THE DIGITAL AQUIFER

UNDERSTANDING GROUNDWATER THROUGH GIS

Water Wise in BR Teacher Workshop
2/1/2013

ANSWERING THE CALL

Scientific and Engineering Practices of the Framework (NRC 2012, p3)

1. Asking questions and defining problems.
2. Developing and using models.
3. Planning and carrying out investigations
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations and designing solutions.
7. Engaging in argument from evidence.
8. Obtaining, evaluating and communicating information.

ANSWERING THE CALL

Percent of Baton Rouge voters that are unaware of “serious threats” to groundwater:

76

Percent who think saltwater intrusion into drinking water is a problem:

17

Percent who think local drinking water comes from the Mississippi River:

7

Percent who responded that they didn’t know where their water comes from:

30

*DNR survey conducted in Dec. 2012

EASY TO USE GIS TOOLS

Sonris: a free web-based interactive map developed by the Louisiana Department of Natural Resources.

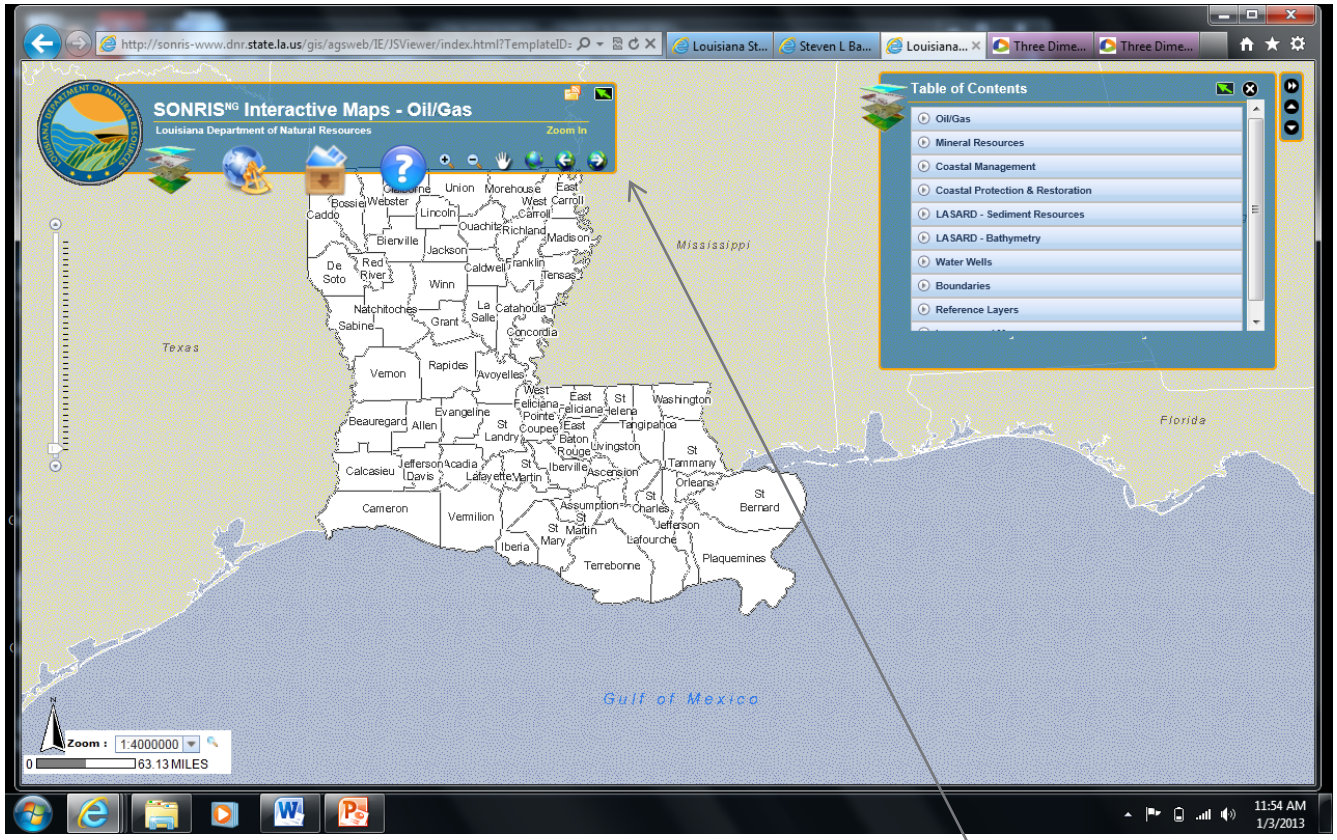
GeoMapApp: a free web-based geologic mapping program developed by Columbia University.

Google Earth: free web-based GIS that everyone loves!

GETTING STARTED WITH SONRIS

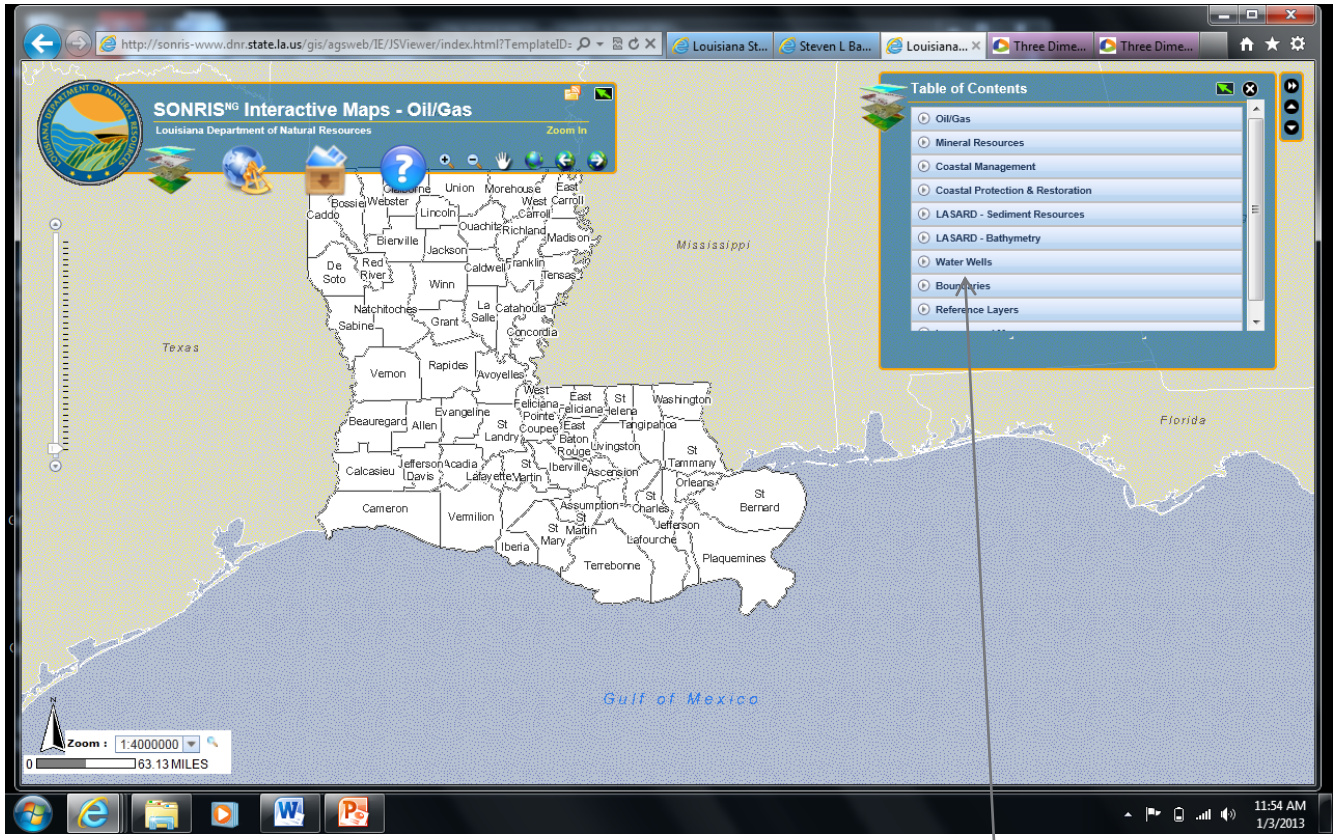
HTTP://SONRIS-WWW.DNR.STATE.LA.US/GIS/AGSWEB/IE/JSVIEWER/INDEX.HTML?TEMPLATEID=181

SONRIS IS A UNIQUE LOUISIANA RESOURCE



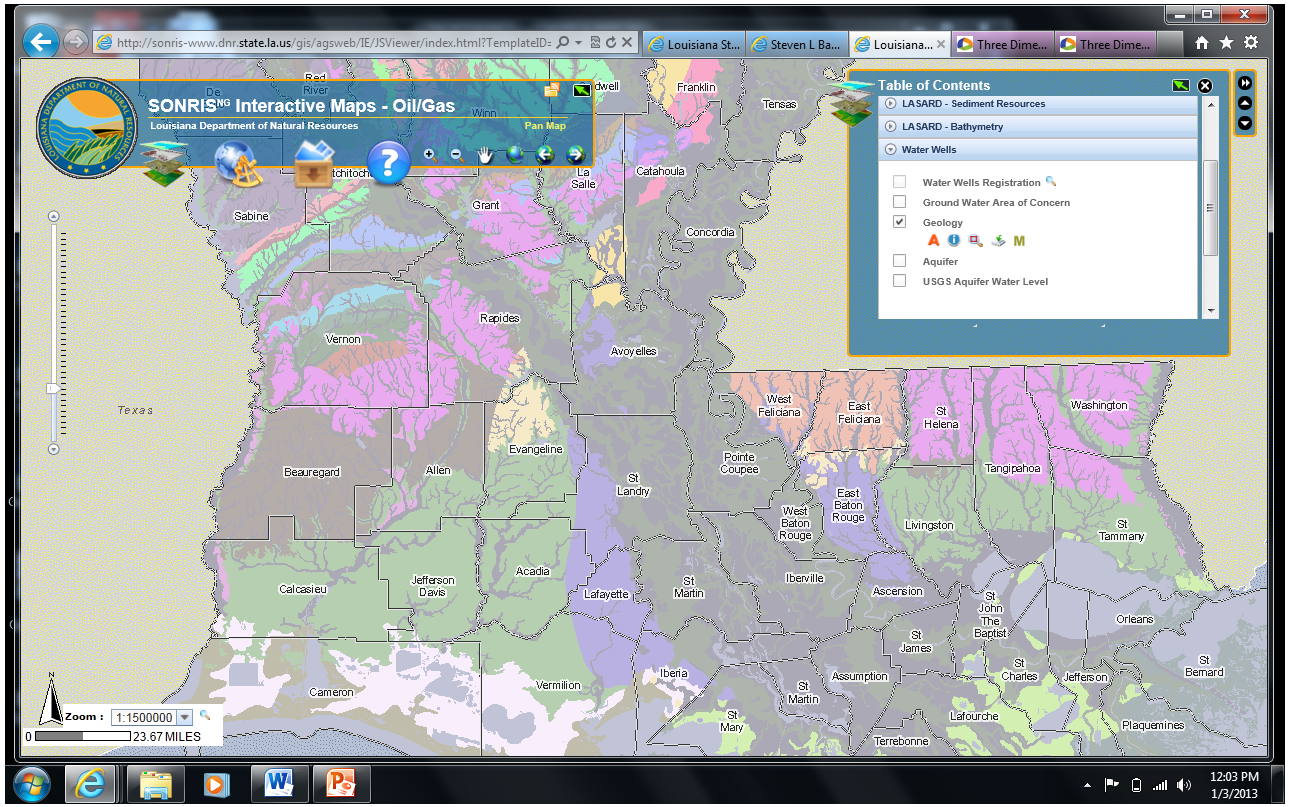
Toolbar is familiar to all Google Earth Users

SONRIS IS A UNIQUE LOUISIANA RESOURCE

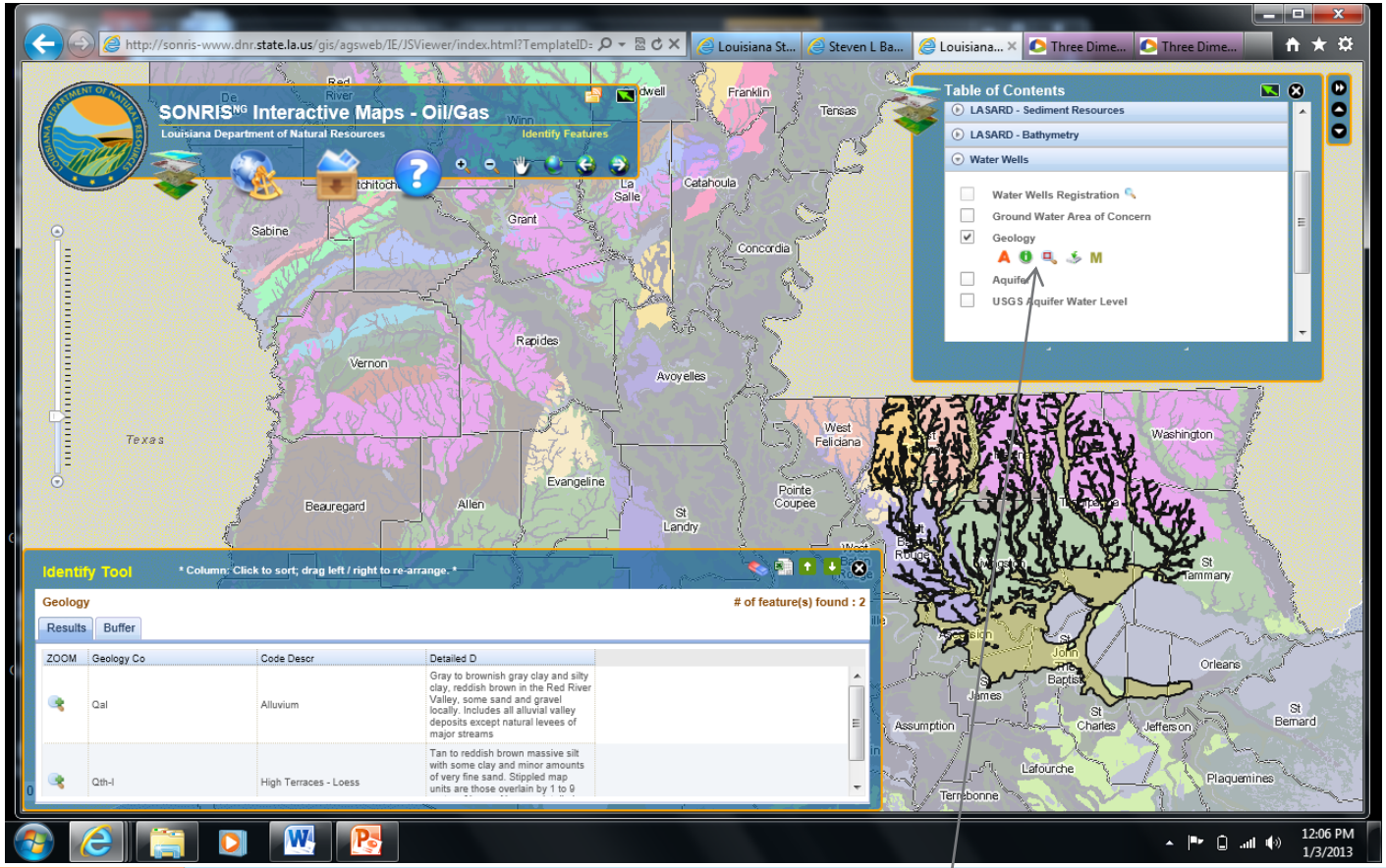


Many Layers are relevant to groundwater study.

GEOLOGY AND GROUNDWATER



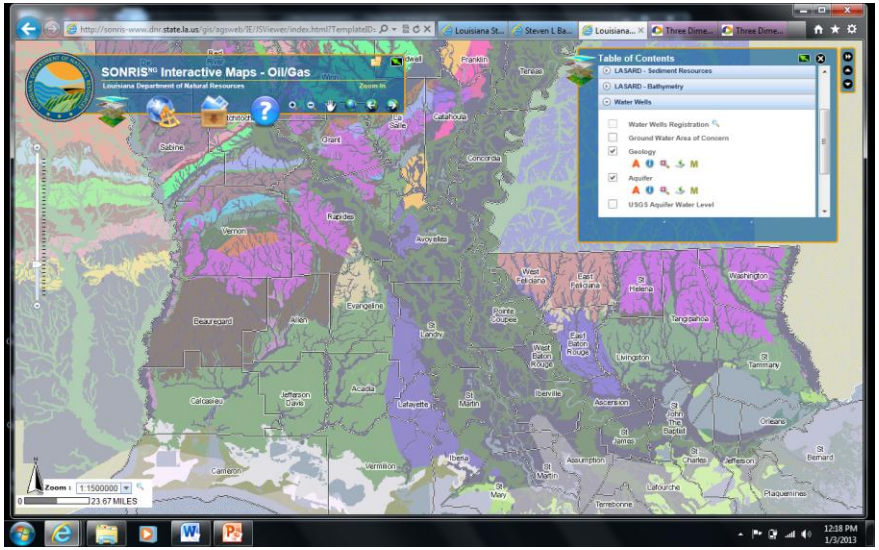
GEOLOGIC FEATURE IDENTIFICATION



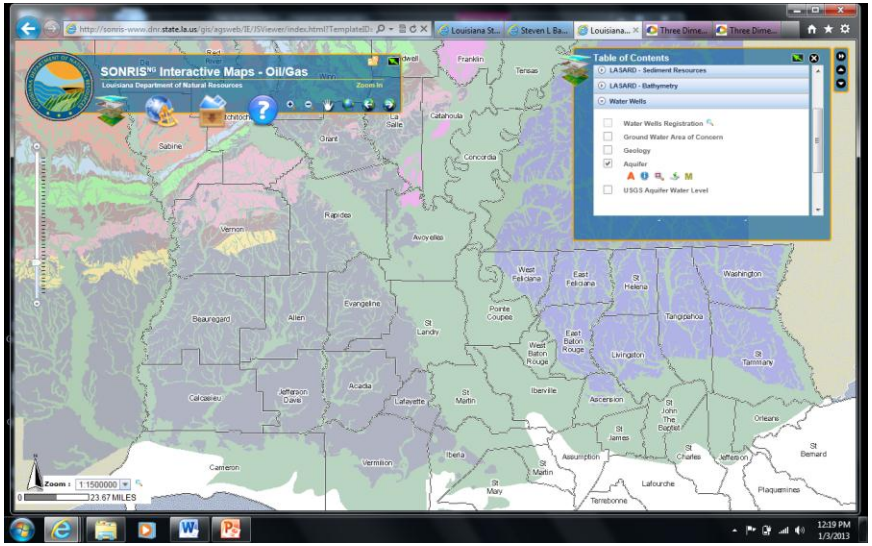
The ID icon allows a point and click information retreval about areas of interest.

SEEING THE RELATIONSHIPS

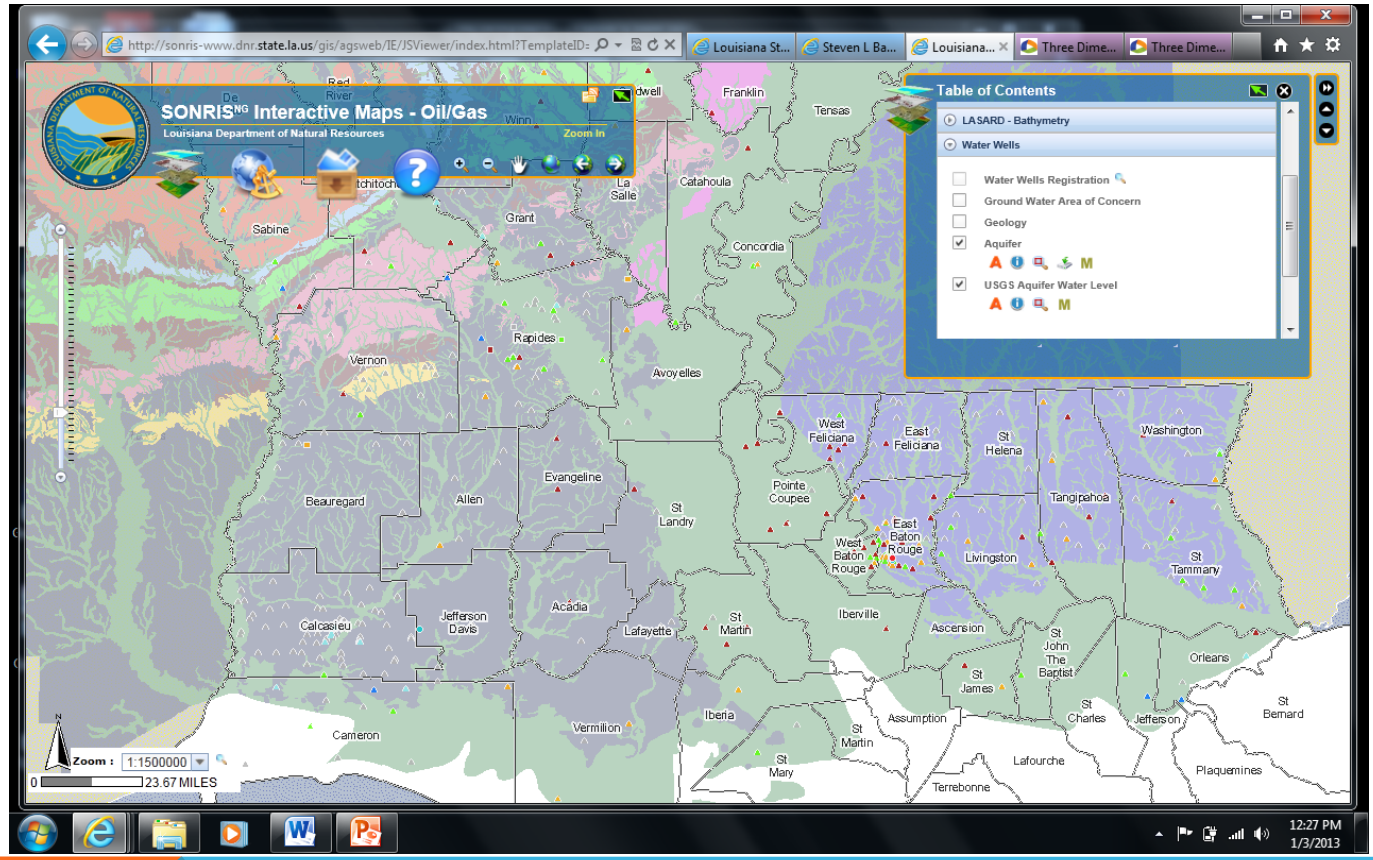
GEOLOGY AND AQUIFERS



AQUIFERS ONLY

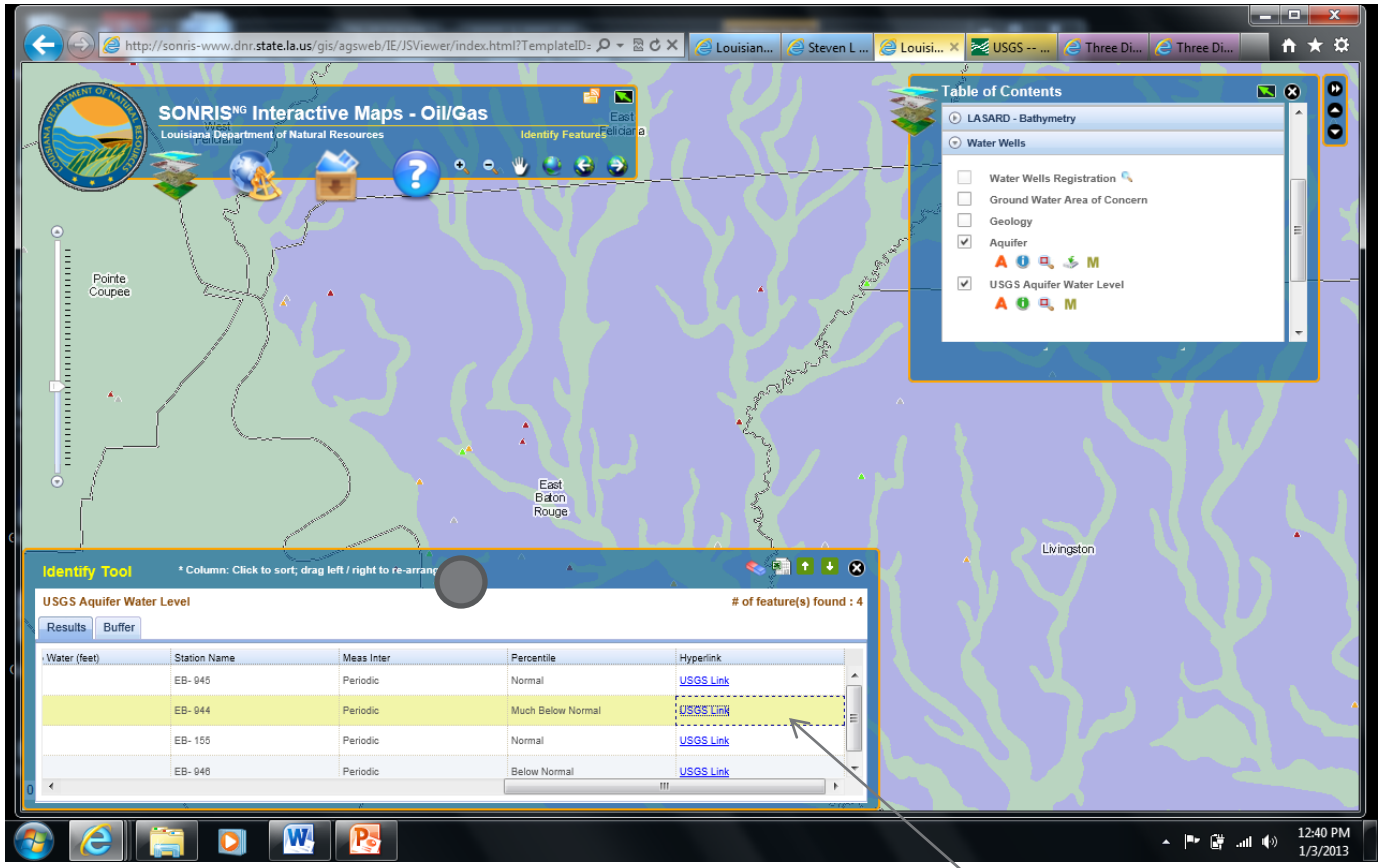


USGS AQUIFER WATER LEVELS



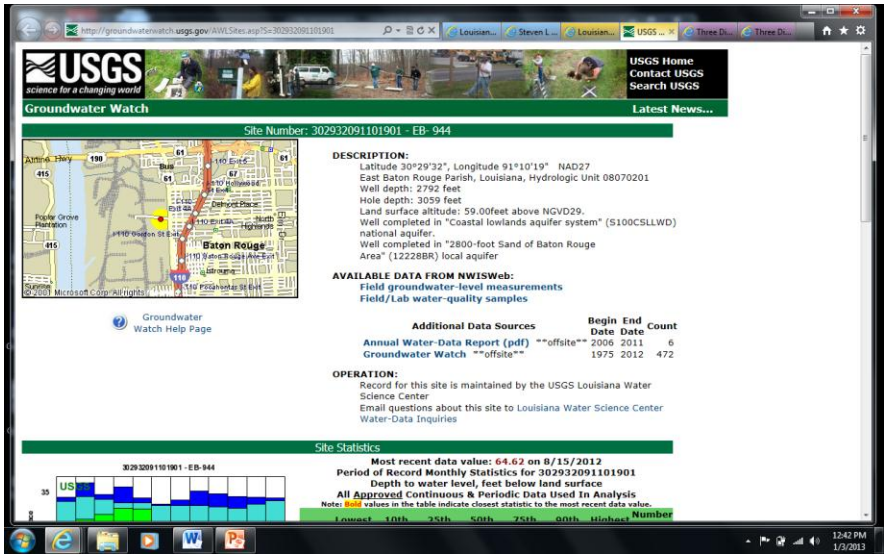
Note red triangles which show below normal water levels.

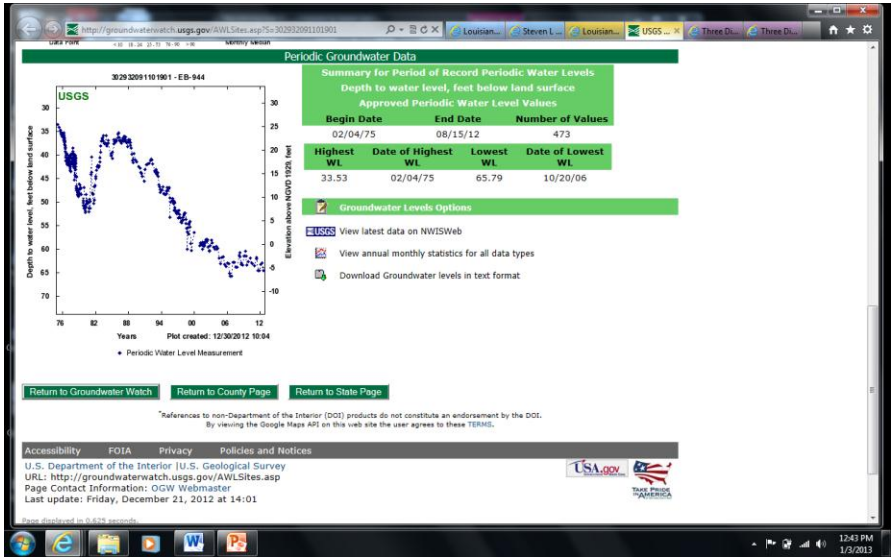
USGS AQUIFER WATER LEVELS

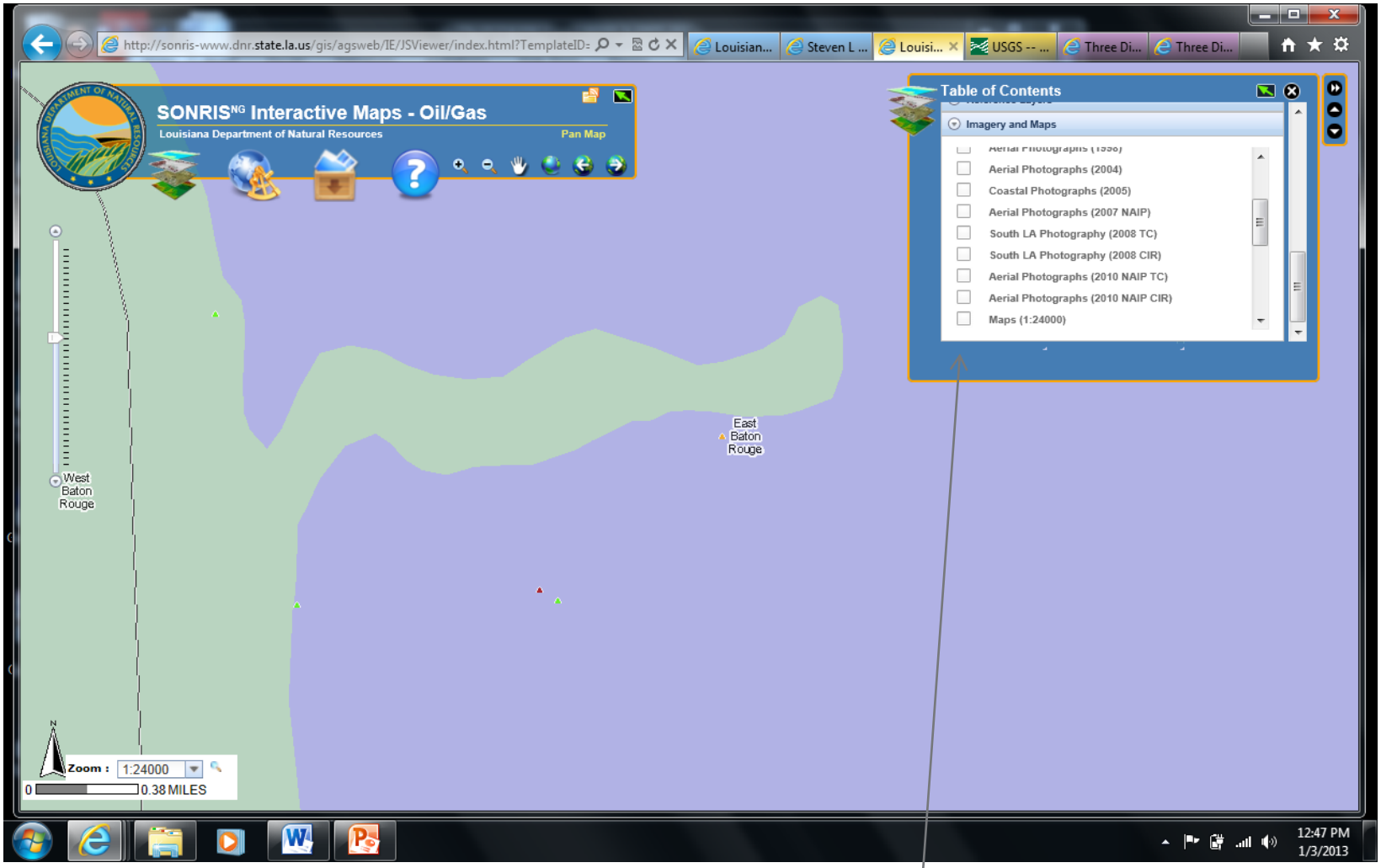


Information about wells can be used for a variety of investigations.

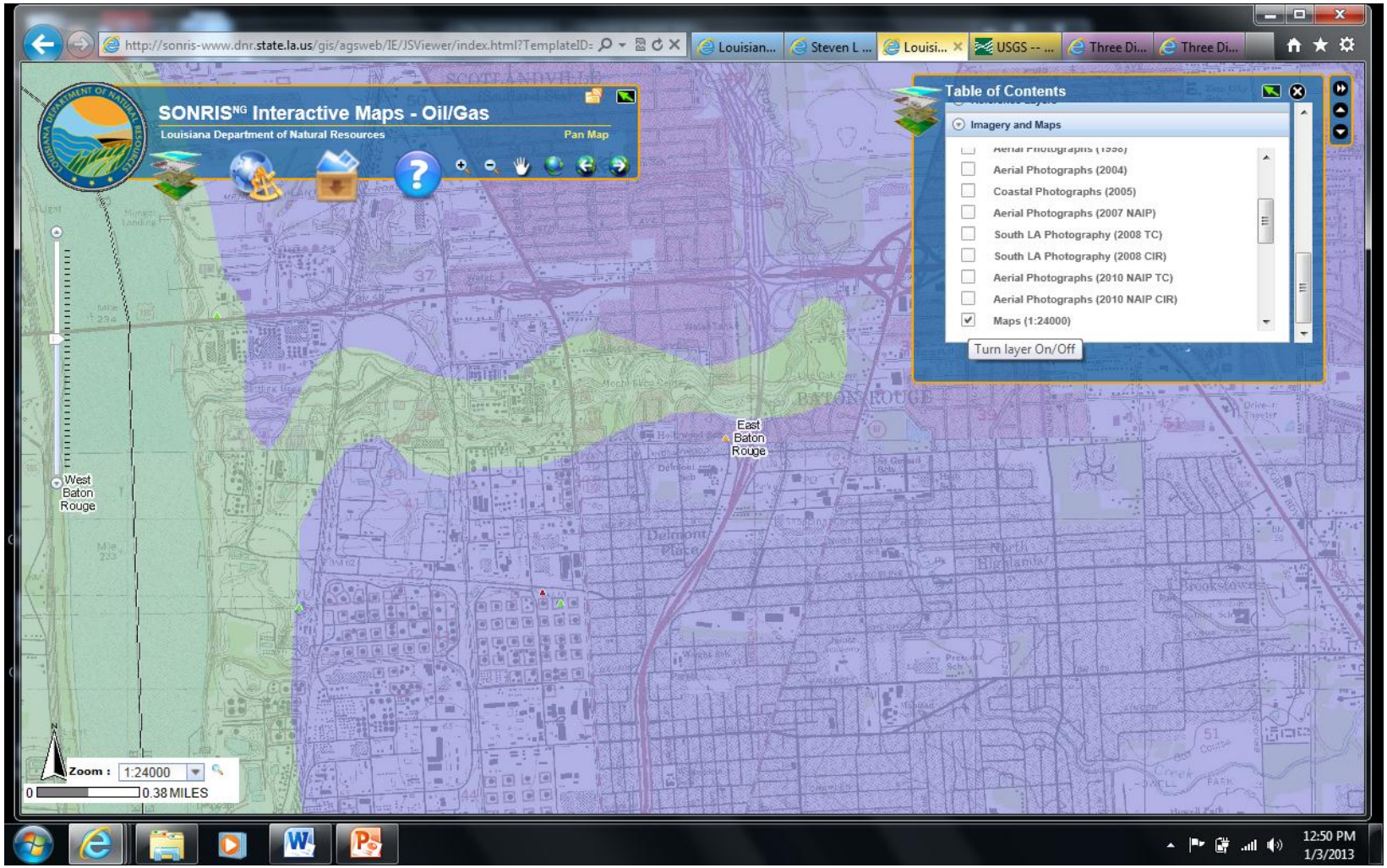
WELL ENTRIES HAVE HYPERLINKS TO DATA



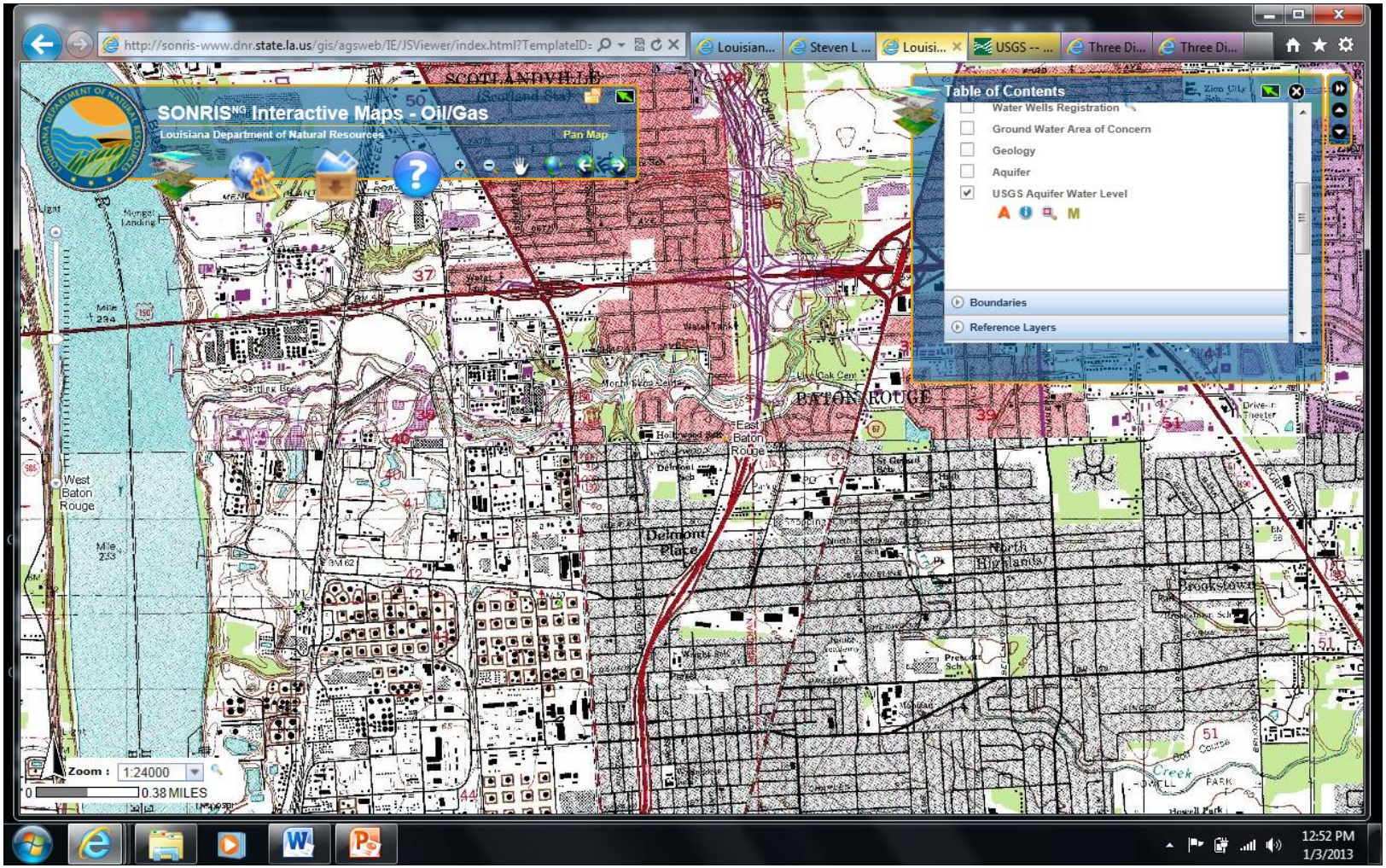




Location, location, location! Not sure where your well is? Sonris also includes map and image layers.



1:24000 Map overlay on aquifer.....



Aquifer layer turned off……

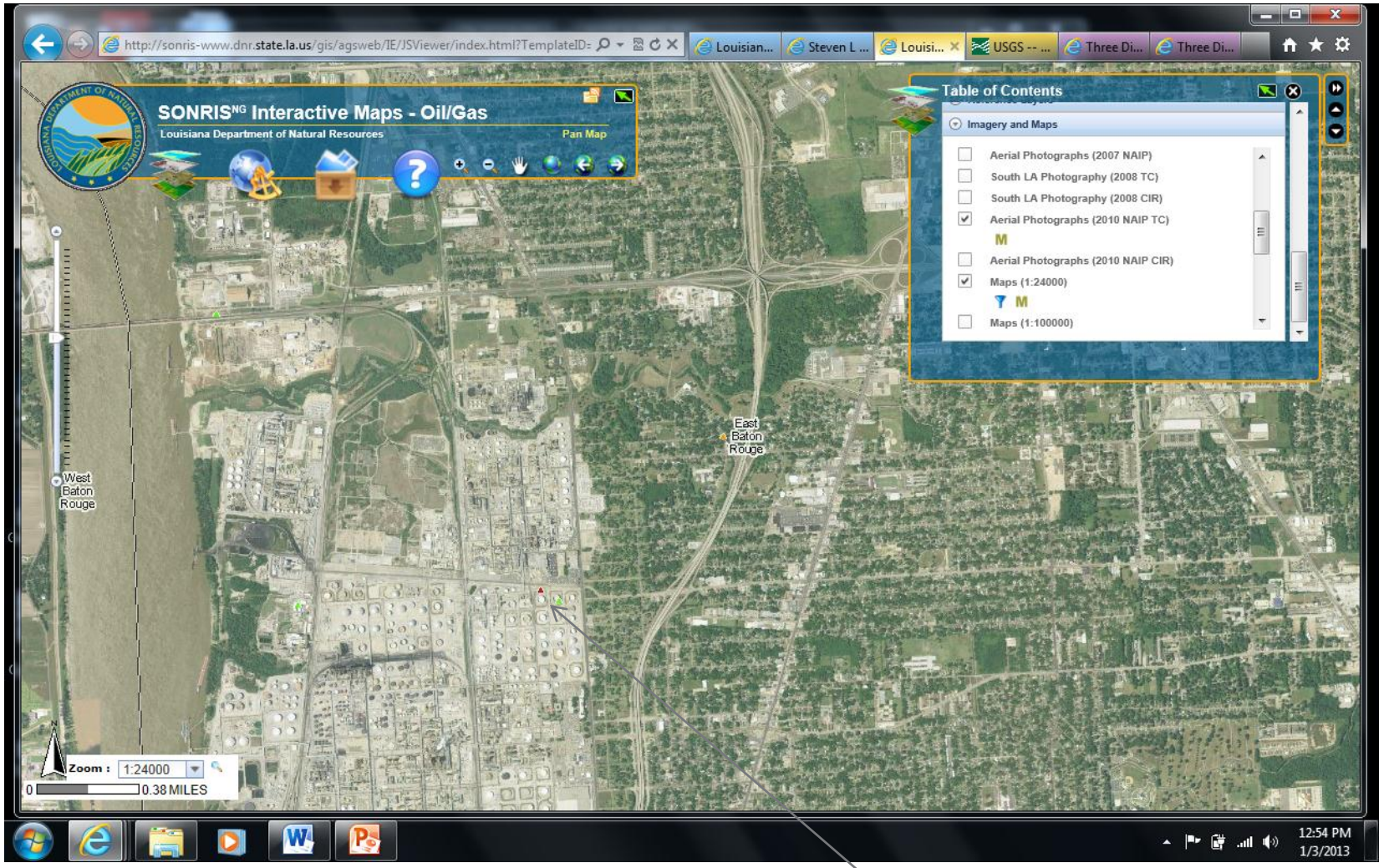
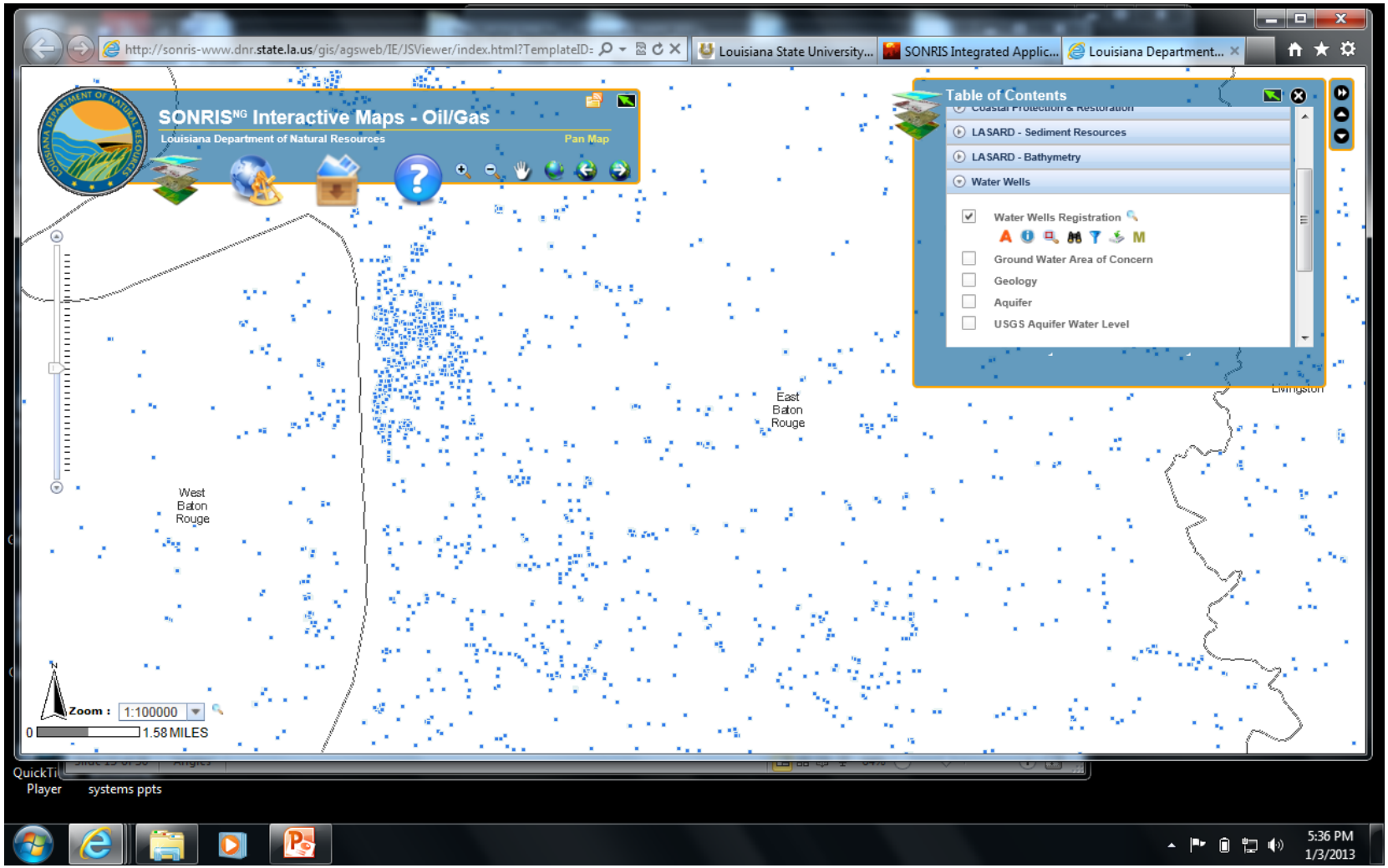


Image turned on and our well is still visible!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Louisiana State University...
SONRIS Integrated Applic...
Louisiana Department...
SONRIS NG Interactive Maps - Oil/Gas
Louisiana Department of Natural Resources
Pan Map
Table of Contents
LASARD - Sediment Resources
LASARD - Bathymetry
Water Wells
Water Wells Registration
Ground Water Area of Concern
Geology
Aquifer
USGS Aquifer Water Level
East Baton Rouge
West Baton Rouge
Zoom : 1:100000
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1.58 MILES
Player
systems ppts
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1/3/2013

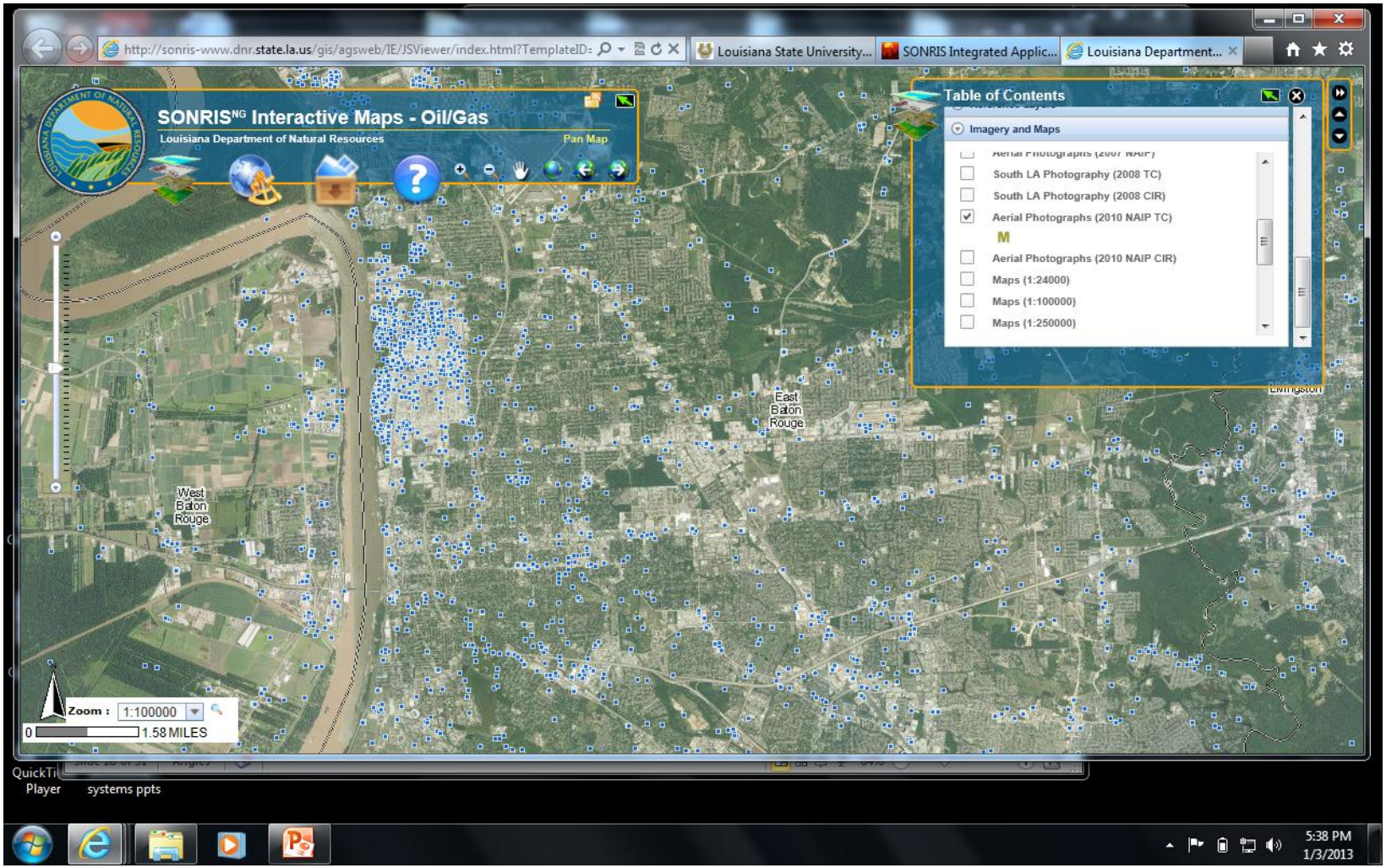
http://sonris-www.dnr.state.la.us/gis/agsweb/IE/JSViewer/index.html?TemplateID=
Louisiana State University...
SONRIS Integrated Applic...
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Table of Contents
Imagery and Maps
South LA Photography (2008 TC)
South LA Photography (2008 CIR)
Aerial Photographs (2010 NAIP TC)
M
Aerial Photographs (2010 NAIP CIR)
Maps (1:24000)
Maps (1:100000)
Maps (1:250000)
East Baton Rouge
West Baton Rouge
Zoom : 1:100000
0 1.58 MILES
QuickTi
Player
systems ppts
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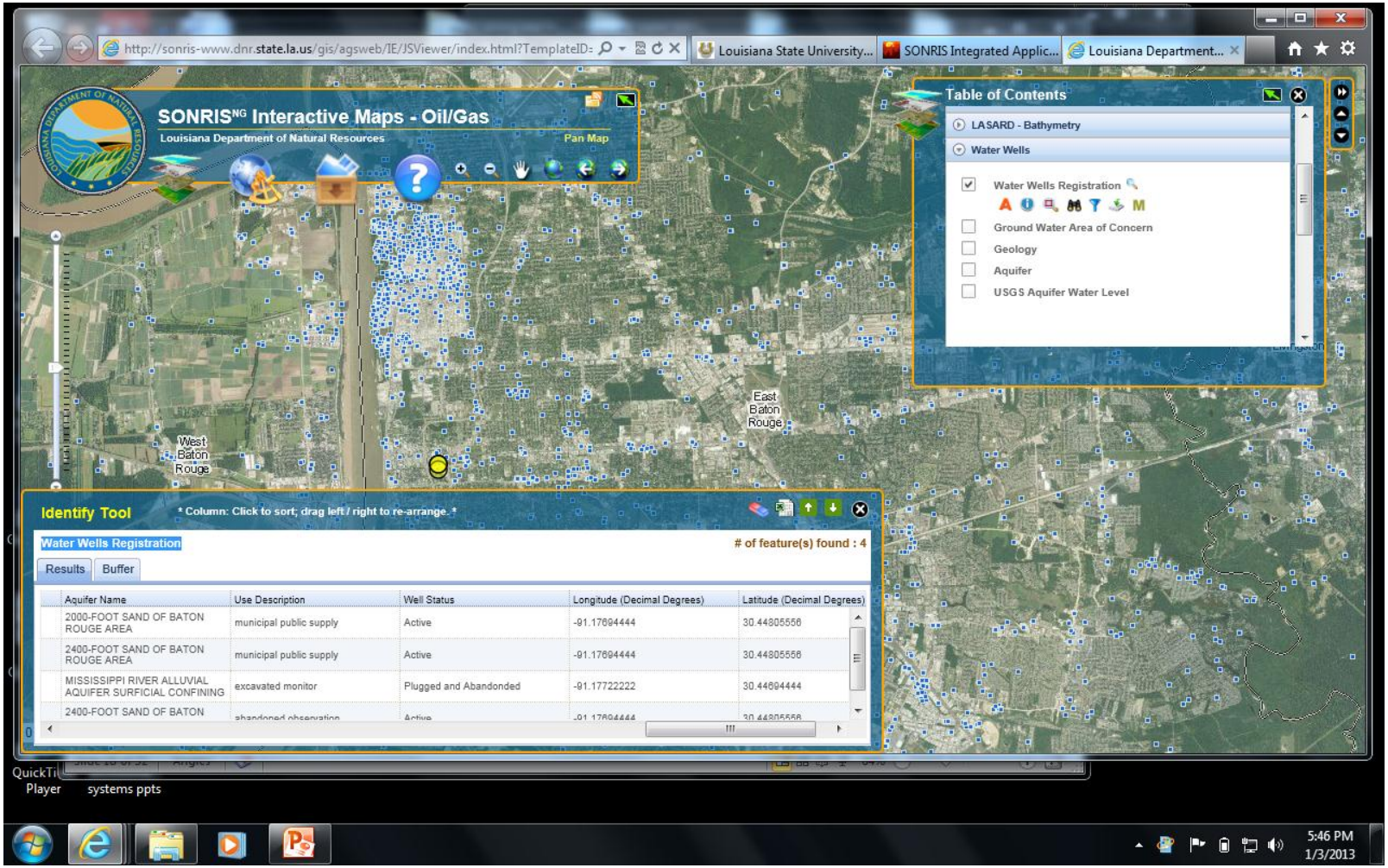
1/3/2013

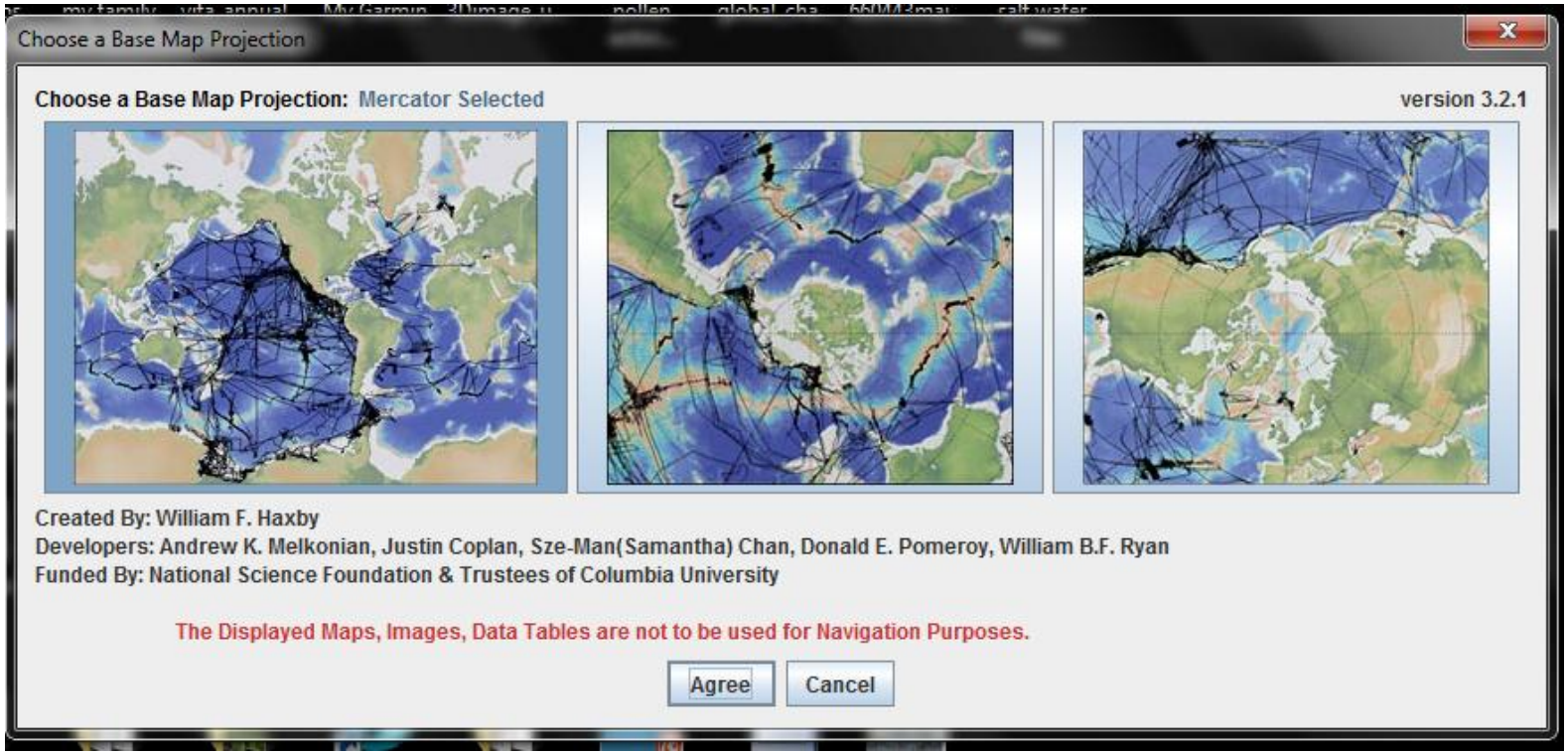


But what about saltwater intrusion?

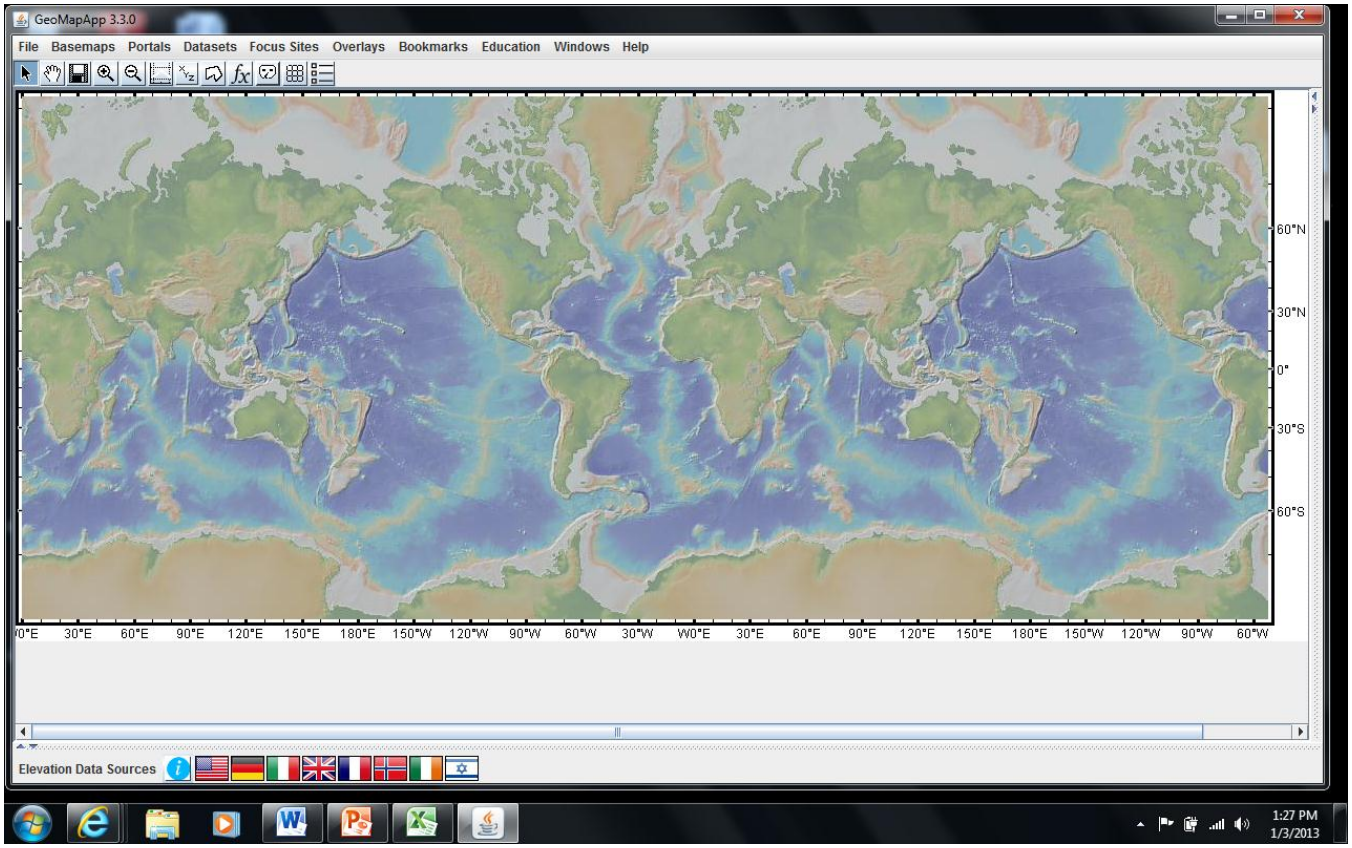
GEOMAPAPP

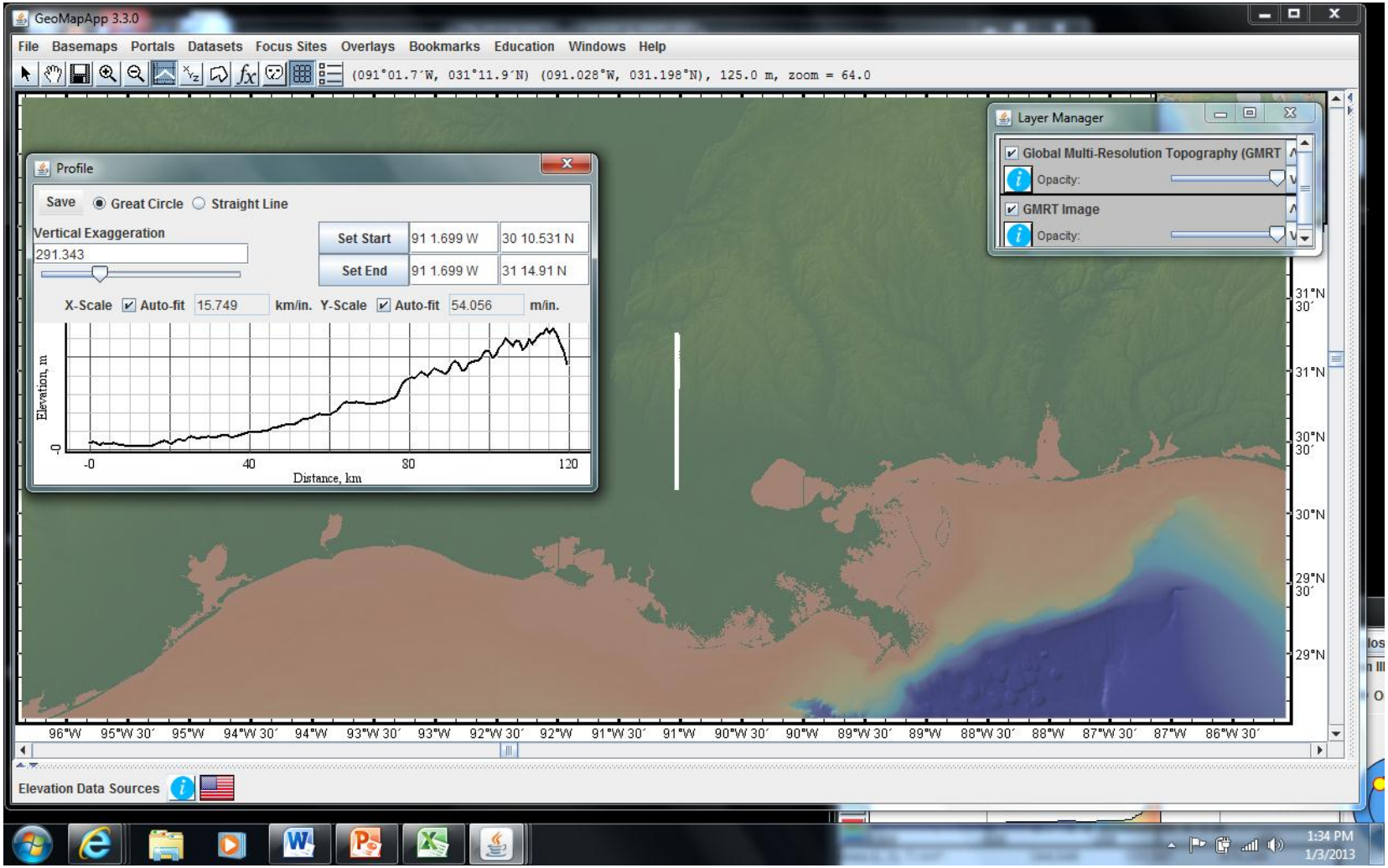
HOW STUDENTS CAN CREATE THEIR OWN GIS

GEOMAPAPP START SCREEN



A WORLD OF DATA

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File Basemaps Portals Datasets Focus Sites Overlays Bookmarks Education Windows Help
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Profile
Save
Great Circle
Straight Line
Vertical Exaggeration
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30 10.531 N
Set End
91 1.699 W
31 14.91 N
X-Scale
Auto-fit
15.749
km/in.
Y-Scale
Auto-fit
54.056
m/in.
Elevation, m
-0
-0
40
80
120
Distance, km
Layer Manager
Global Multi-Resolution Topography (GMRT
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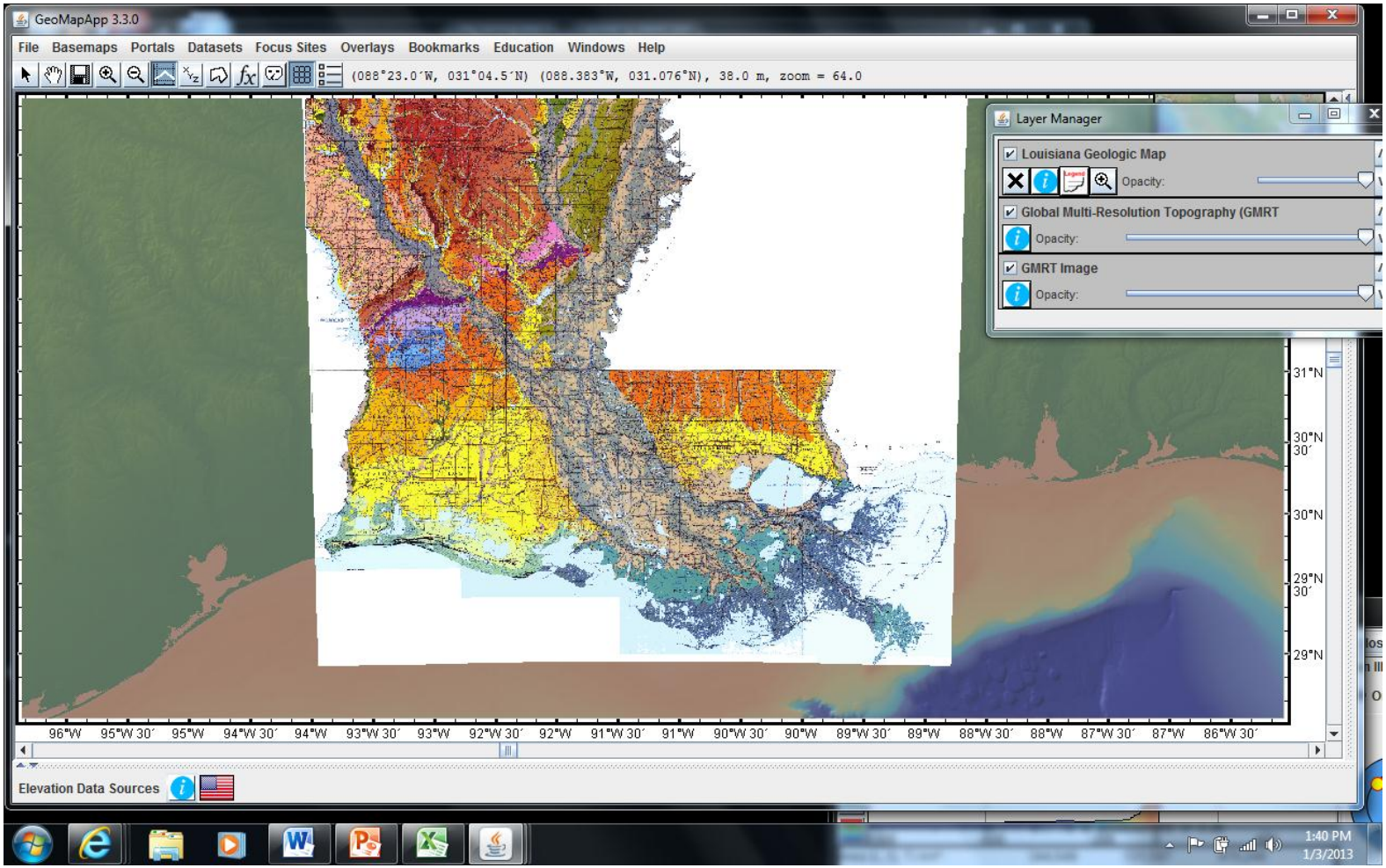
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GMRT Image
Opacity:
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Elevation Data Sources
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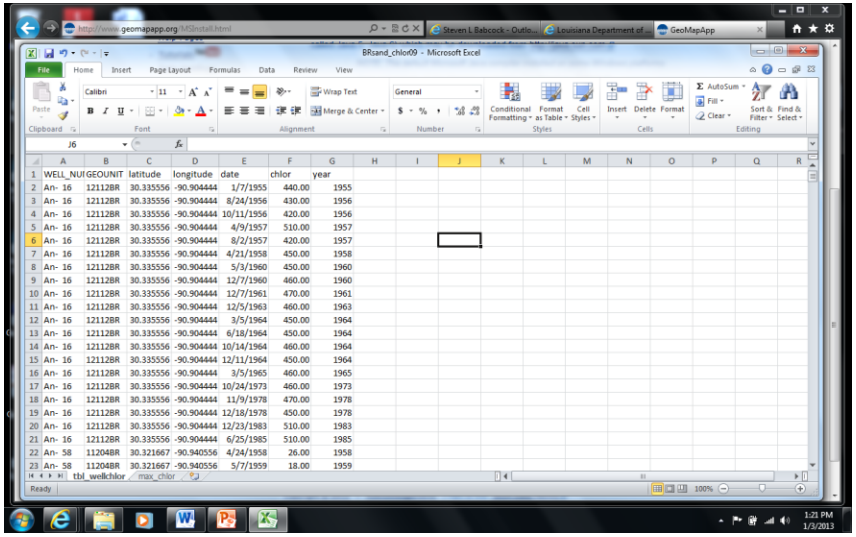
IT ALWAYS BEGINS WITH DATA!

If it has latitude and longitude data you can map it!

Chloride Concentrations



WELL_NUI	GEOUNIT	latitude	longitude	date	chlor	year
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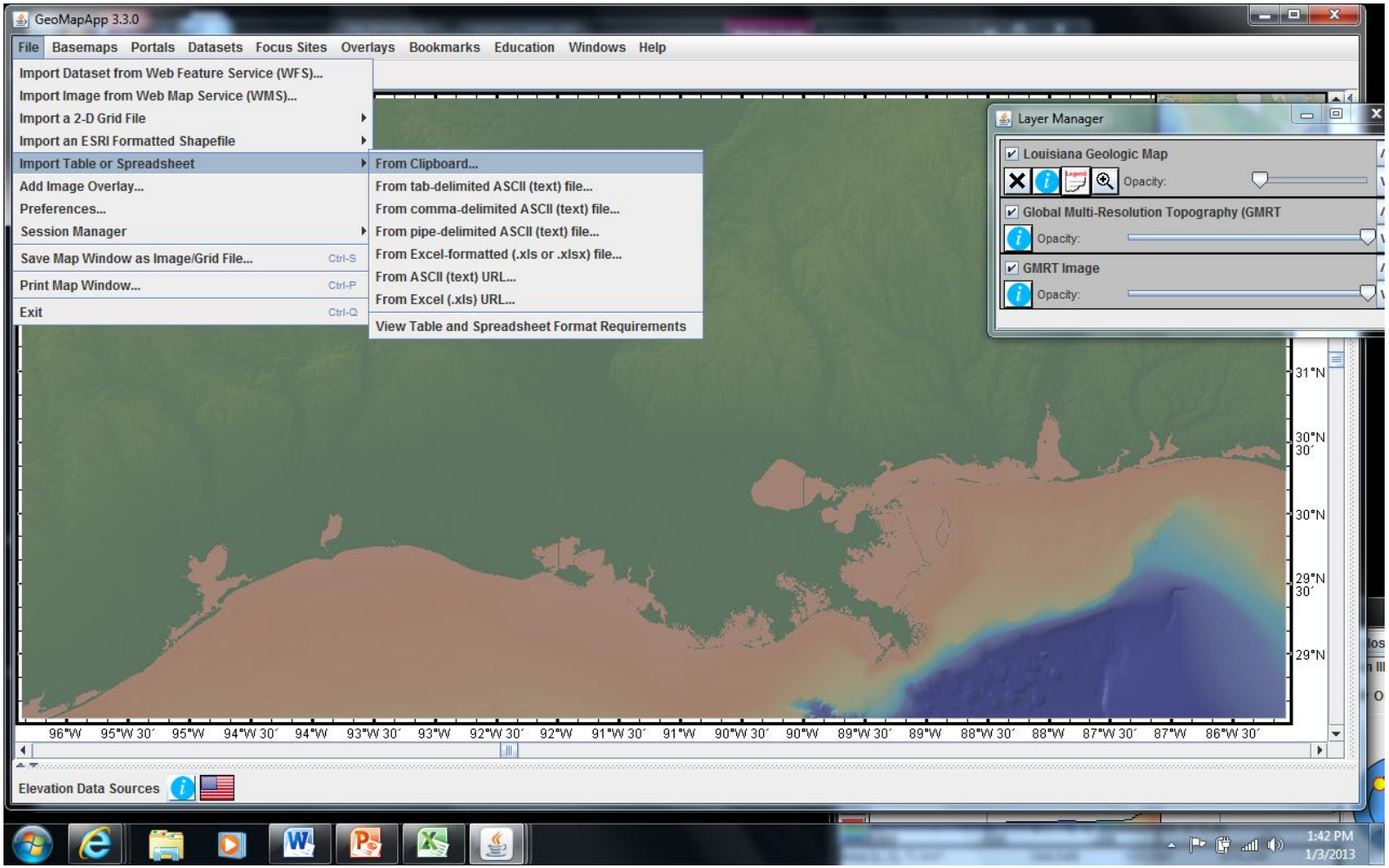
An- 16	12112BR	30.335556	-90.904444	8/24/1956	430.00	1956
An- 16	12112BR	30.335556	-90.904444	10/11/1956	420.00	1956
An- 16	12112BR	30.335556	-90.904444	4/9/1957	510.00	1957
An- 16	12112BR	30.335556	-90.904444	8/2/1957	420.00	1957
An- 16	12112BR	30.335556	-90.904444	4/21/1958	450.00	1958
An- 16	12112BR	30.335556	-90.904444	5/3/1960	450.00	1960
An- 16	12112BR	30.335556	-90.904444	12/7/1960	460.00	1960
An- 16	12112BR	30.335556	-90.904444	12/7/1961	470.00	1961
An- 16	12112BR	30.335556	-90.904444	12/5/1963	460.00	1963
An- 16	12112BR	30.335556	-90.904444	3/5/1964	450.00	1964
An- 16	12112BR	30.335556	-90.904444	6/18/1964	450.00	1964
An- 16	12112BR	30.335556	-90.904444	10/14/1964	460.00	1964
An- 16	12112BR	30.335556	-90.904444	12/11/1964	450.00	1964
An- 16	12112BR	30.335556	-90.904444	3/5/1965	460.00	1965
An- 16	12112BR	30.335556	-90.904444	10/24/1973	460.00	1973
An- 16	12112BR	30.335556	-90.904444	11/9/1978	470.00	1978
An- 16	12112BR	30.335556	-90.904444	12/18/1978	450.00	1978
An- 16	12112BR	30.335556	-90.904444	12/23/1983	510.00	1983
An- 16	12112BR	30.335556	-90.904444	6/25/1985	510.00	1985
An- 58	11204BR	30.321667	-90.940556	4/24/1958	26.00	1958
An- 58	11204BR	30.321667	-90.940556	5/7/1959	18.00	1959

John K. Lovelace, U.S. Geological Survey, written commun., 2012).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Portals
Datasets
Focus Sites
Overlays
Bookmarks
Education
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Import Image from Web Map Service (WMS)...
Import a 2-D Grid File
Import an ESRI Formatted Shapefile
Import Table or Spreadsheet
Add Image Overlay...
Preferences...
Session Manager
Save Map Window as Image/Grid File... Ctrl-S
Print Map Window... Ctrl-P
Exit Ctrl-Q
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From tab-delimited ASCII (text) file...
From comma-delimited ASCII (text) file...
From pipe-delimited ASCII (text) file...
From Excel-formatted (.xls or .xlsx) file...
From ASCII (text) URL...
From Excel (.xls) URL...
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Global Multi-Resolution Topography (GMRT
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Elevation Data Sources
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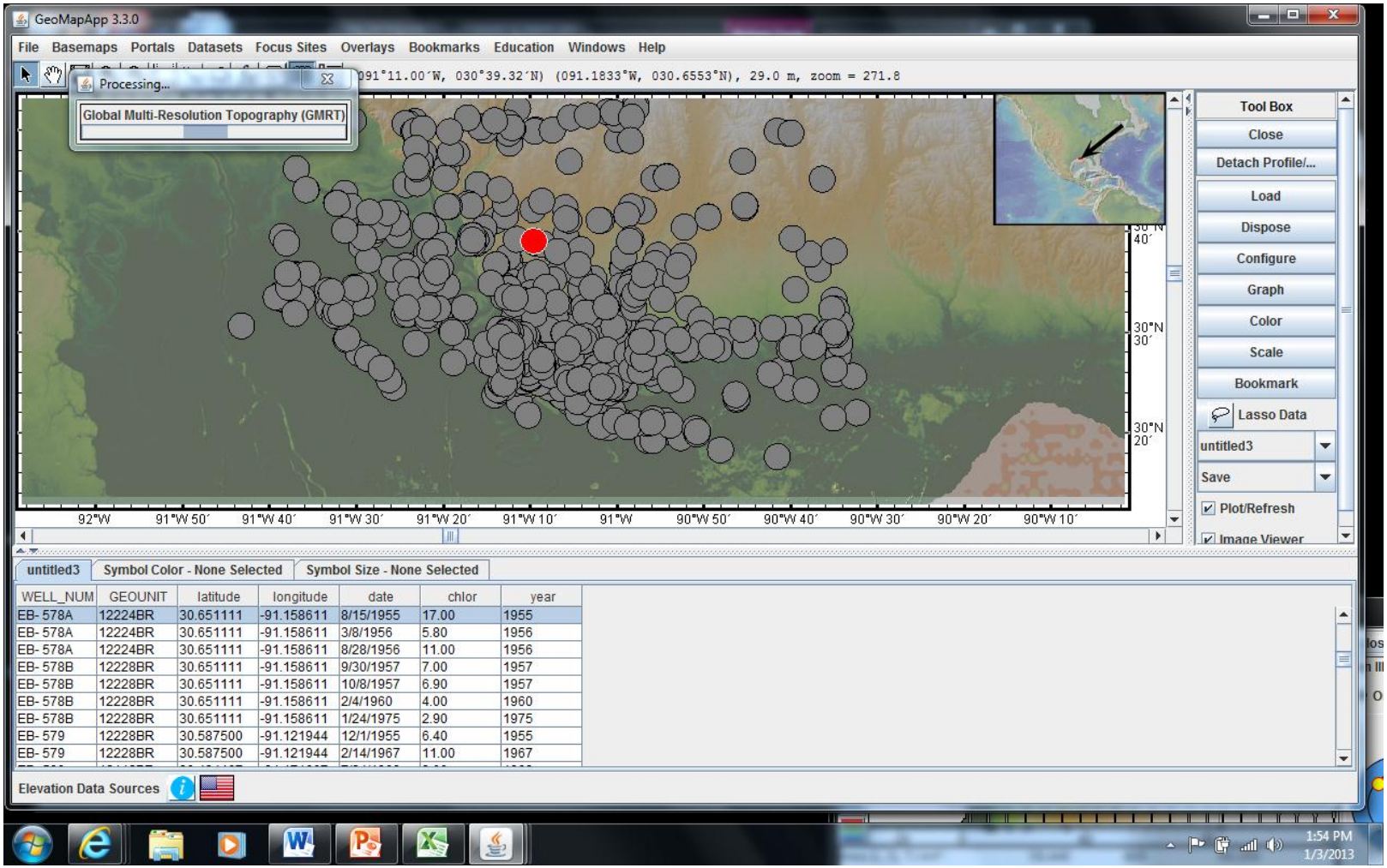
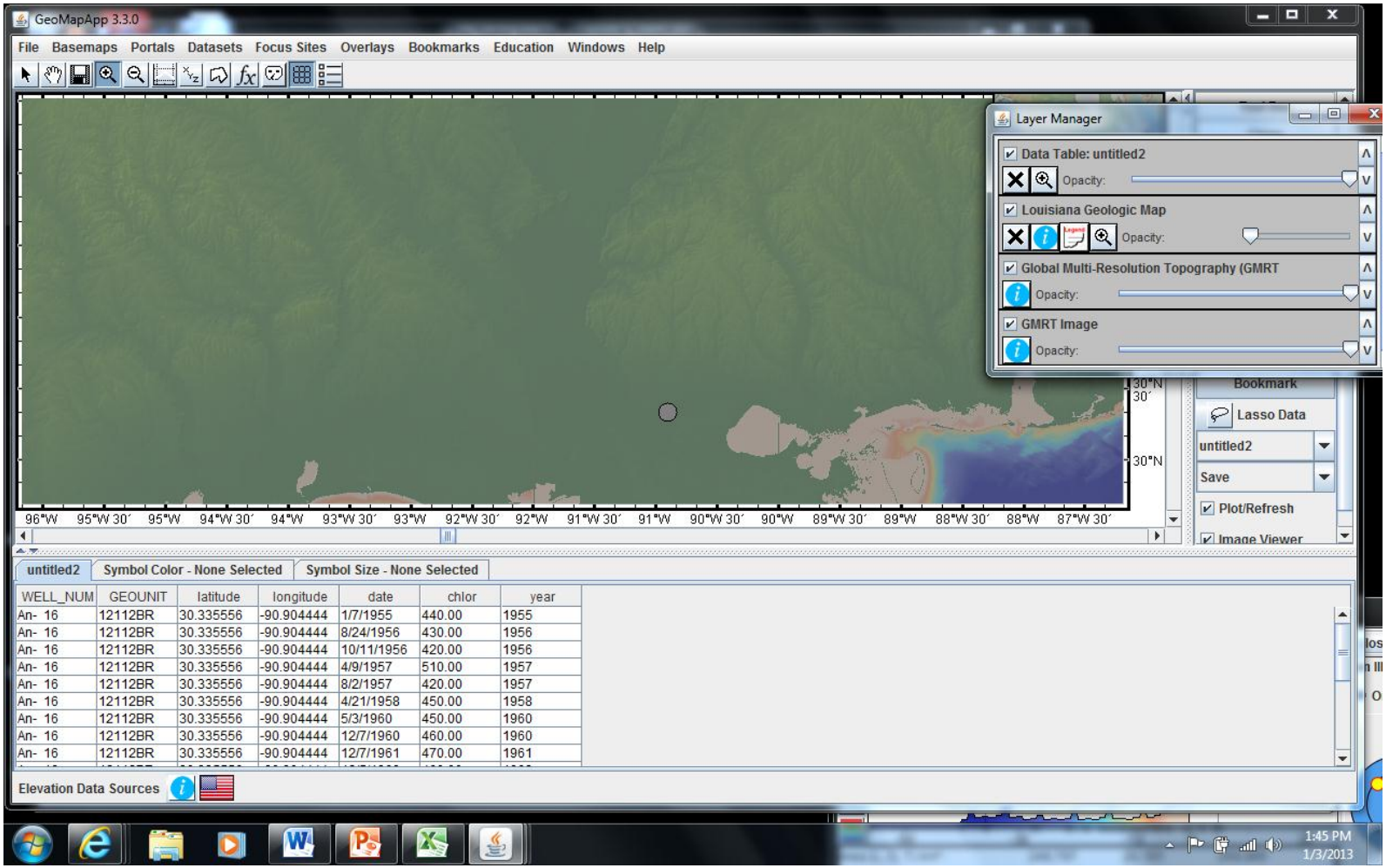
1/3/2013



WELL_NUM	GEOUNIT	latitude	longitude	date	chlor	year
EB- 578A	12224BR	30.651111	-91.158611	8/15/1955	17.00	1955
EB- 578A	12224BR	30.651111	-91.158611	3/8/1956	5.80	1956
EB- 578A	12224BR	30.651111	-91.158611	8/28/1956	11.00	1956
EB- 578B	12228BR	30.651111	-91.158611	9/30/1957	7.00	1957
EB- 578B	12228BR	30.651111	-91.158611	10/8/1957	6.90	1957
EB- 578B	12228BR	30.651111	-91.158611	2/4/1960	4.00	1960
EB- 578B	12228BR	30.651111	-91.158611	1/24/1975	2.90	1975
EB- 579	12228BR	30.587500	-91.121944	12/1/1955	6.40	1955
EB- 579	12228BR	30.587500	-91.121944	2/14/1967	11.00	1967


GeoMapApp 3.3.0
File Basemaps Portals Datasets Focus Sites Overlays Bookmarks Education Windows Help
Layer Manager
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Opacity:
Louisiana Geologic Map
Opacity:
Global Multi-Resolution Topography (GMRT
Opacity:
GMRT Image
Opacity:
Bookmark
Lasso Data
untitled2
Save
Plot/Refresh
Image Viewer
30°N
30´
30°N
96°W 95°W 30´ 95°W 94°W 30´ 94°W 93°W 30´ 93°W 92°W 30´ 92°W 91°W 30´ 91°W 90°W 30´ 90°W 89°W 30´ 89°W 88°W 30´ 88°W 87°W 30´
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Symbol Size - None Selected
WELL_NUM GEOUNIT latitude longitude date chlor year
An- 16 12112BR 30.335556 -90.904444 1/7/1955 440.00 1955
An- 16 12112BR 30.335556 -90.904444 8/24/1956 430.00 1956
An- 16 12112BR 30.335556 -90.904444 10/11/1956 420.00 1956
An- 16 12112BR 30.335556 -90.904444 4/9/1957 510.00 1957
An- 16 12112BR 30.335556 -90.904444 8/2/1957 420.00 1957
An- 16 12112BR 30.335556 -90.904444 4/21/1958 450.00 1958
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An- 16 12112BR 30.335556 -90.904444 12/7/1960 460.00 1960
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Elevation Data Sources
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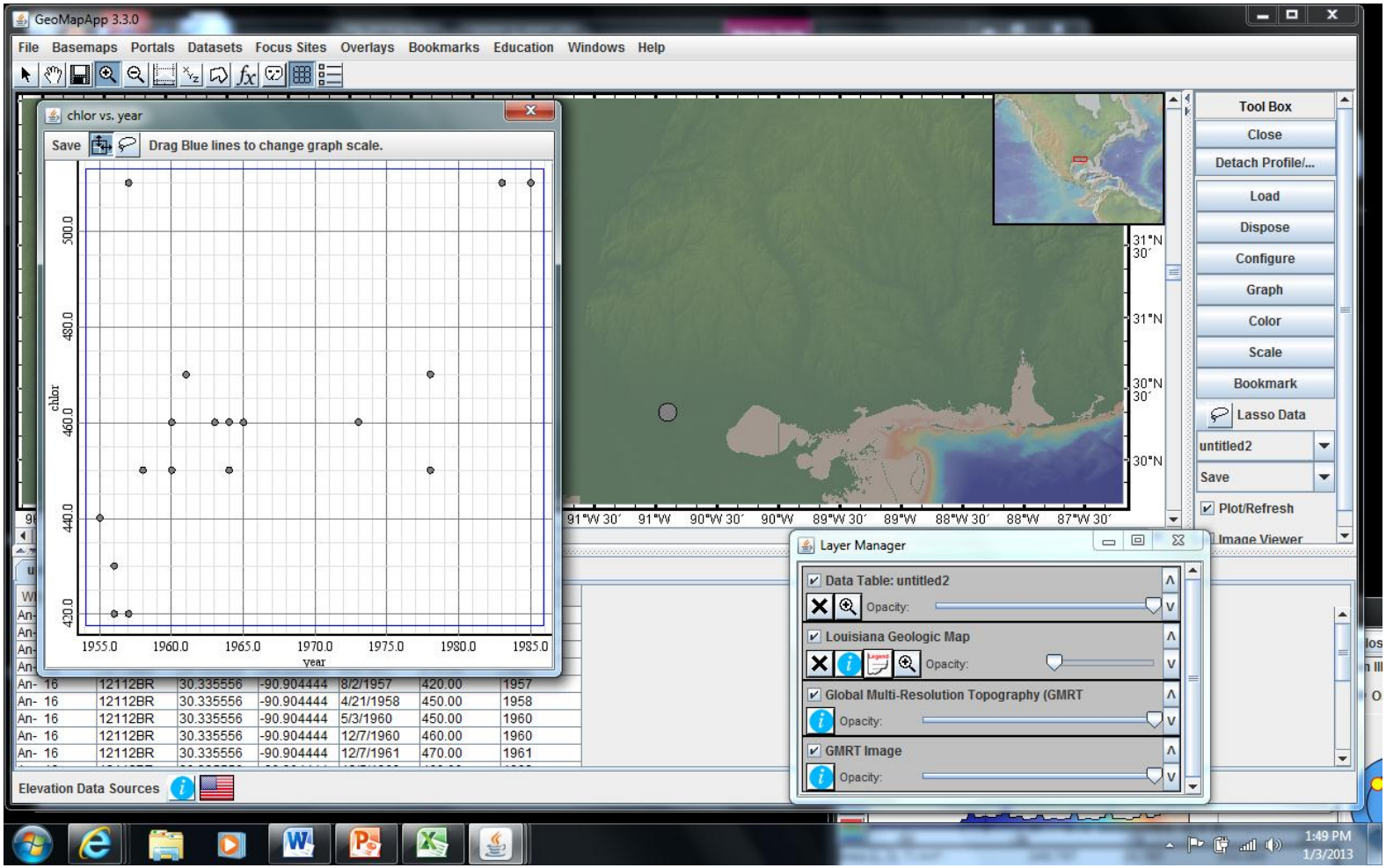
1/3/2013


GeoMapApp 3.3.0
File Basemaps Portals Datasets Focus Sites Overlays Bookmarks Education Windows Help
chlor vs. year
Save
Drag Blue lines to change graph scale.
chlor
year
Tool Box
Close
Detach Profile/...
Load
Dispose
Configure
Graph
Color
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Louisiana Geologic Map
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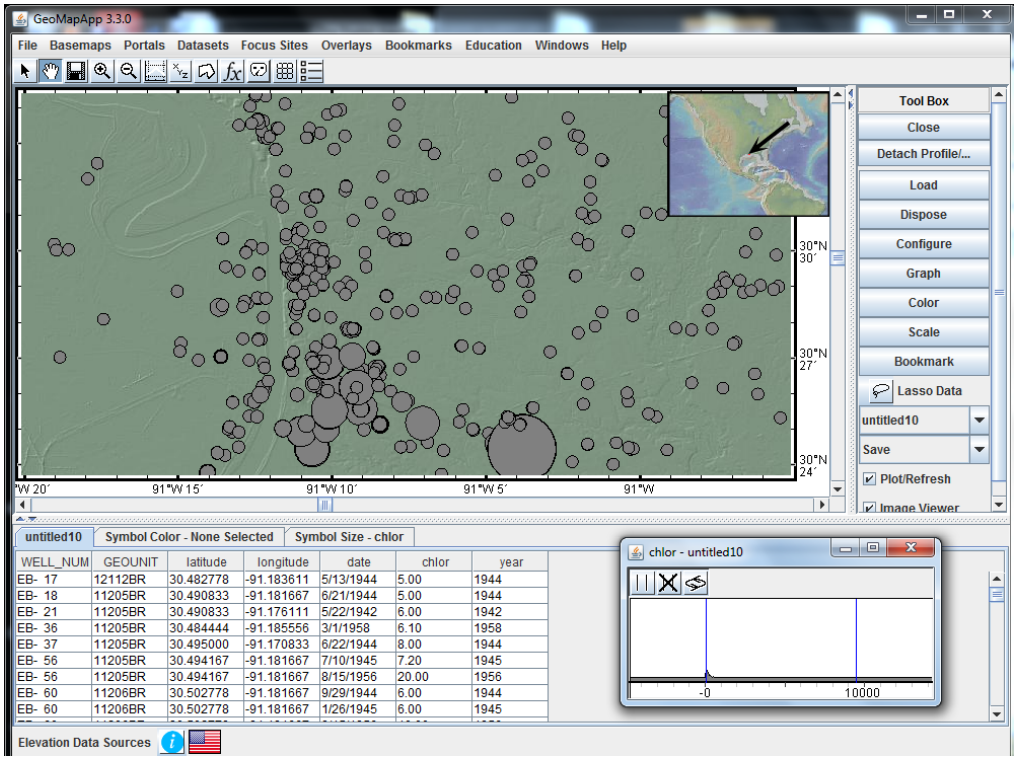
Elevation Data Sources
1:49 PM
1/3/2013

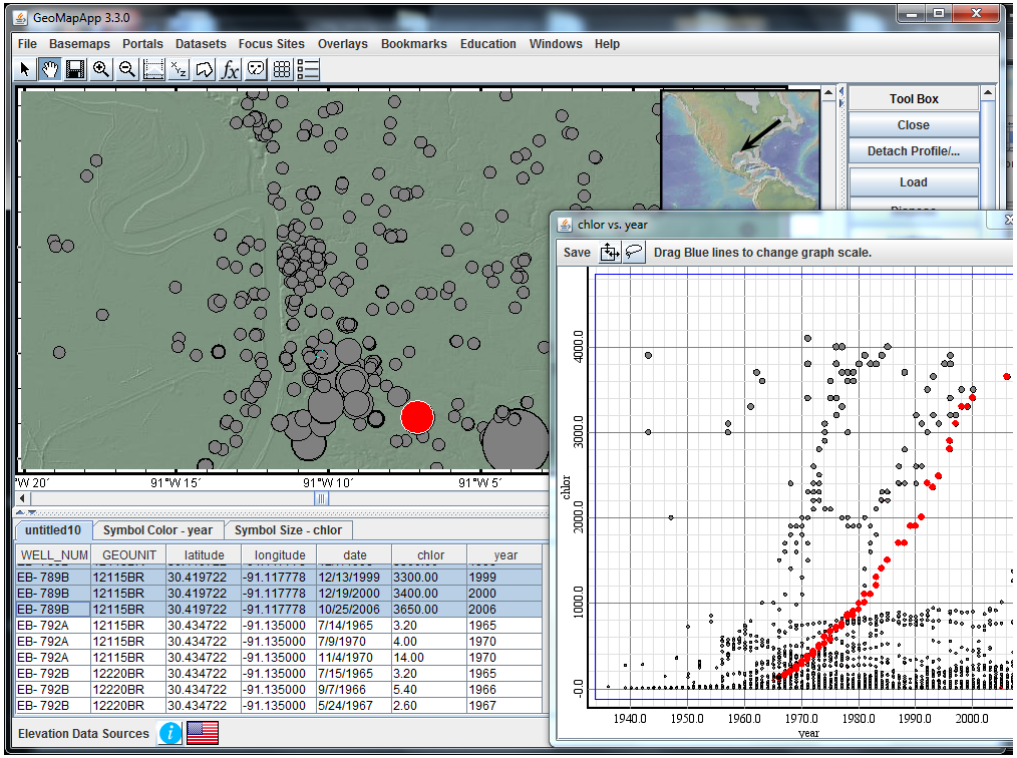
ACTIVITY

- Aim: Determine changes in chloride levels in public supply wells in EBR .
- Background Study: Students review abstracts and introductions of key papers.
- Method: Students load USGS data into GeoMapApp and select several public wells to examine. Students create a series of scatterplots of chloride levels over time. Students analyze trends and suggest reasons for changing choride concentrations.
- Product: Students use papers as working models for their own reports. Reports should include introduction to the problem, map of study area, brief method section, data tables for selected wells, scatterplots of data and a conclusion/ evaluation section.

WELL LOCATIONS SHOWING CHLORIDE LEVEL BY ICON SIZE



SCATTERPLOT OF ALL WELL CHLORIDE LEVELS WITH ONE WELL HIGHLIGHTED



WELL_NUM	GEOUNIT	latitude	longitude	date	chlor	year
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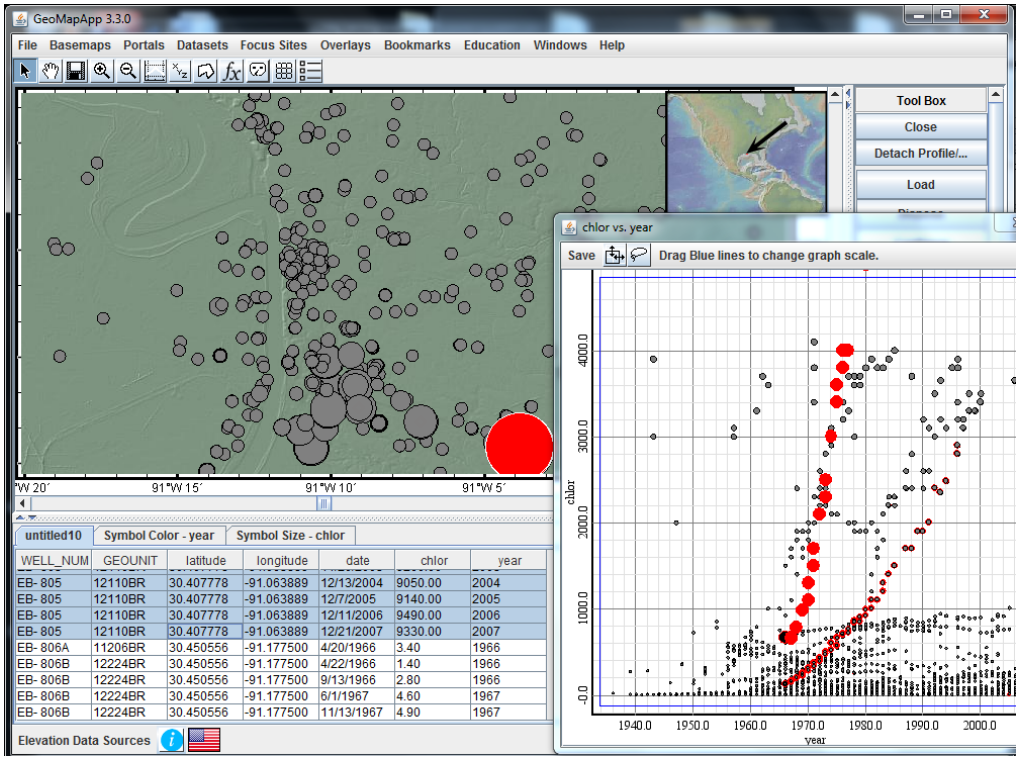
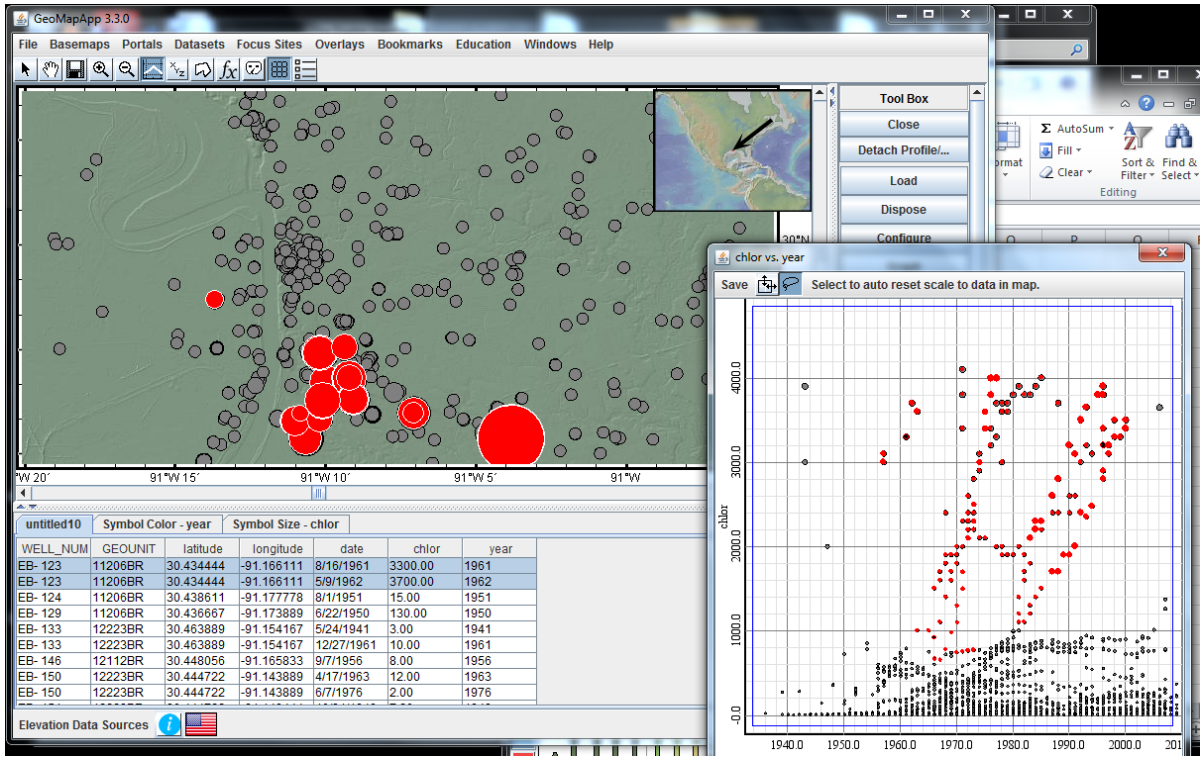
EB- 789B	12115BR	30.419722	-91.117778	12/19/2000	3400.00	2000
EB- 789B	12115BR	30.419722	-91.117778	10/25/2006	3650.00	2006
EB- 792A	12115BR	30.434722	-91.135000	7/14/1965	3.20	1965
EB- 792A	12115BR	30.434722	-91.135000	7/9/1970	4.00	1970
EB- 792A	12115BR	30.434722	-91.135000	11/4/1970	14.00	1970
EB- 792B	12220BR	30.434722	-91.135000	7/15/1965	3.20	1965
EB- 792B	12220BR	30.434722	-91.135000	9/7/1966	5.40	1966
EB- 792B	12220BR	30.434722	-91.135000	5/24/1967	2.60	1967

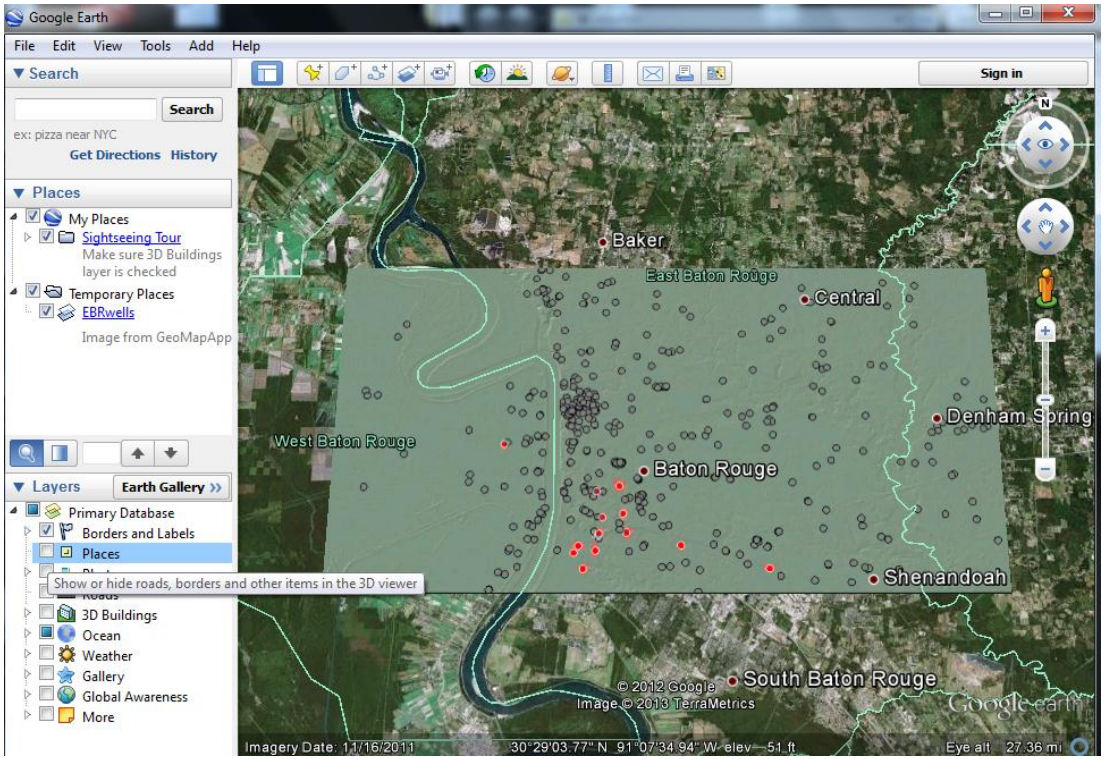
TWO WELL TRENDS COMPARED



ALL WELLS WITH STRONG POSITIVE TREND HIGHLIGHTED



WELL LOCATIONS SHOWN IN GOOGLE EARTH



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Tomaszewski, D,J., 1996. Distribution and Movement of Saltwater in Aquifers in the Baton Rouge Area, Louisiana, 1990-1992. Water Resources Technical Report No.59.

Well locations and chloride concentration data were obtained from the United States Geological Survey (John K. Lovelace, U.S. Geological Survey, written commun., 2012).

QUESTIONS?

Feel free to contact me....

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