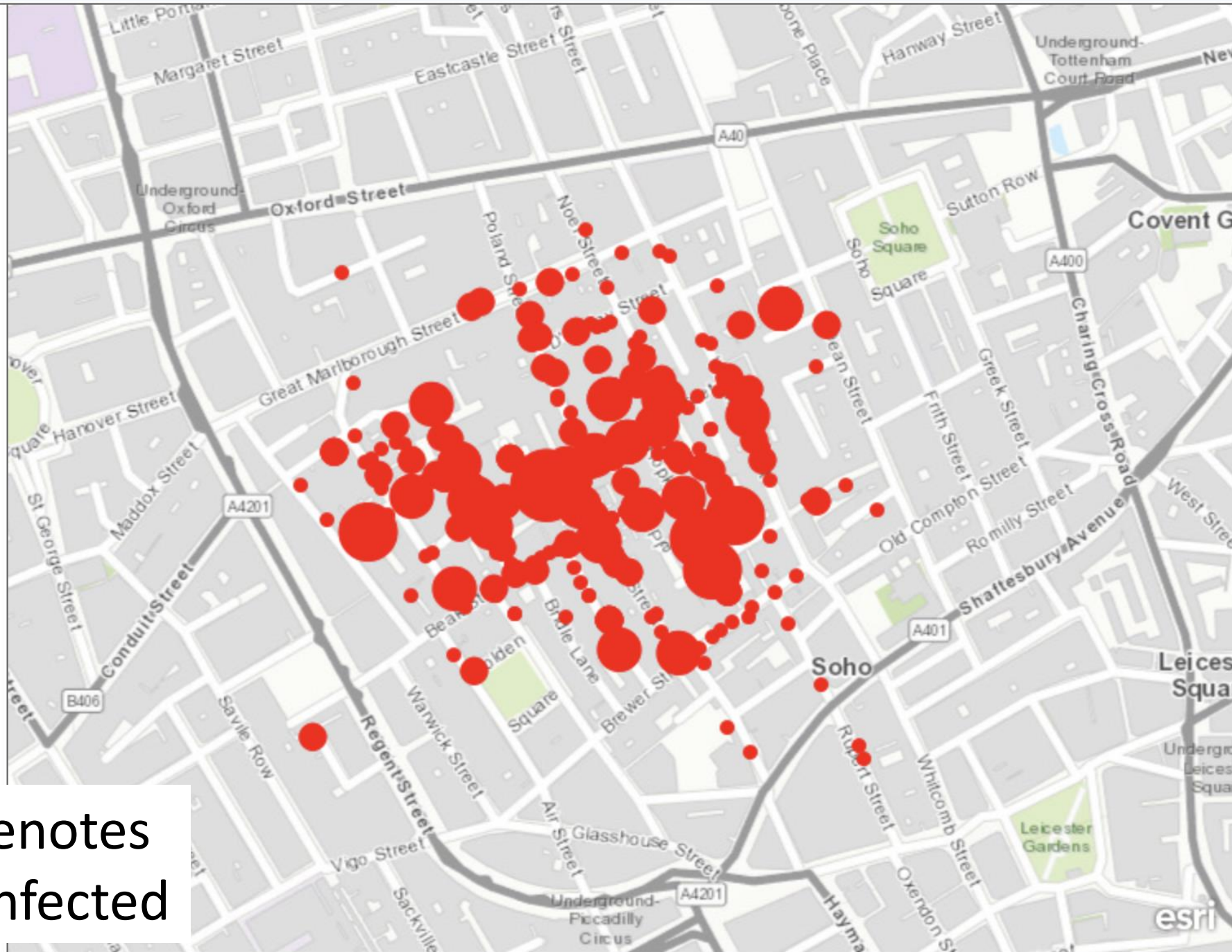
Cholera Cases

Noted in **red** on the map



john_snow - Deaths by Address

Deaths



Circle size denotes number of infected

john_snow - Broad Street Pump



john_snow - Pumps



john_snow - Deaths by Address

Deaths



18



7 - 9



4 - 5

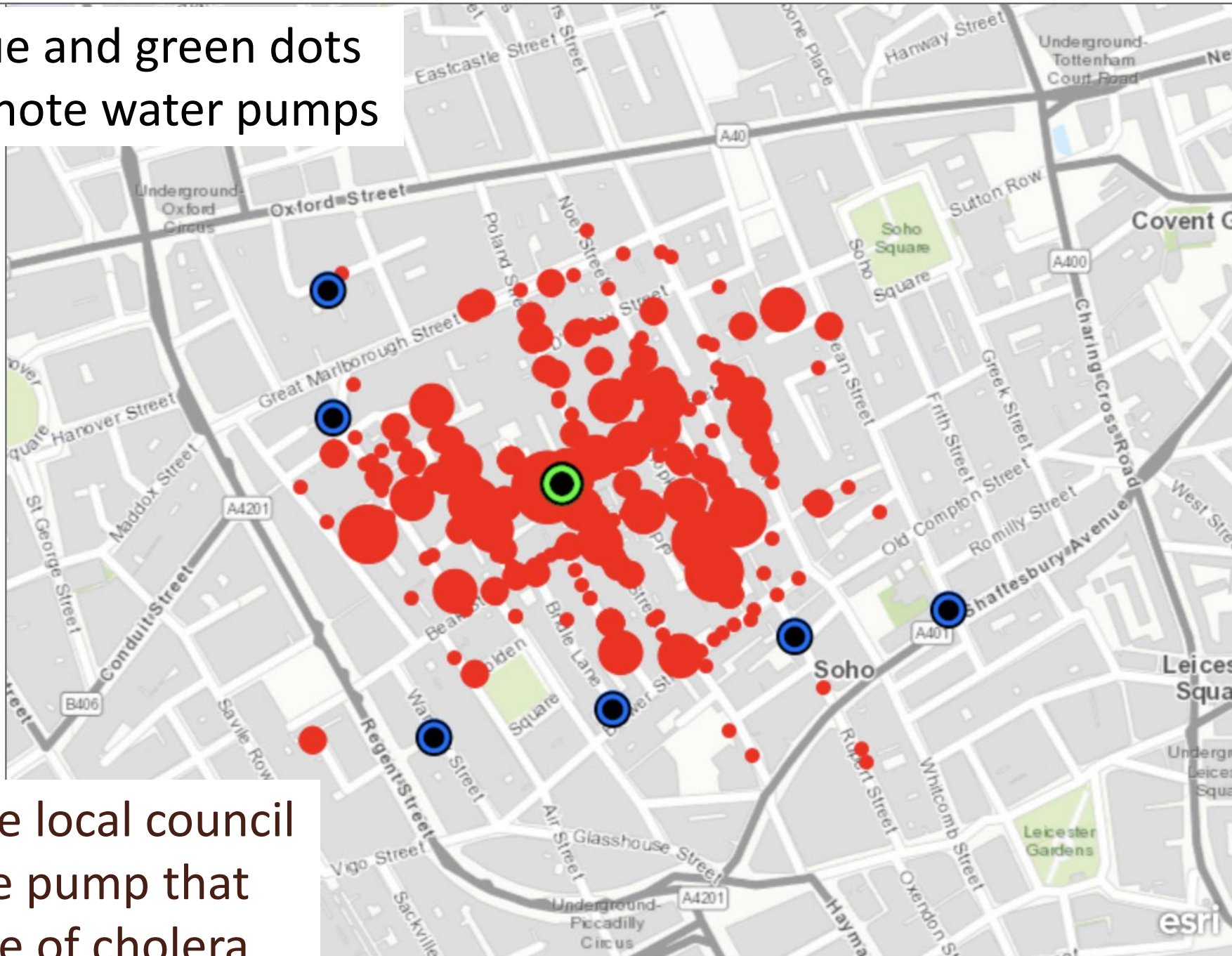


2 - 3



1

Blue and green dots denote water pumps



As a result, the local council shut down the pump that was the source of cholera