

Remote Sensing and Passive Geophysical Techniques in Clark County, Nevada

David J. Donovan, MS, RG, CPG,
AquaPetrus

Jim O'Donnell, BC-Geophysics

Kale McLin, KLM Geoscience

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- Optim
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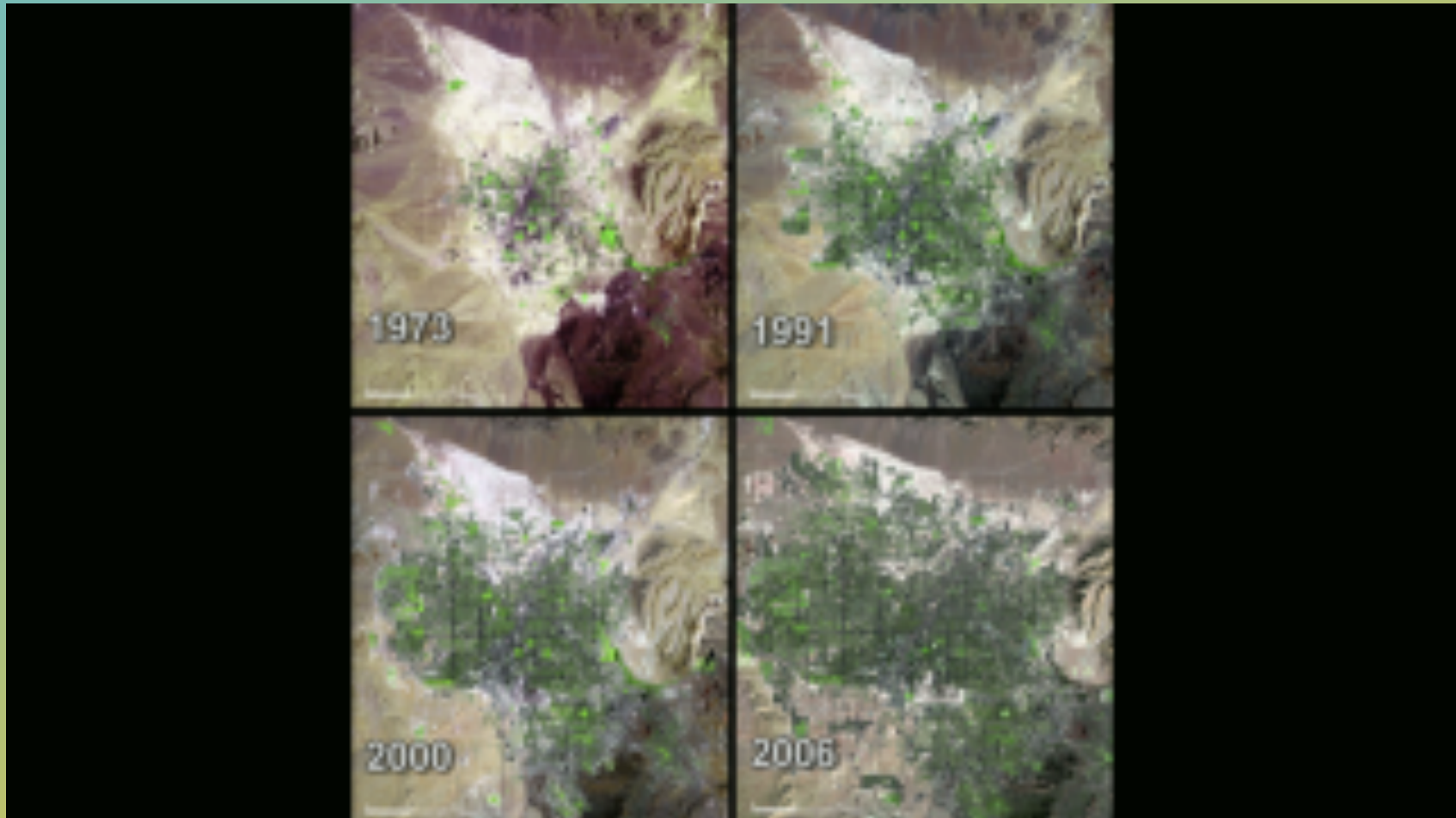
Overview

- Landsat and Google Earth Imagery
- InSAR and PINSAR Images
- Hydrogeologic Overview
- Real Time & Near Real Time Observation
- Passive Geophysical Techniques (ReMi)
- Key Points

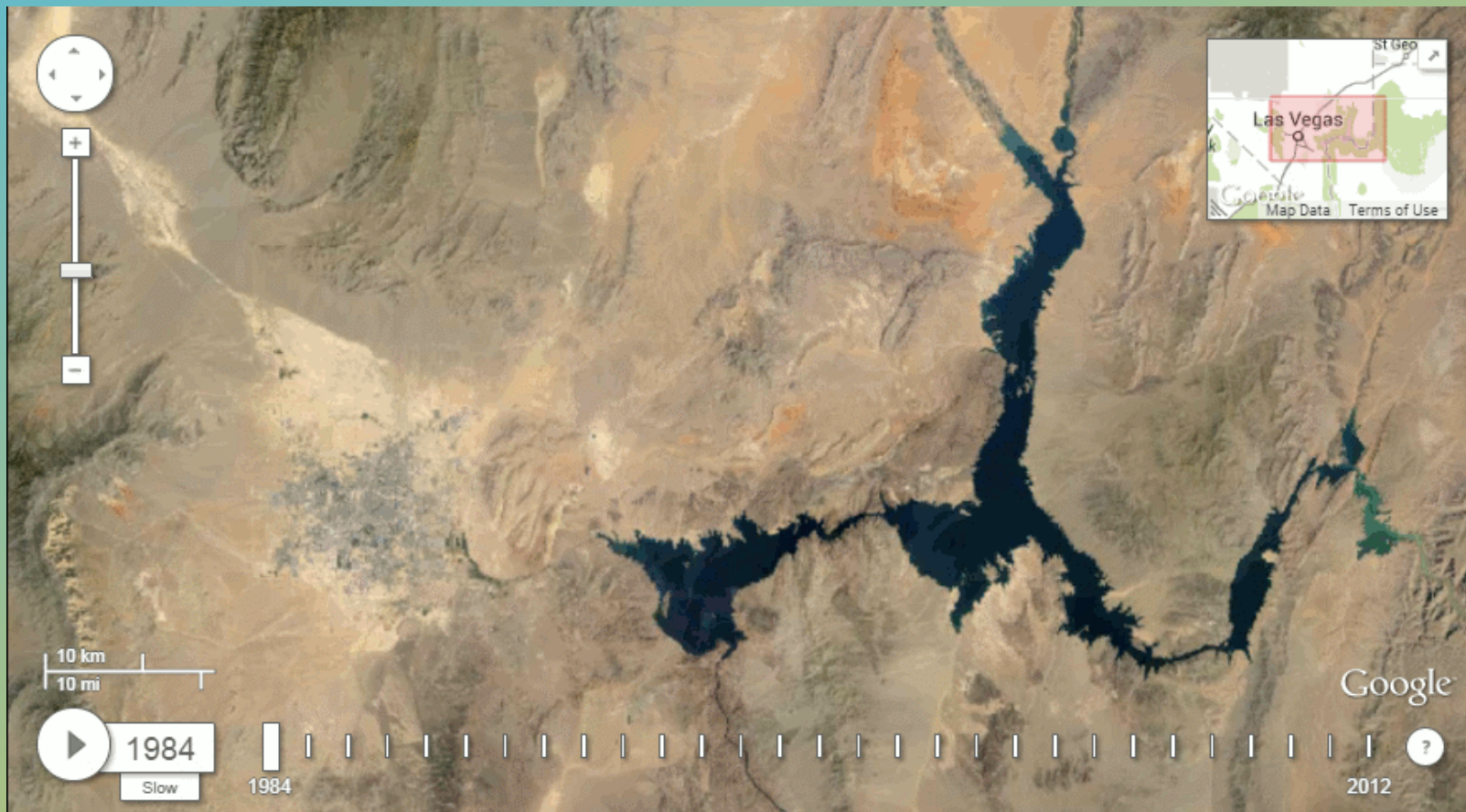
Landsat and Google Earth

- Several Satellite based technology
- NAIP is often incorporated into GE
- LIDAR
 - NBMG proposed new imagery for Clark County
- GRACE??
- TRMM??

Landsat Time Series



<http://svs.gsfc.nasa.gov/vis/a010000/a010100/a010184/>



<https://earthengine.google.org/#intro/LasVegas>

InSar and PINSAR

Amelung et al. 1999

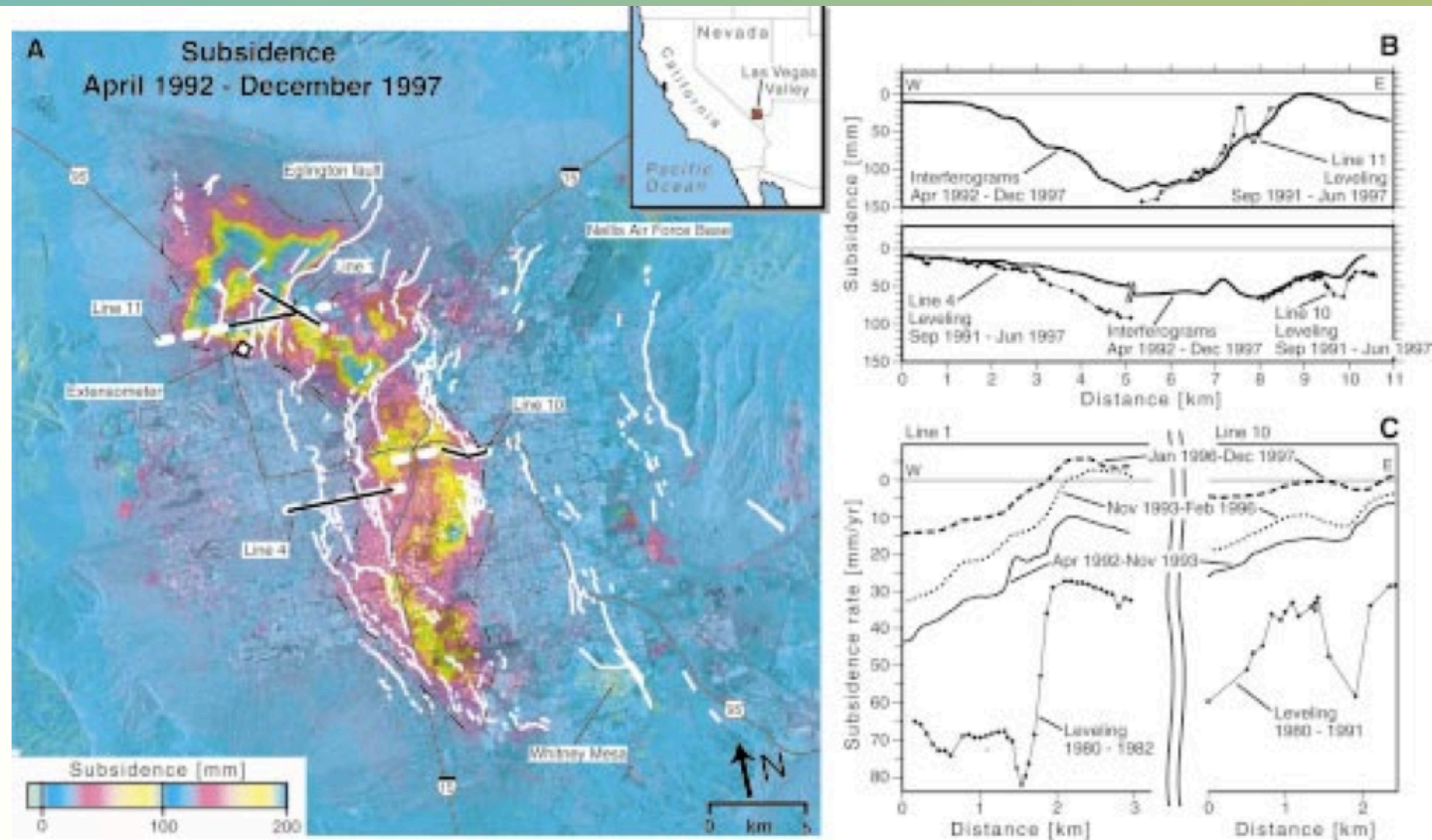
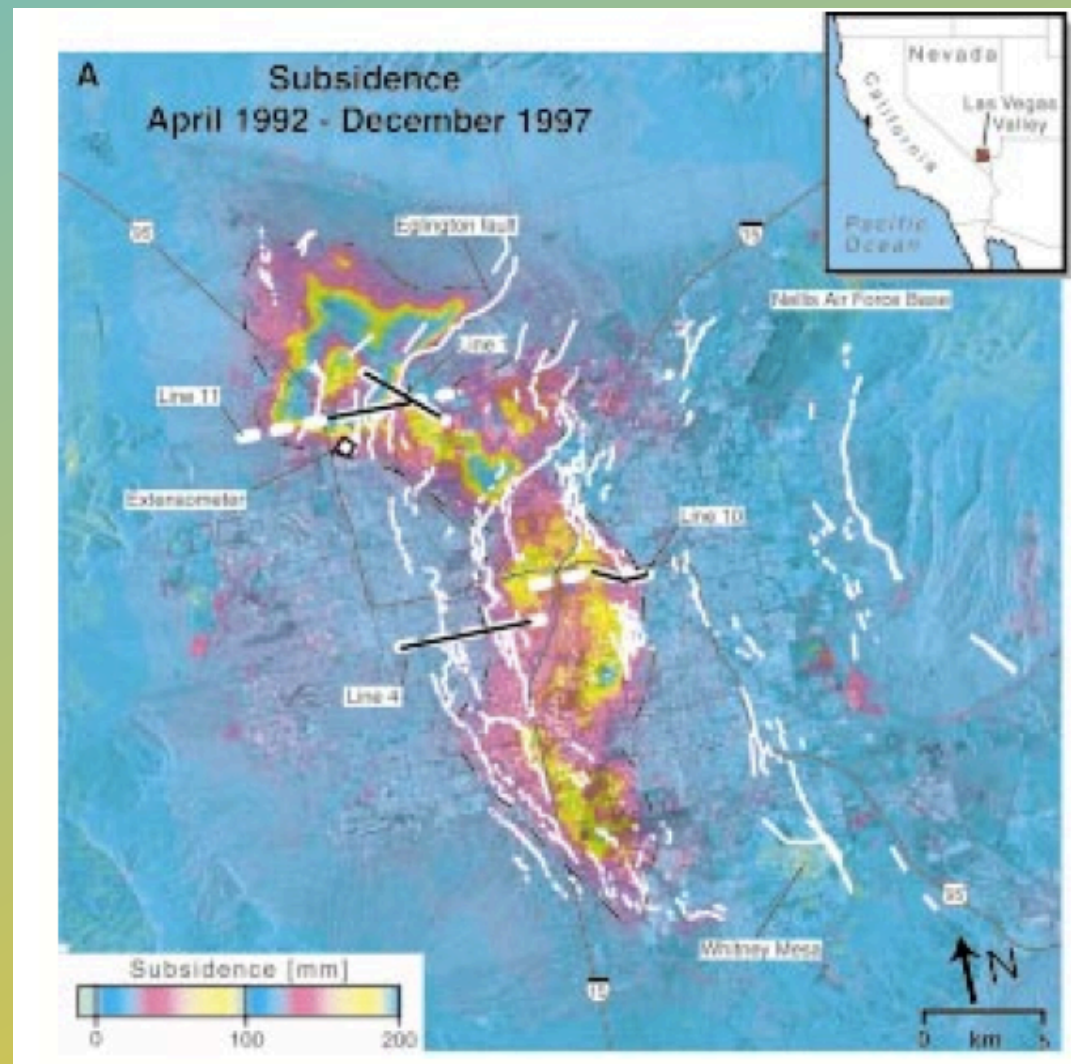
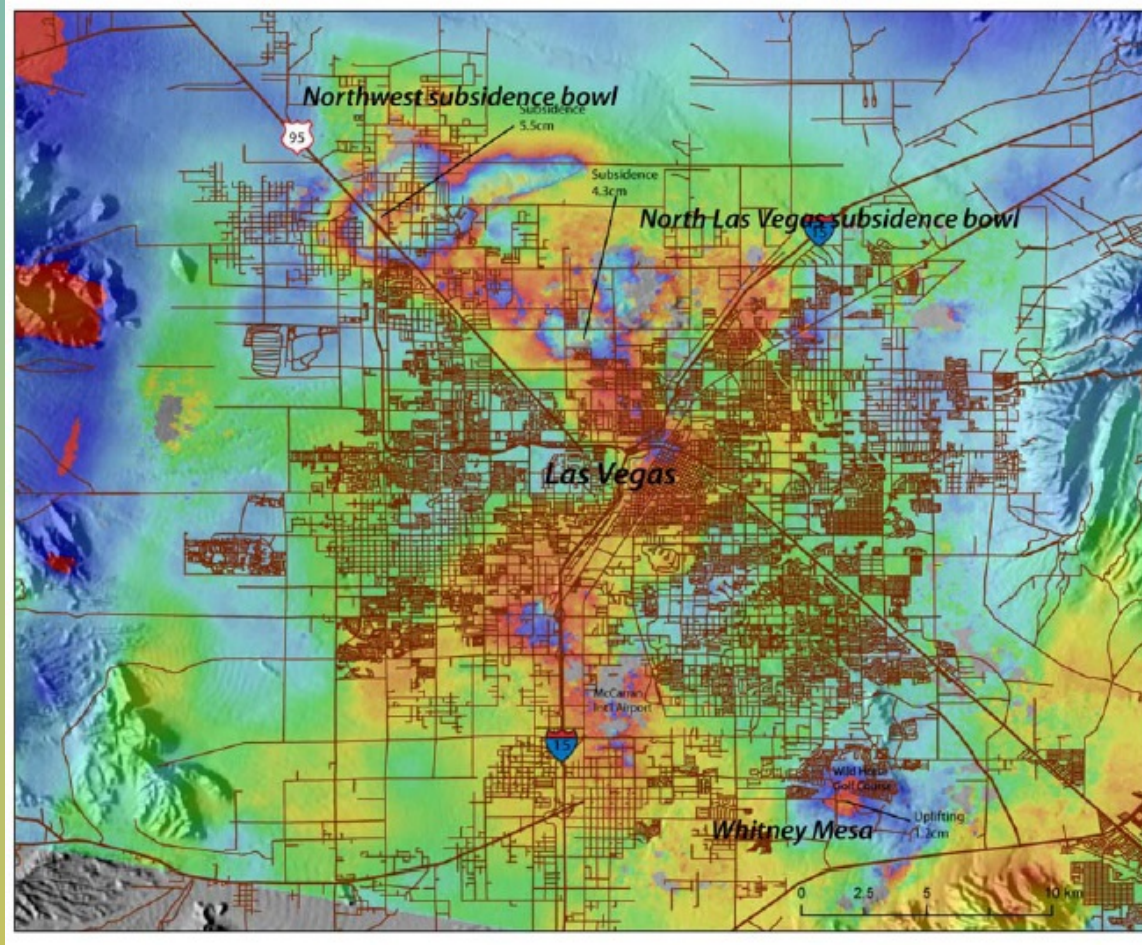


Figure 1. A: Subsidence in Las Vegas Valley between April 1992 and December 1997, obtained from interferograms (Fig. 2, A, B, and C) by unwrapping phases using Zebker and Lu (1998) algorithm, projecting range displacement onto equivalent vertical displacement, and summing interferograms; and mapped surface faults. Dashed line indicates 30 mm subsidence contour. Pixel size is 1600 m². One color cycle indicates 100 mm of displacement. Stable landforms (bedrock) are assigned zero subsidence. Phase signatures along urban margins may be artifacts related to loss of coherence due to construction. B, C: Subsidence and subsidence rates as measured by interferograms (thick dashed white lines in A) and leveling (solid black lines in A). Leveling data are relative and shifted to arbitrary value. Random error of leveling data from difference between backward and forward runs is 5–10 mm.

Amelung et al. 1999



Bell et al. 2008 (95-97)



0 5 km

1992-1996

Velocity

- + 2-5 mm/yr
- + 2- -2 mm/yr
- 2-5 mm/yr
- 5-10 mm/yr
- 10-20 mm/yr
- 20-30 mm/yr

A, B

C, D

R169

+15

EXT-1

NWSB

EF

F

NLVSB

+10

LVVWD

+5

CSB

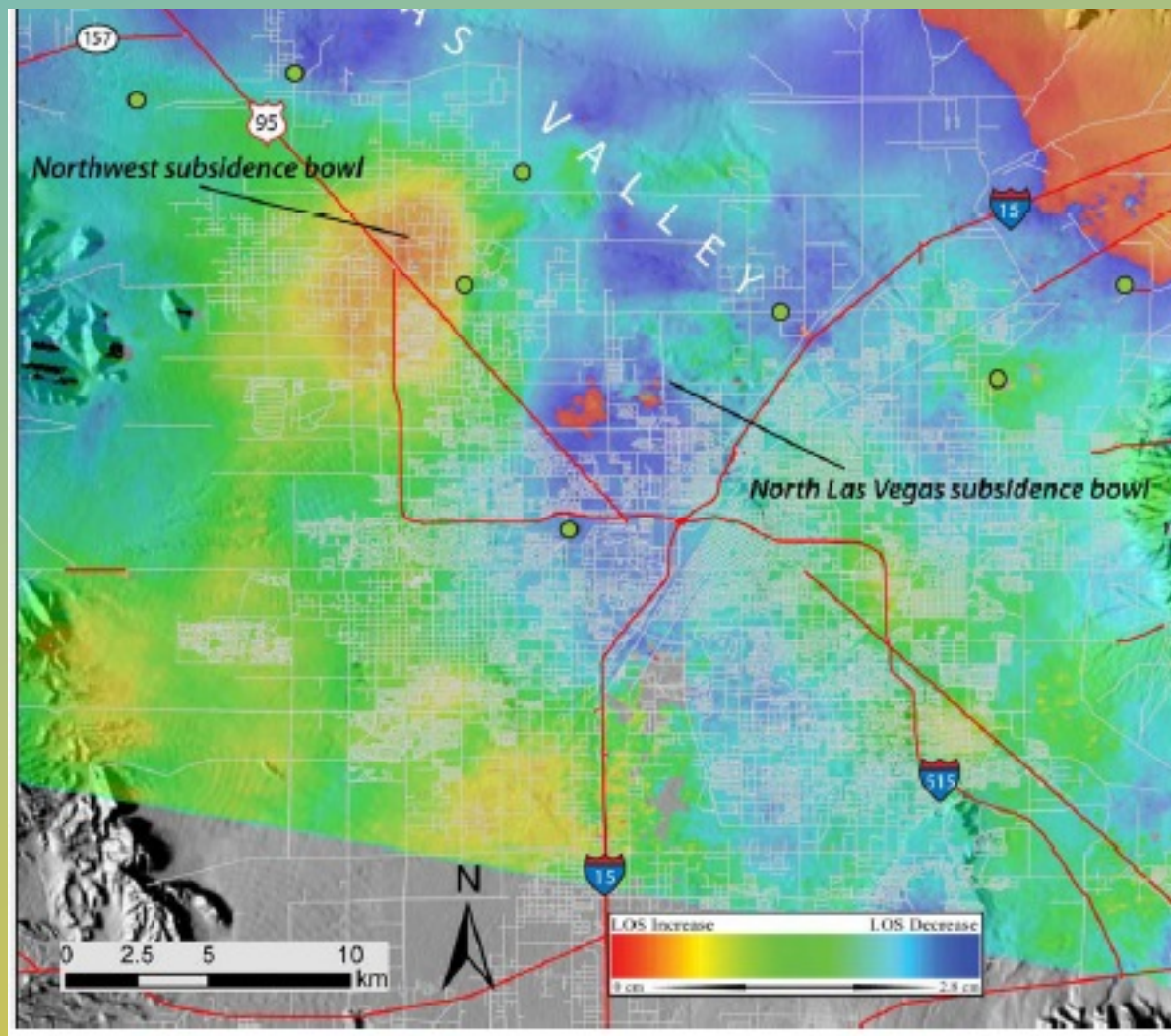
E

VWF

Pumping volume 1990-1998

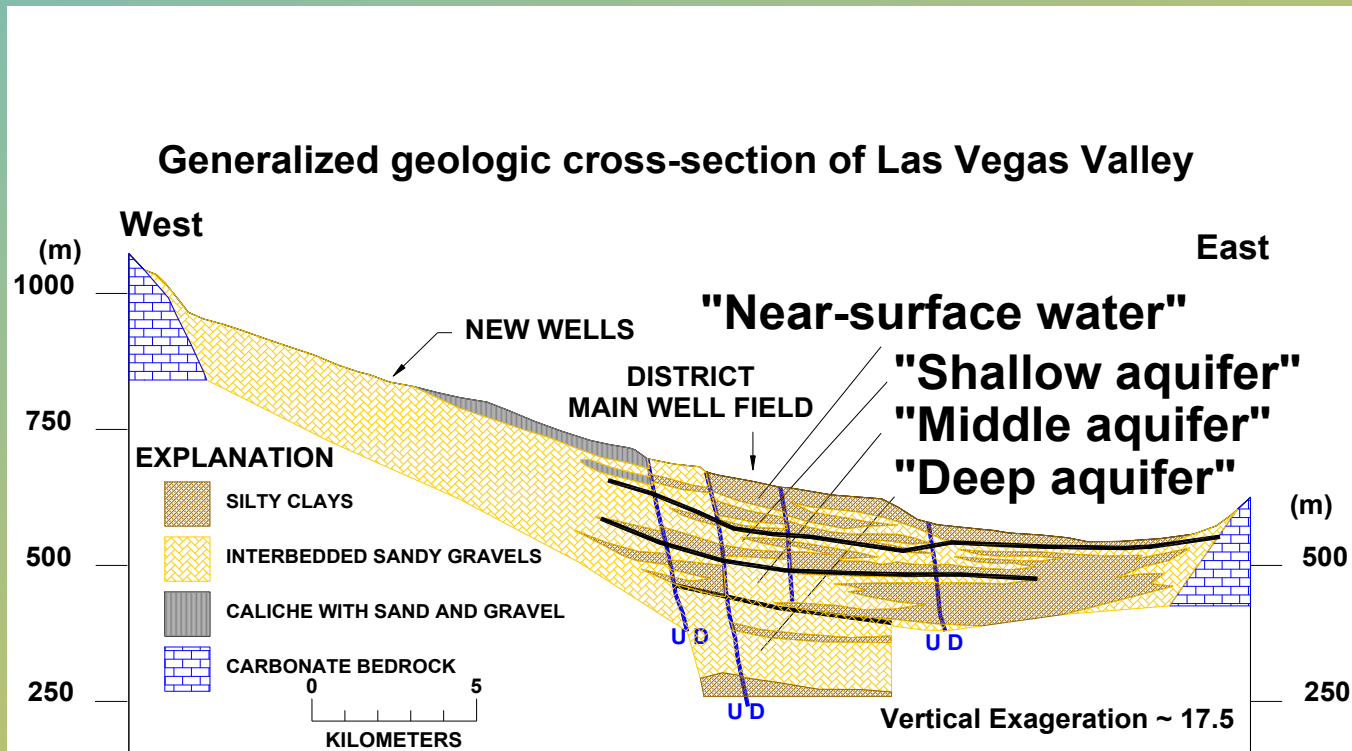
- 10-20 x 10³ a-f
- 30-40 x 10³ a-f
- 40-50 x 10³ a-f
- monitoring well

Bell et al. 2009 (06-07)



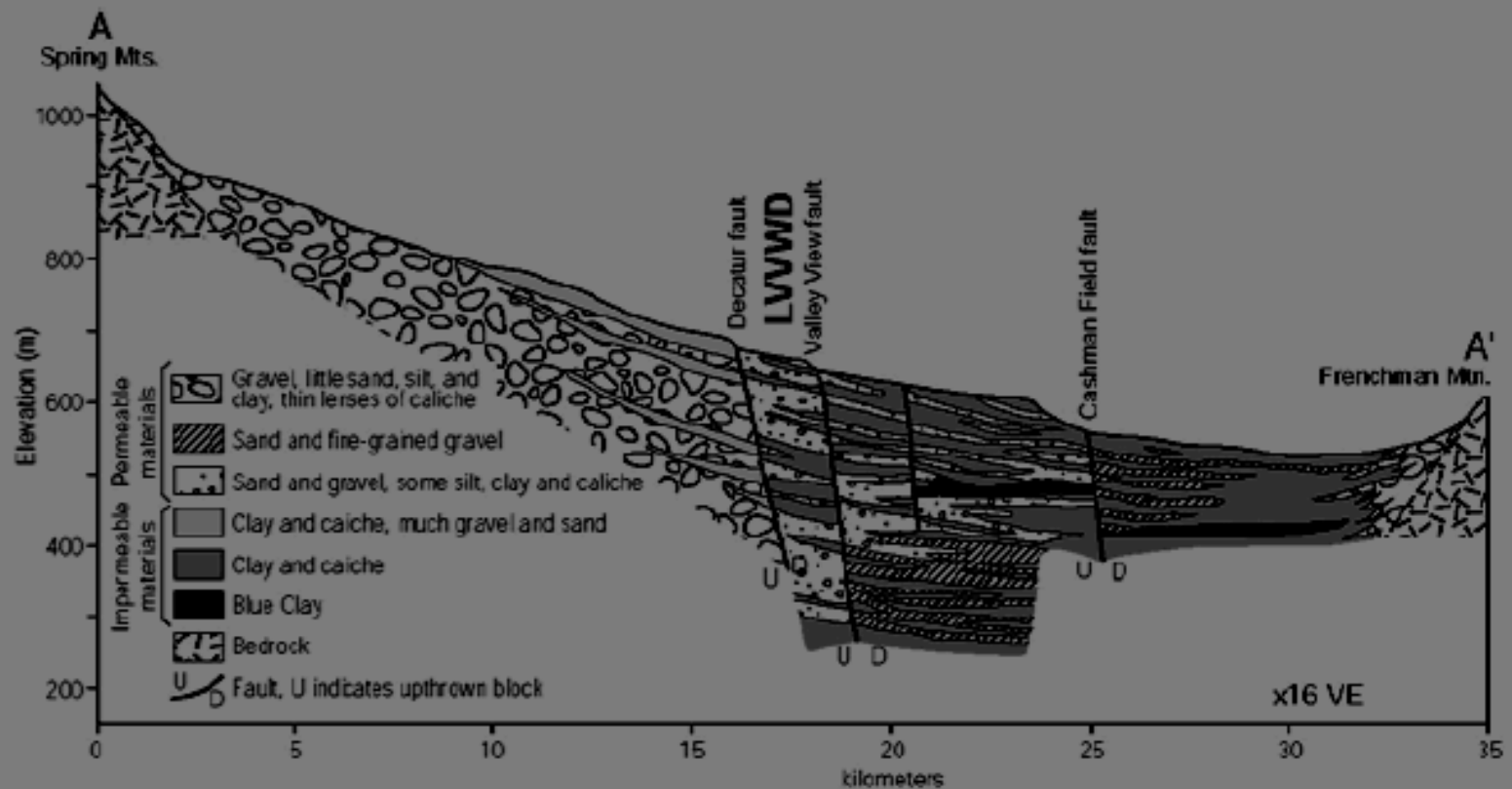
Hydrogeology of Las Vegas Valley

Maxey and Jameson Cross-section Along Charleston Blvd

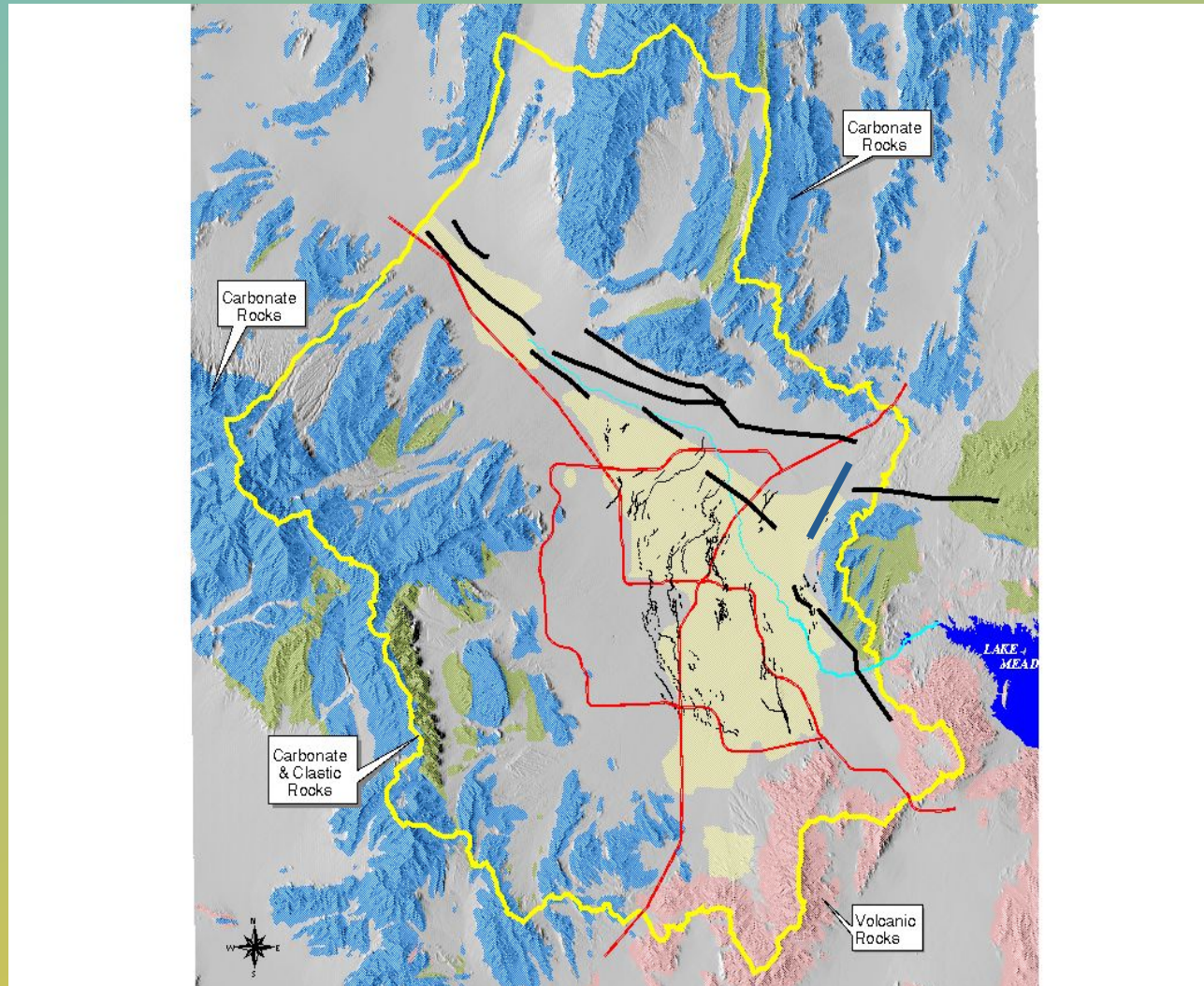


Modified from Maxey and Jameson (1948)

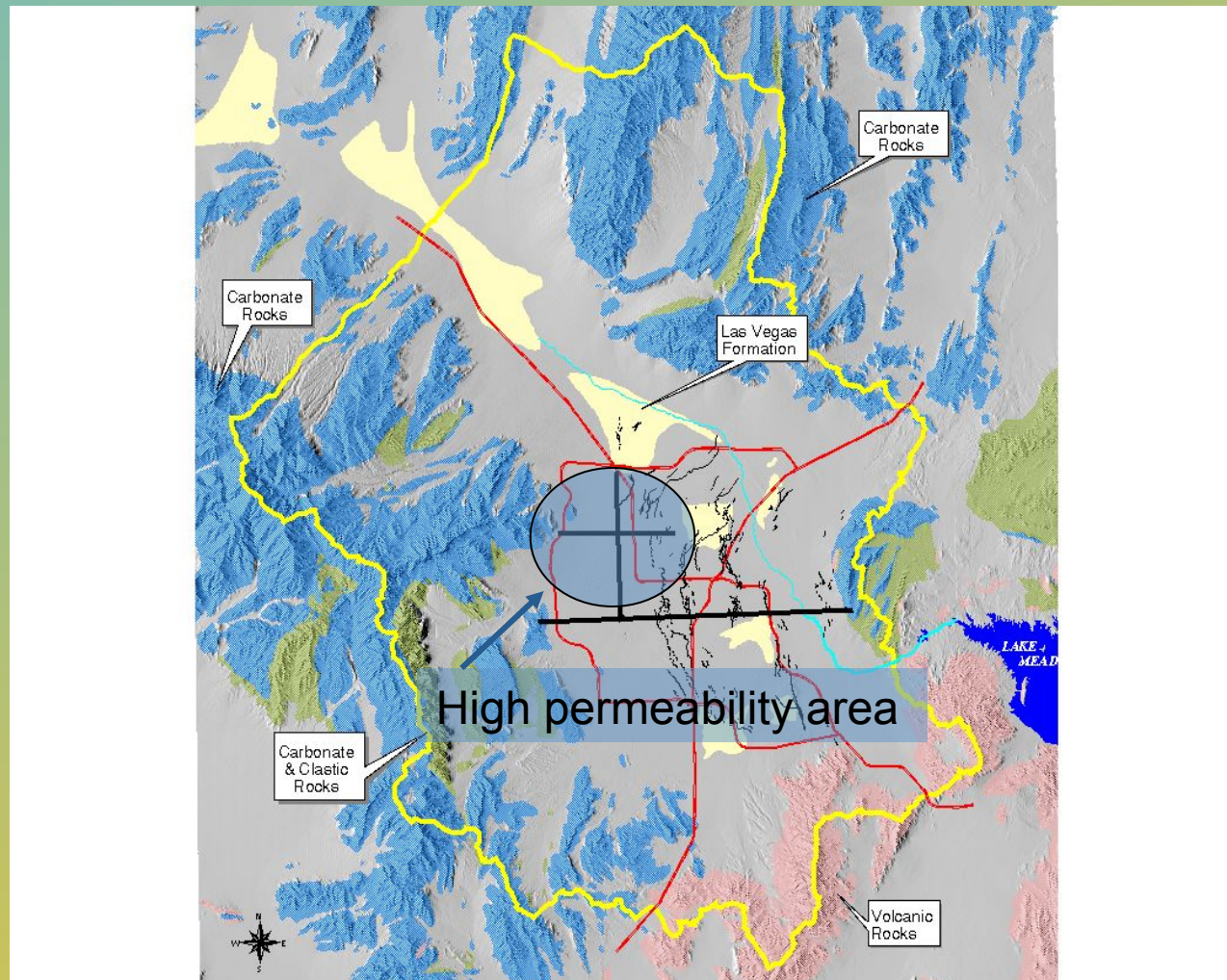
Bell et al. 2008



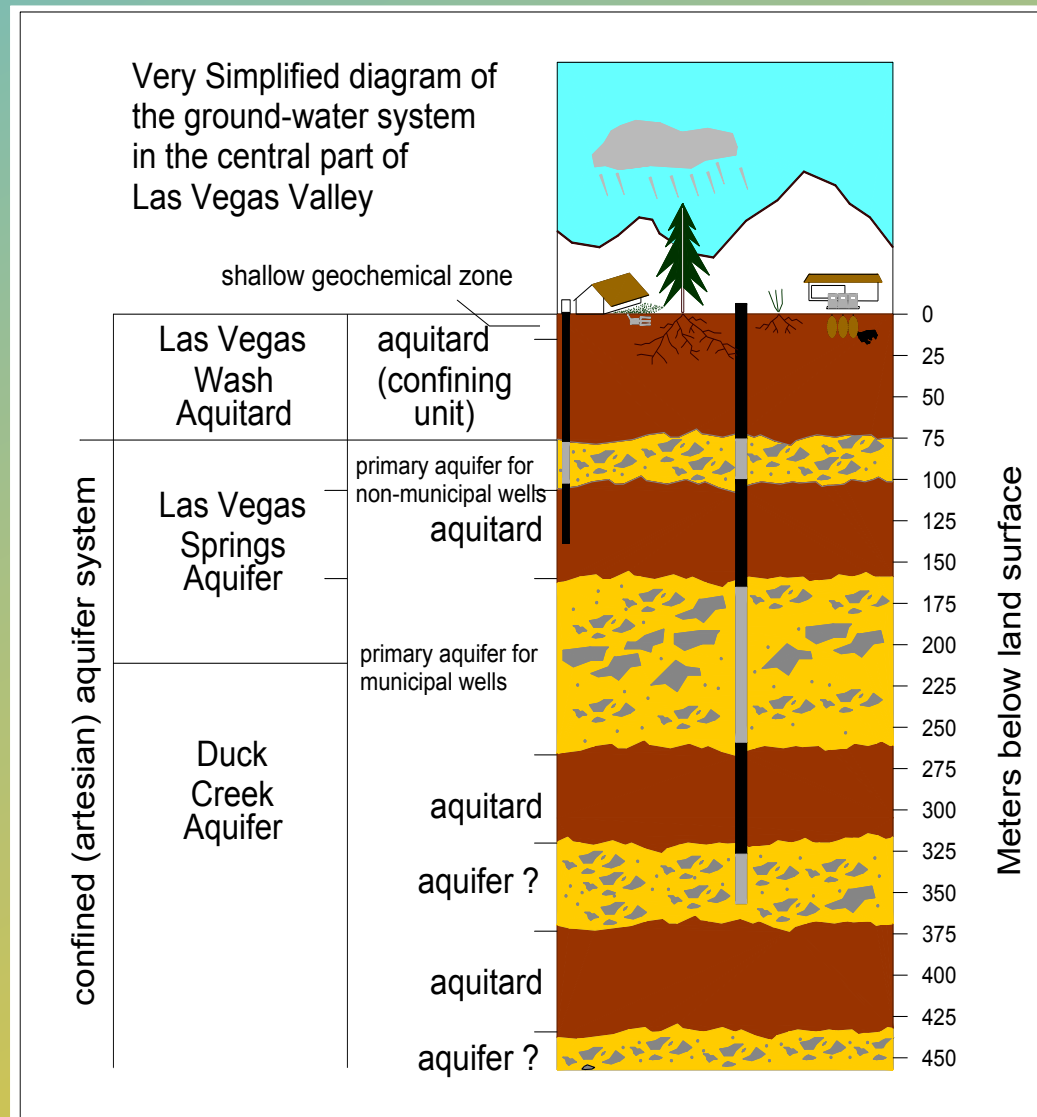
Major Structures and Lithologies in Las Vegas Valley



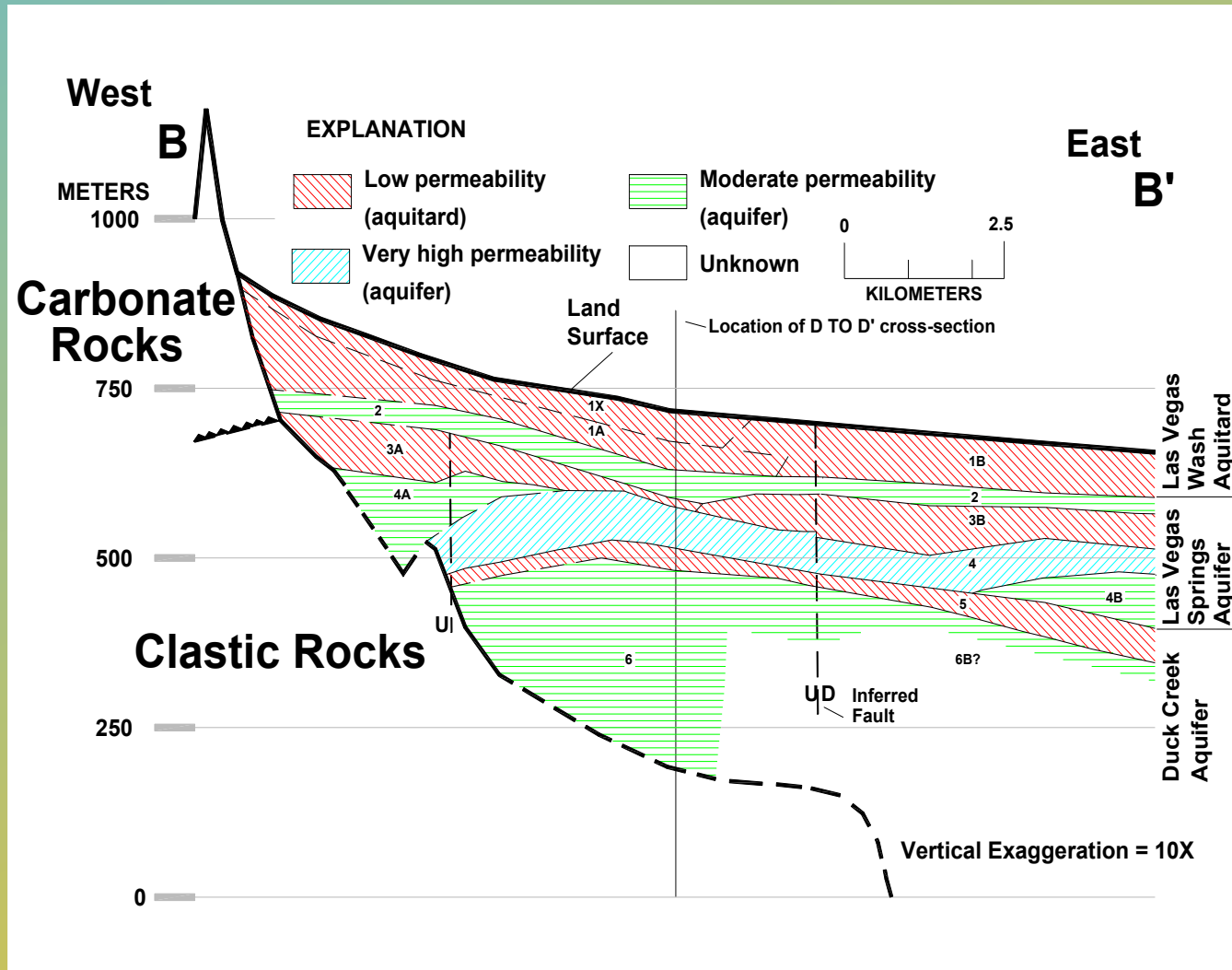
High Permeability Area in Las Vegas Valley



Hydrostratigraphic Units

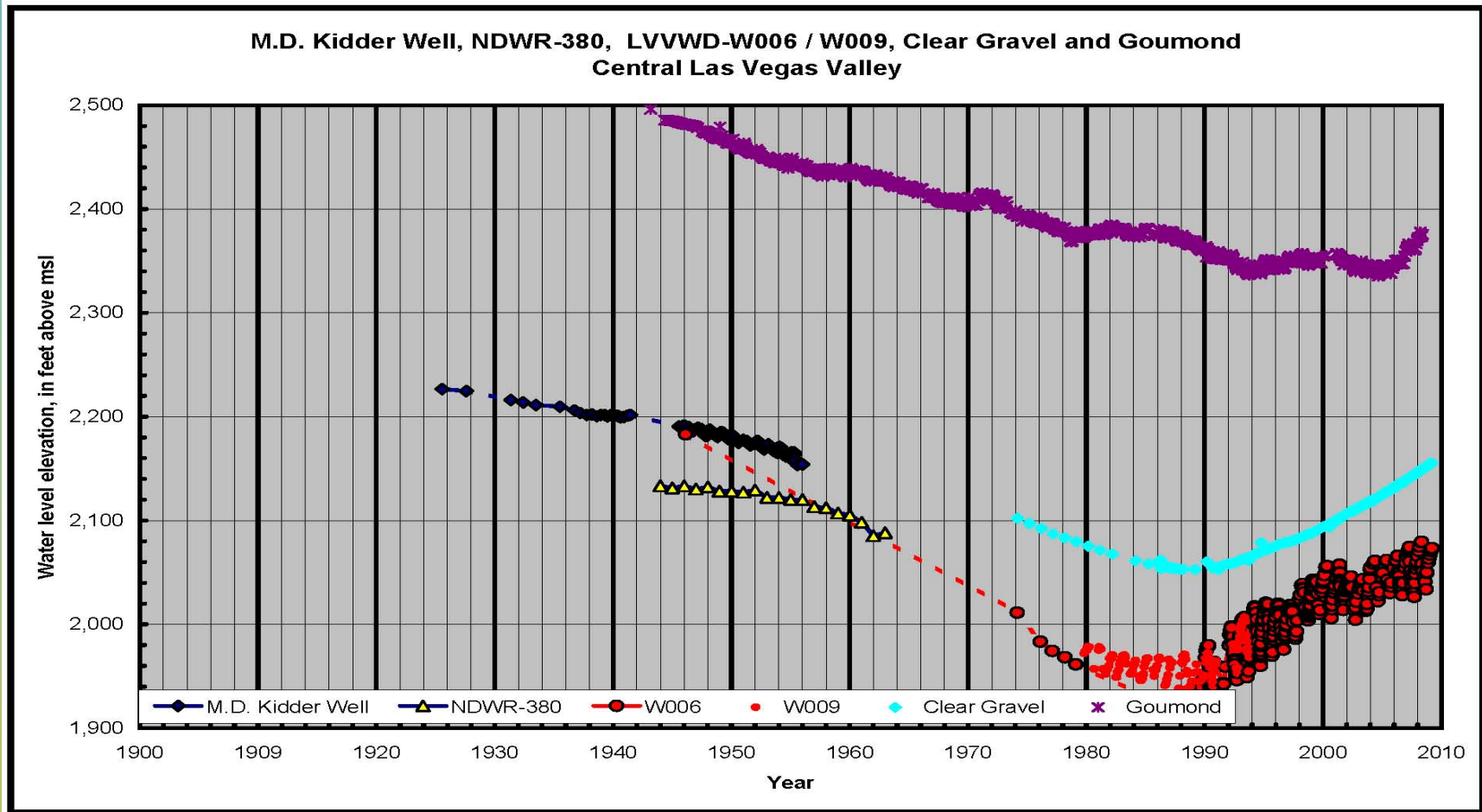


Hydrostratigraphic units cross-section

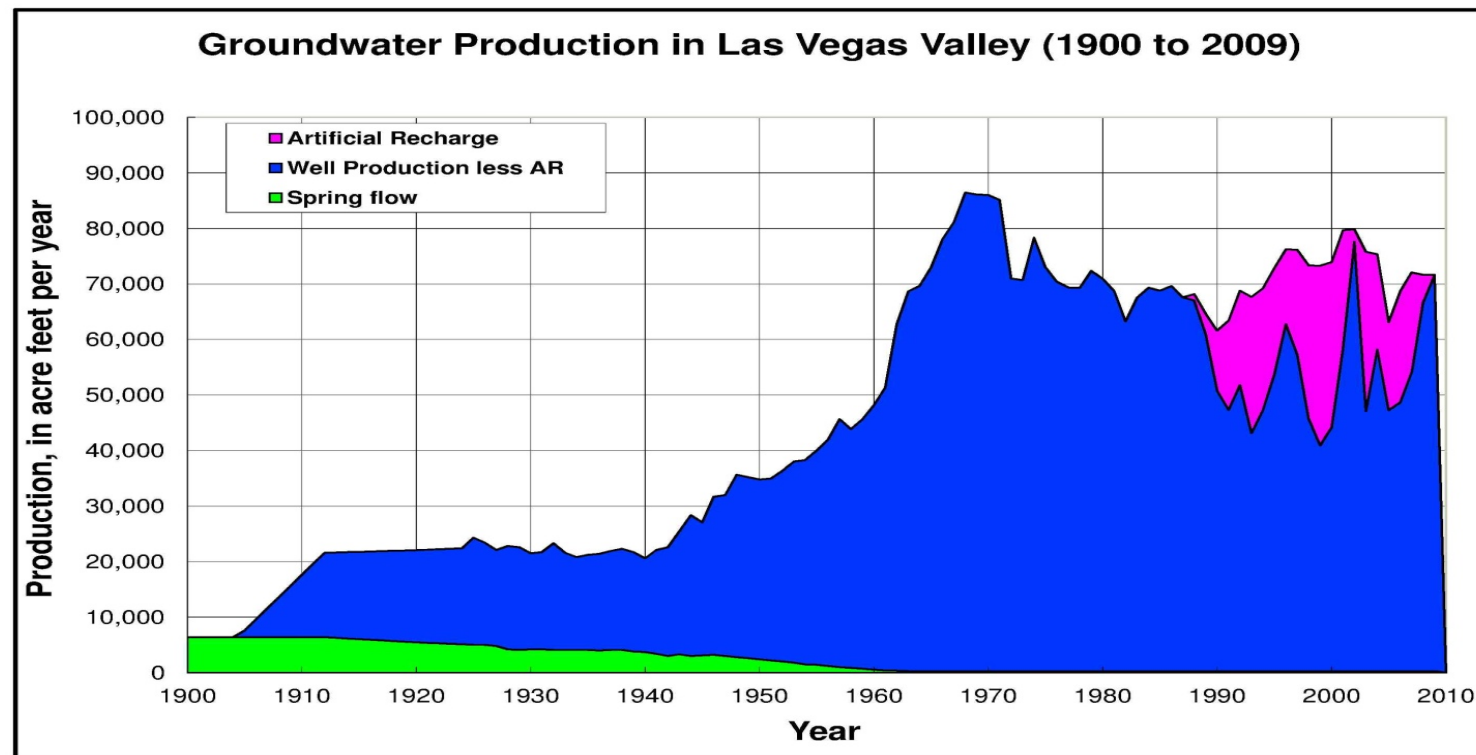


Hydrology of Las Vegas Valley

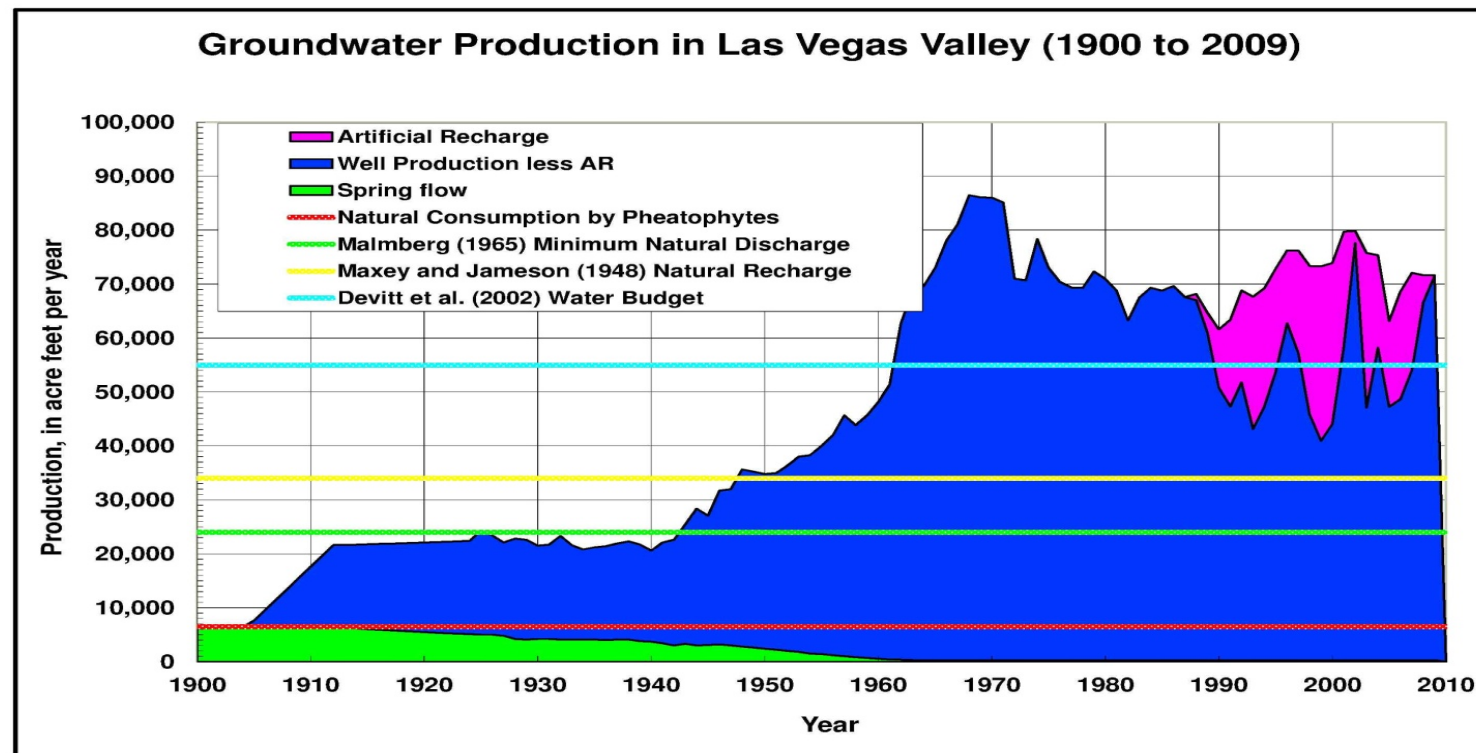
Central LVV Hydrographs



Ground Water Use



Water Use and Estimated PY



Hydrologic Telemetry System

Las Vegas GMP

- HTS Network
 - Cell Modem
 - Websites



http://www.lasvegasgmp.com/html/telemetry_map.html



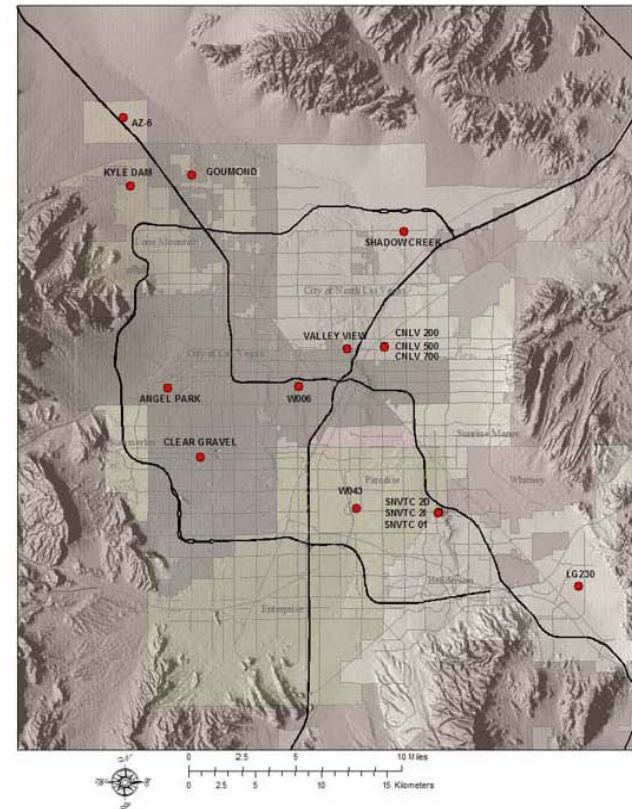
[Home](#)
[About the Program](#)
[GMP Fee & Billing](#)
[Conservation](#)
[Financial Assistance](#)
[Wells & Groundwater](#)
[Groundwater Level Data](#)

[Map of Wells](#)
[Map of Shallow System](#)
[Map of Zip Codes](#)
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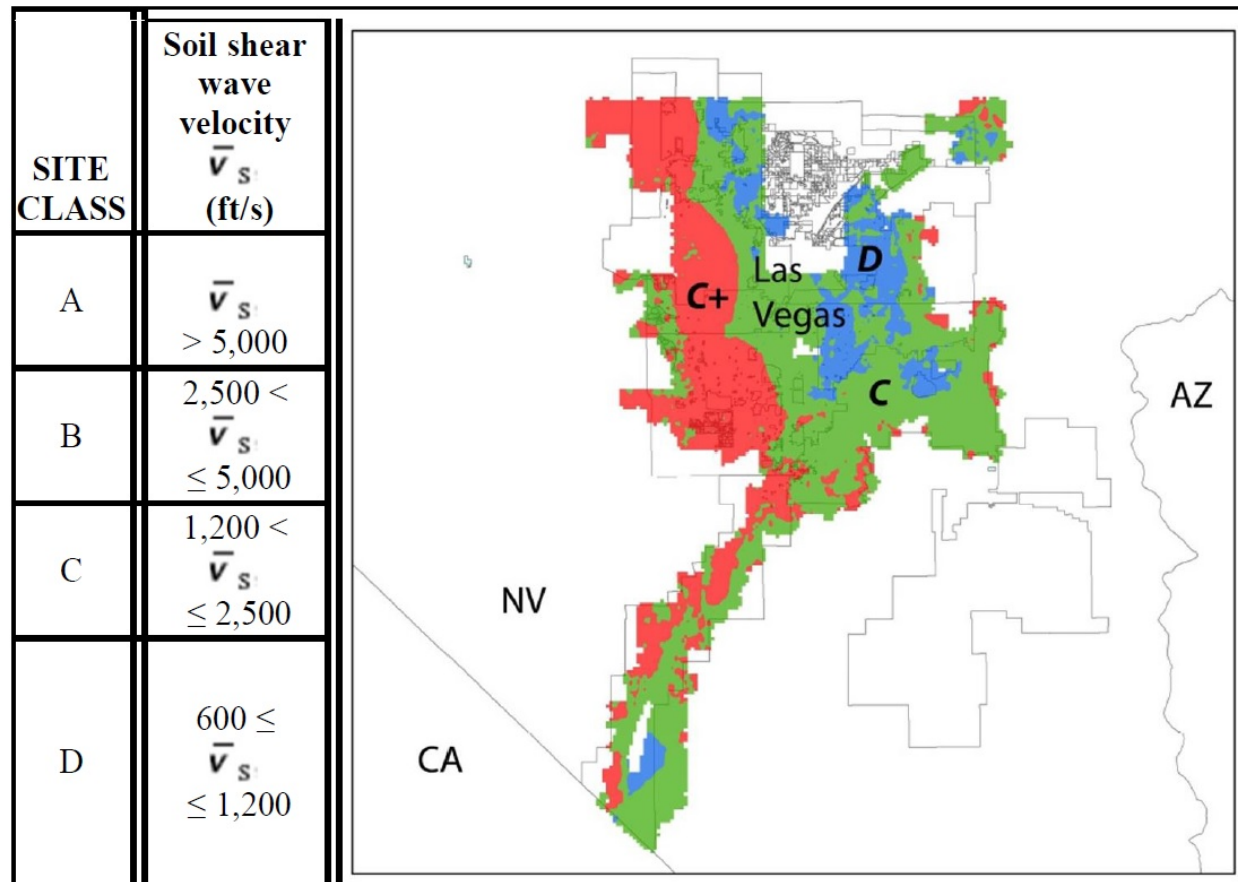
Map of Wells

Click on a well to plot groundwater level data.



Refraction Microtremor (ReMi)

Louis et al. 2012



Modified from TABLE 1613.5.2 SITE CLASS DEFINITIONS

<http://crack.seismo.unr.edu/ma/Louie-12geocong-paper-final.pdf>

http://gisgate.co.clark.nv.us/ openweb/

The screenshot displays the GISMO OpenWeb application in a web browser. The browser's address bar shows the URL `gisgate.co.clark.nv.us/openweb/`. The application interface includes a top navigation bar with a search box containing the text "8937 antioch" and a "Submit Quick Search" button. Below the search bar are tabs for "Search", "Display Options", "Tools", "Points of Interest", and "Resources". The main content area features a map of a desert landscape with blue and red overlays. A "Back" button is visible on the left side of the map. The left sidebar contains an "Introduction" section with text about the beta version of OpenWeb and a link to `http://gisgate.co.clark.nv.us/owmobil`. Below this is an "Information" section with details about the current tool, coordinates, flight date, and view. The bottom of the screen shows a Windows taskbar with various application icons and a system clock indicating 2:42 PM on 9/14/2014.

File Edit View History Bookmarks Yahoo! Tools Help

GISMO

gisgate.co.clark.nv.us/openweb/

Most Visited G FB Twitter MU Netflix Hot Pandora hot Hulu LI AP Tumb H DB Web Access Wordle Sign On Sign On Emma Abroad Welcome

8937 antioch Submit Quick Search

(Parcel / Address Search / Owner)

Search Display Options Tools Points of Interest Resources

Introduction

A beta version of OpenWeb that is mobile capable is now available. It is not a full version of OpenWeb but offers basic functionality and tools:

<http://gisgate.co.clark.nv.us/owmobil>

*** September 1, 2014 - Spring 2014 Aerials along with 2013 NAIP imagery are online. ***

Information

Current Tool: Select Property

Coordinates in State Plane ft

X: 831052 Y: 26773260

Flight Date: Most Current Flight

Current View: Seismic

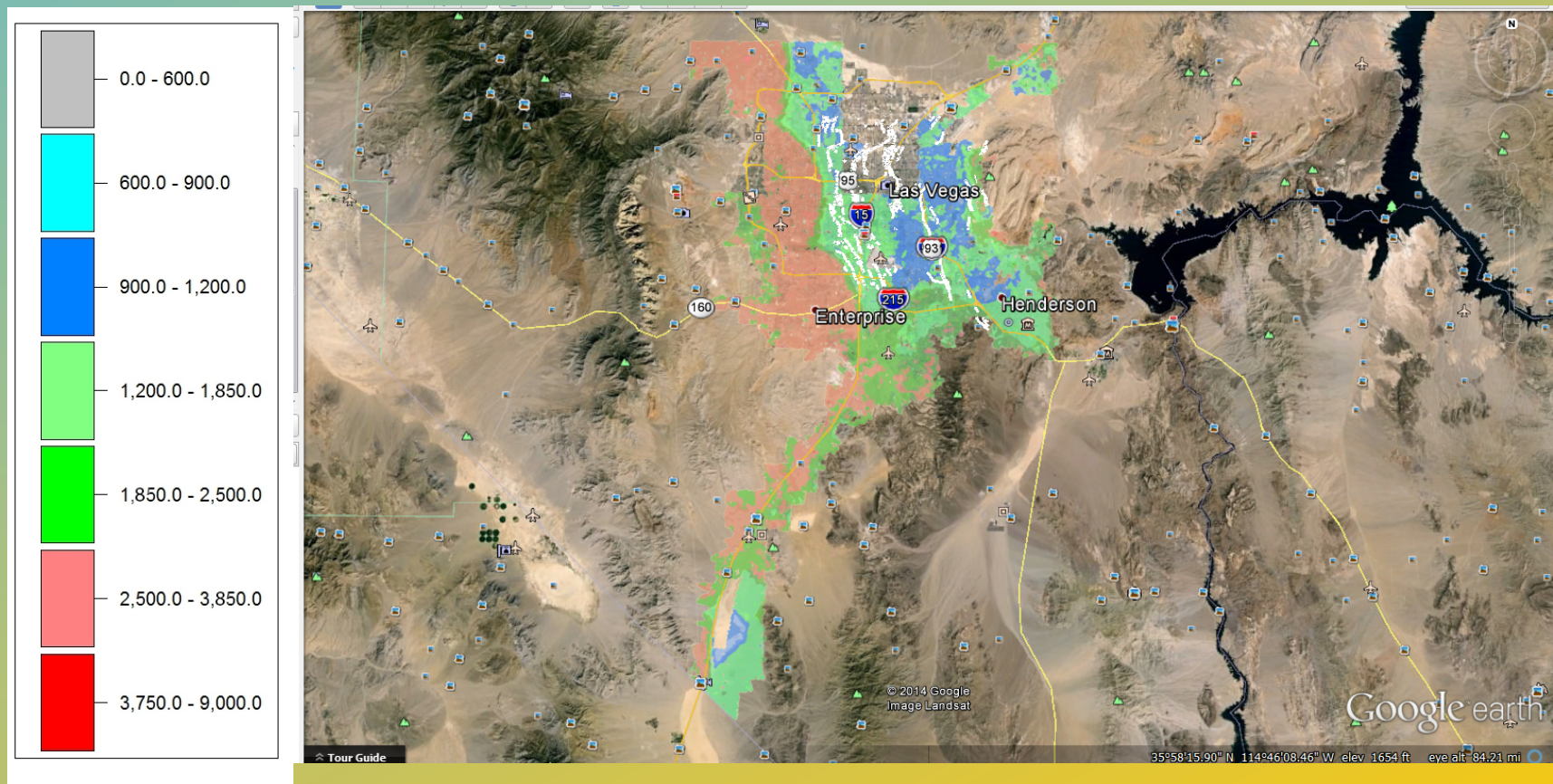
1: 500,000

15km 10mi

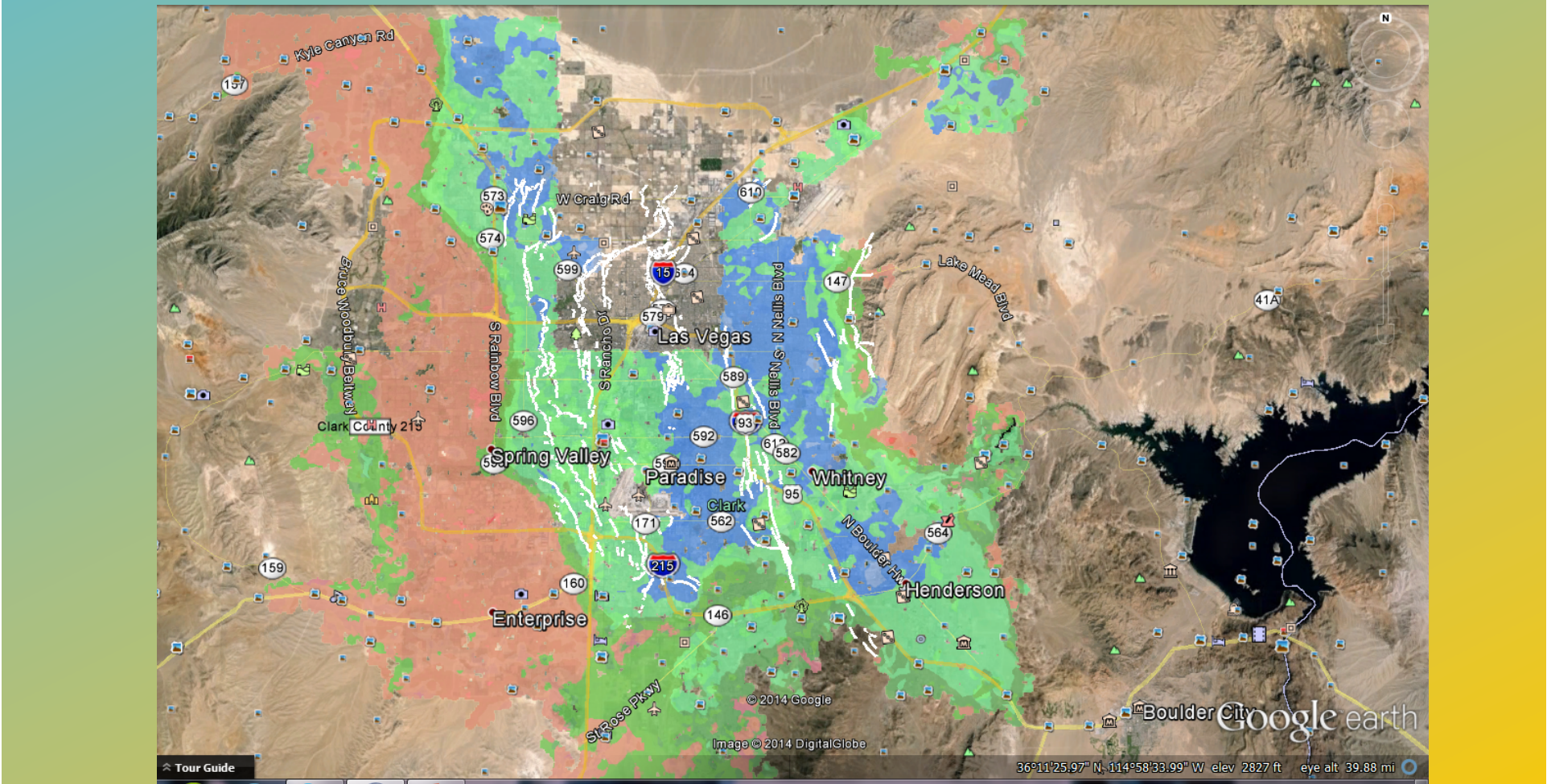
GISMO

2:42 PM 9/14/2014

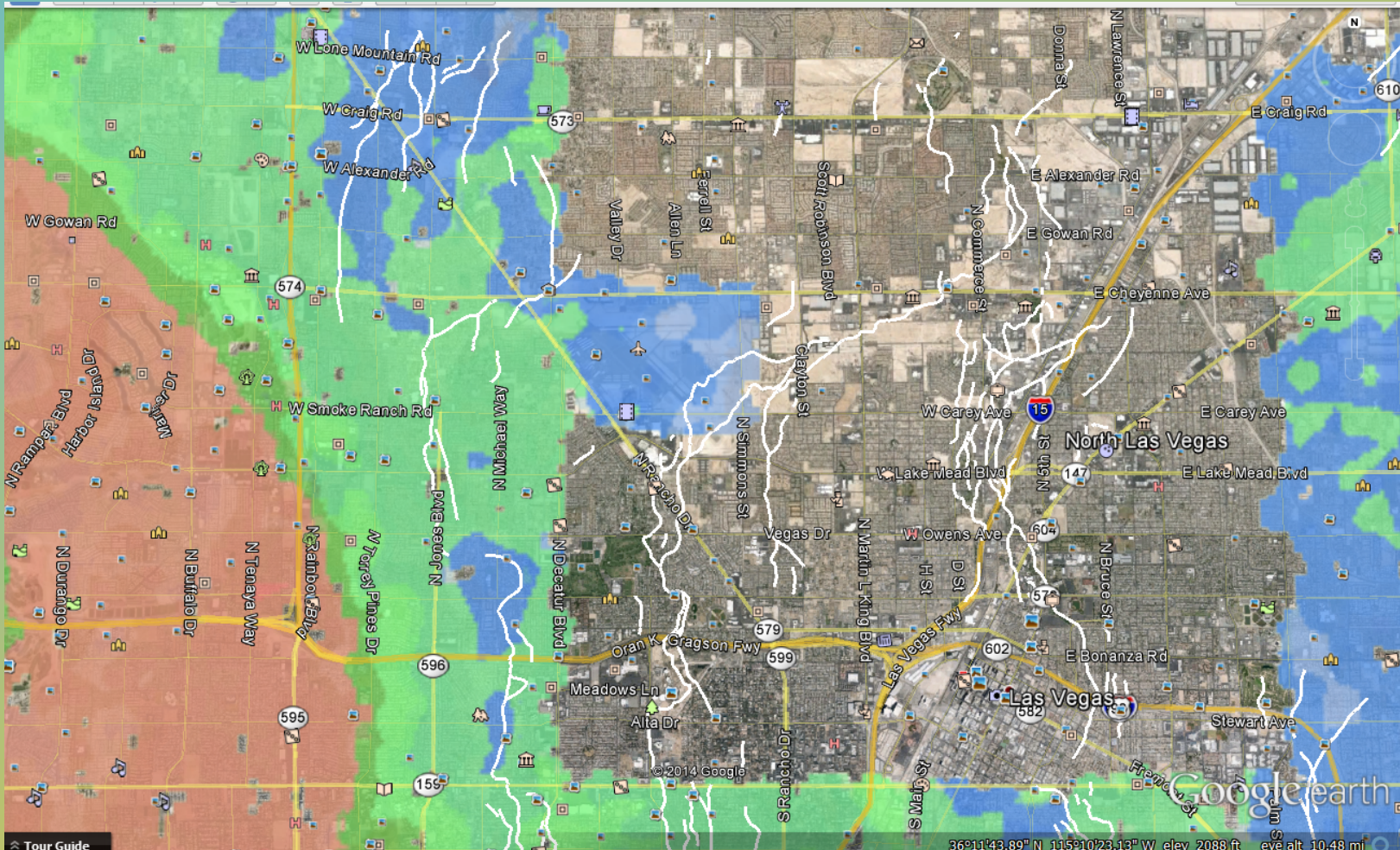
ReMi Seismic Data in GE



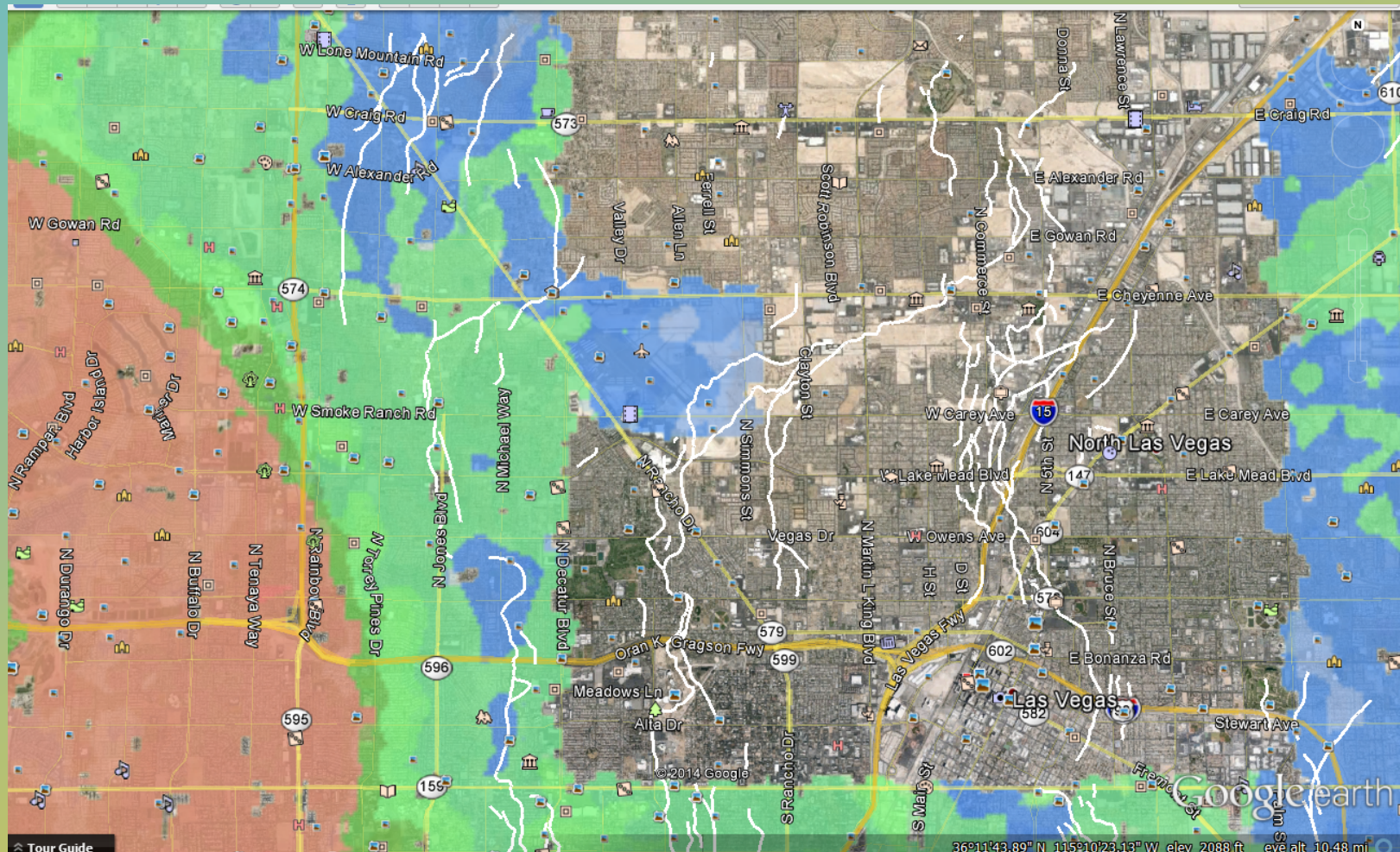
Central Las Vegas



Northern Las Vegas



This satellite map from Google Earth shows the northern part of Las Vegas, Nevada. The map is oriented with North at the top. The area is characterized by a mix of urban development, including residential neighborhoods and commercial areas, and large green spaces, likely parks or undeveloped land. Major roads are visible, including Interstate 15 (I-15) running vertically on the right side, Interstate 59 (I-59) running horizontally across the middle, and several state routes like SR-573, SR-574, SR-579, SR-596, and SR-599. The map also shows the Las Vegas River and other water bodies. The city of North Las Vegas is labeled in the upper right, and the city of Las Vegas is labeled in the lower right. The map includes a grid of latitude and longitude lines, with coordinates 36°11'43.89" N and 115°10'23.16" W marked at the bottom. The elevation is noted as 2088 ft. The map is credited to Google Earth and includes a copyright notice for 2014.



http://gisgate.co.clark.nv.us/ openweb/

The screenshot displays the GISMO OpenWeb application interface within a web browser. The browser's address bar shows the URL `gisgate.co.clark.nv.us/openweb/`. The application header includes the GISMO logo, the title "OPENWEB", and a search bar with the text "8937 antioch". Below the search bar are buttons for "Submit Quick Search", "Search", "Display Options", "Tools", "Points of Interest", and "Resources".

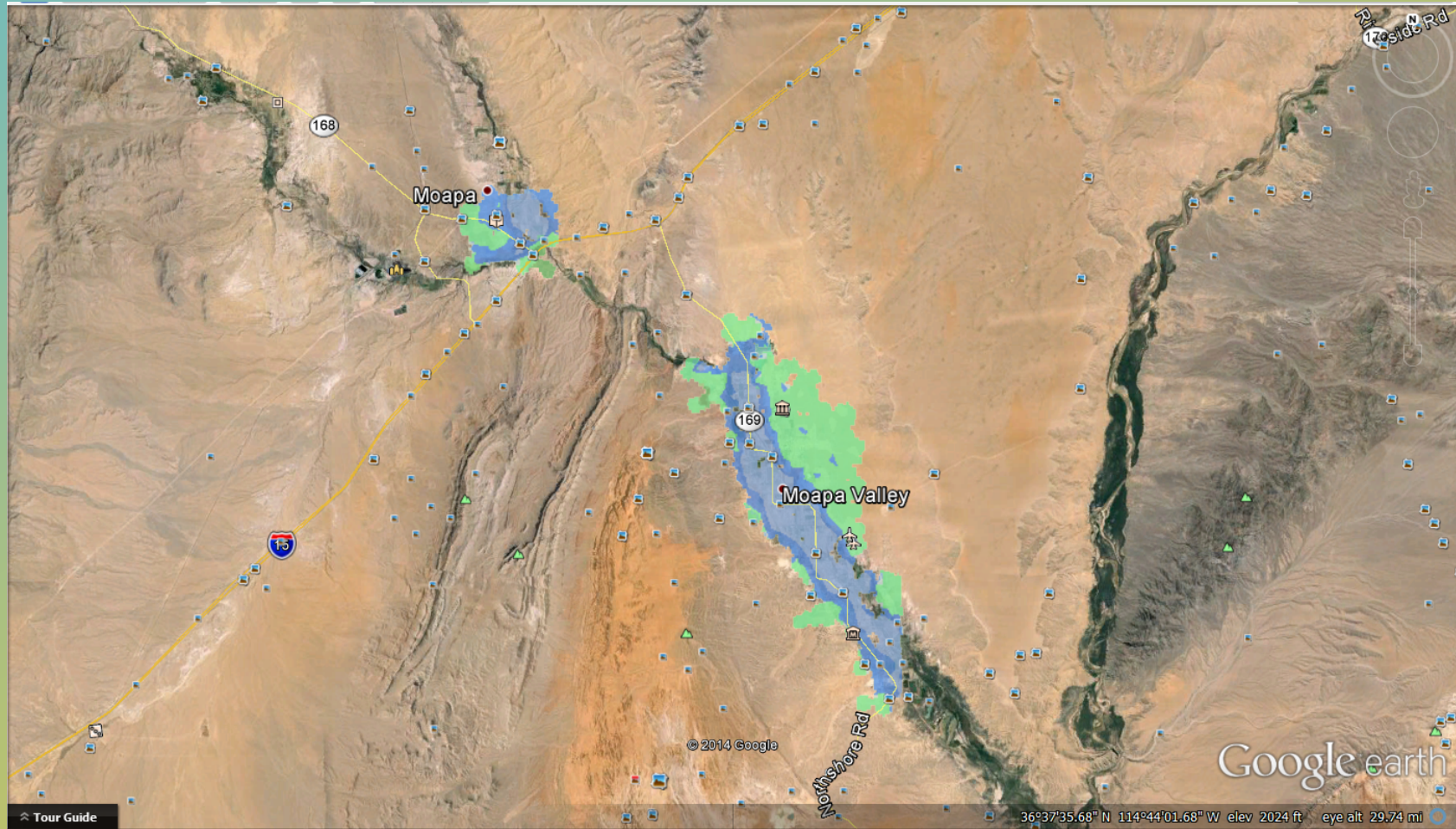
On the left side, there is a sidebar with an "Introduction" section. The text in this section reads: "A beta version of OpenWeb that is mobile capable is now available. It is not a full version of OpenWeb but offers basic functionality and tools: <http://gisgate.co.clark.nv.us/owmobil>". Below this, it states: "*** September 1, 2014 - Spring 2014 Aerials along with 2013 NAIP imagery are online. ***".

At the bottom of the sidebar, there is an "Information" section with the following details: "Current Tool: Select Property", "Coordinates in State Plane ft", "X: 873370 Y: 26969440", "Flight Date: Most Current Flight", "Current View: Seismic", and "1: 250,000".

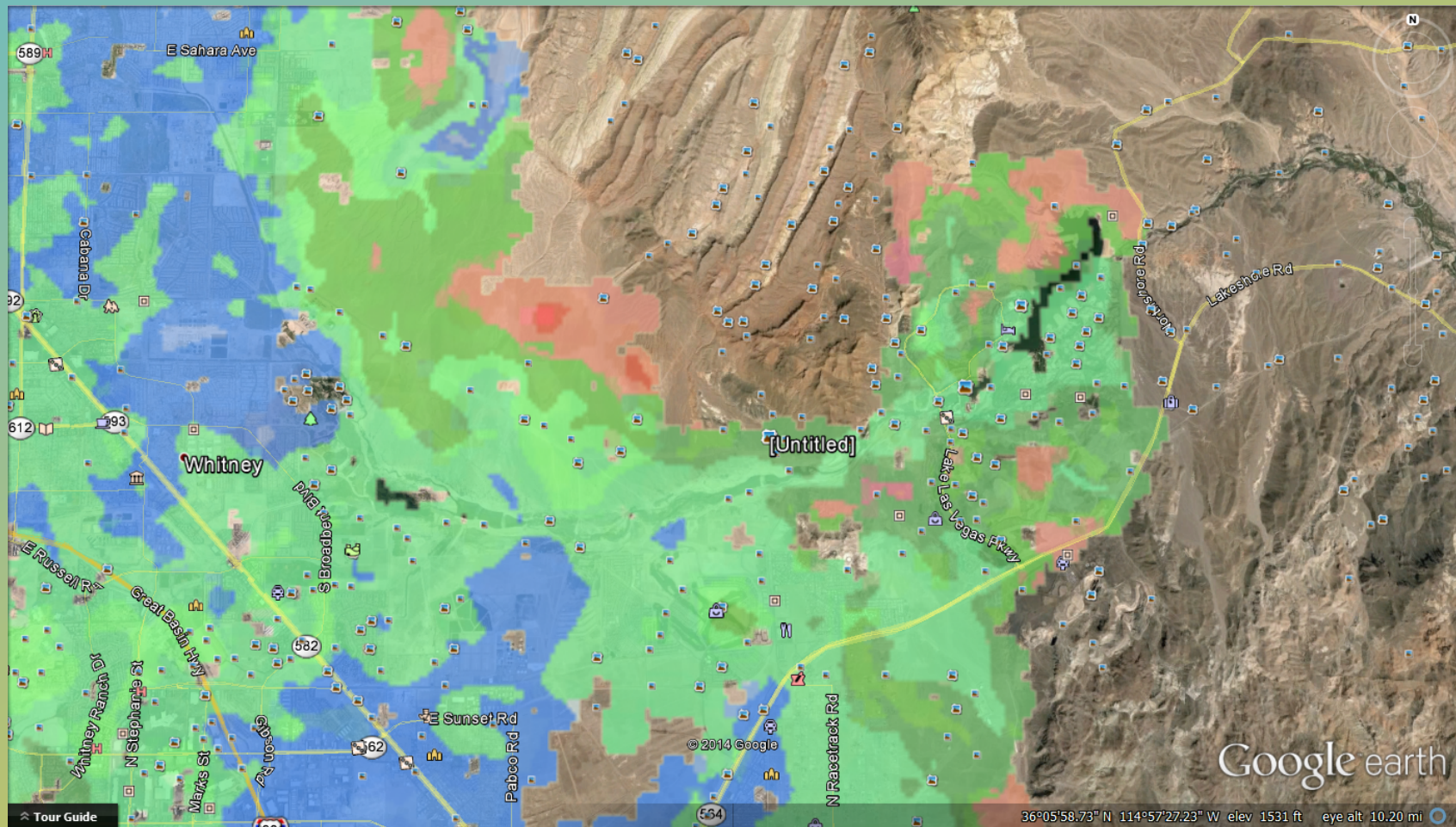
The main area of the application is a map showing a desert landscape with a blue highlighted region. A scale bar indicates 5km and 5mi. The GISMO logo is visible in the bottom right corner of the map area.

The browser's taskbar at the bottom shows various application icons, including Internet Explorer, Firefox, and Google Chrome. The system clock in the bottom right corner displays the time as 2:43 PM on 9/14/2014.

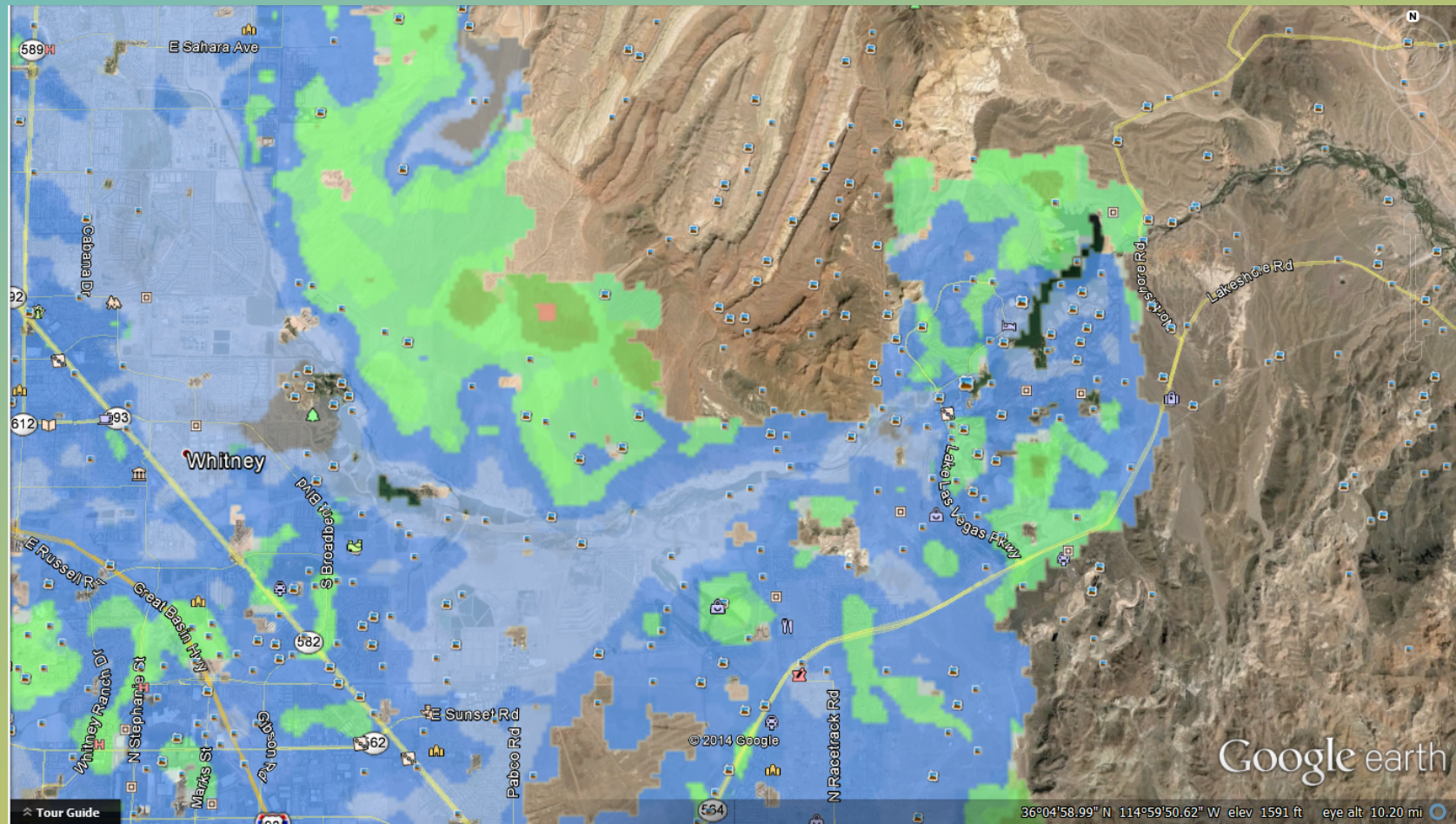
Moapa Area



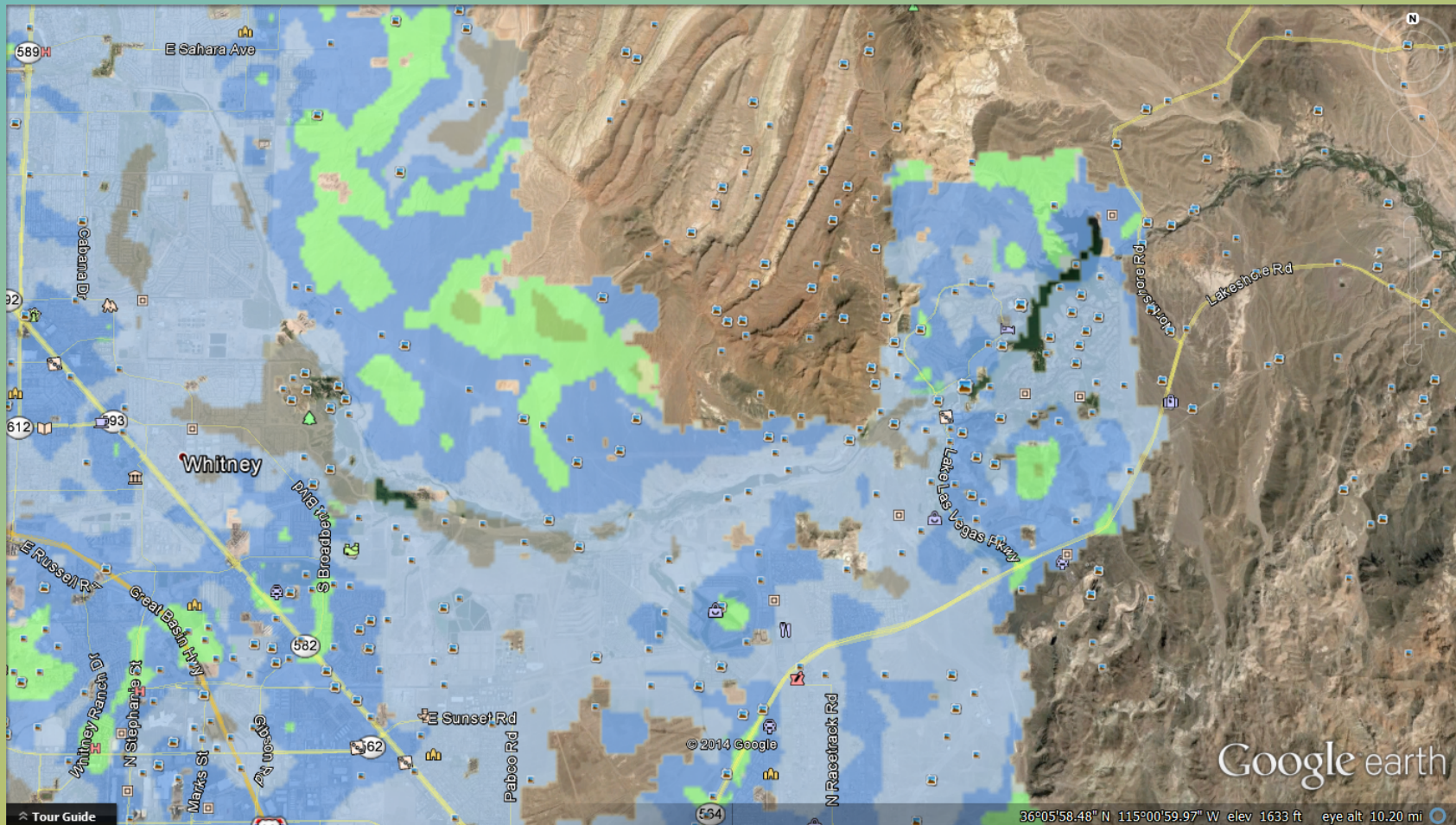
Las Vegas Wash 100 feet



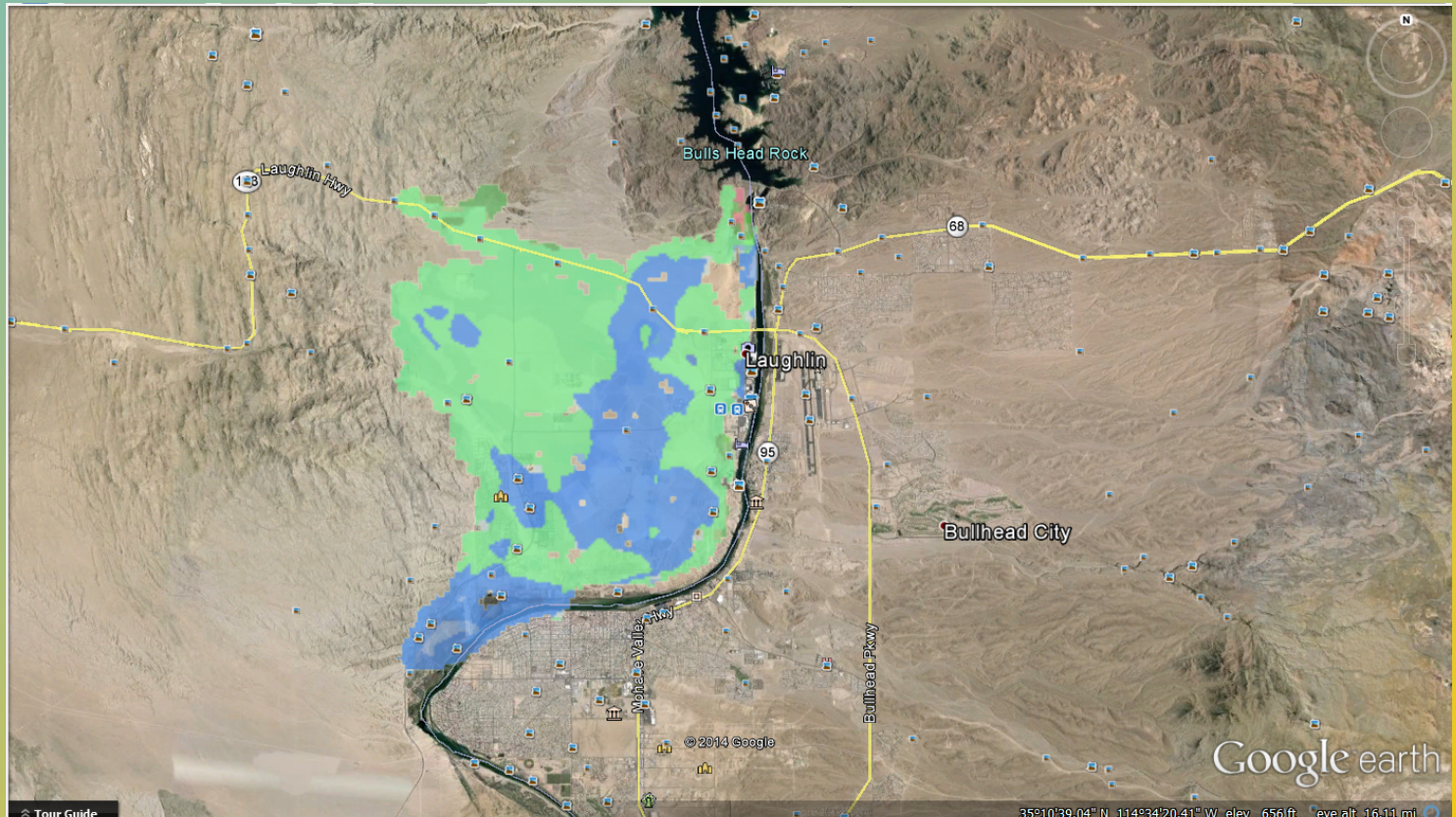
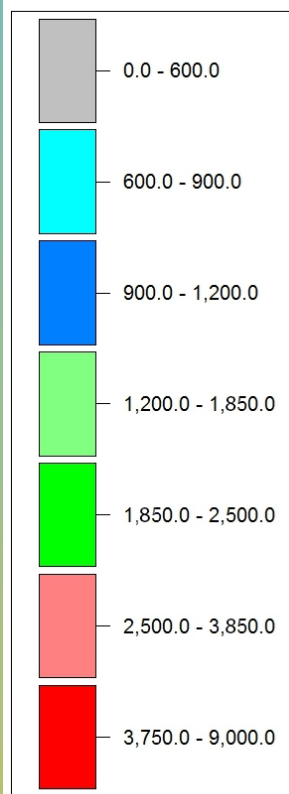
Las Vegas Wash 20 feet



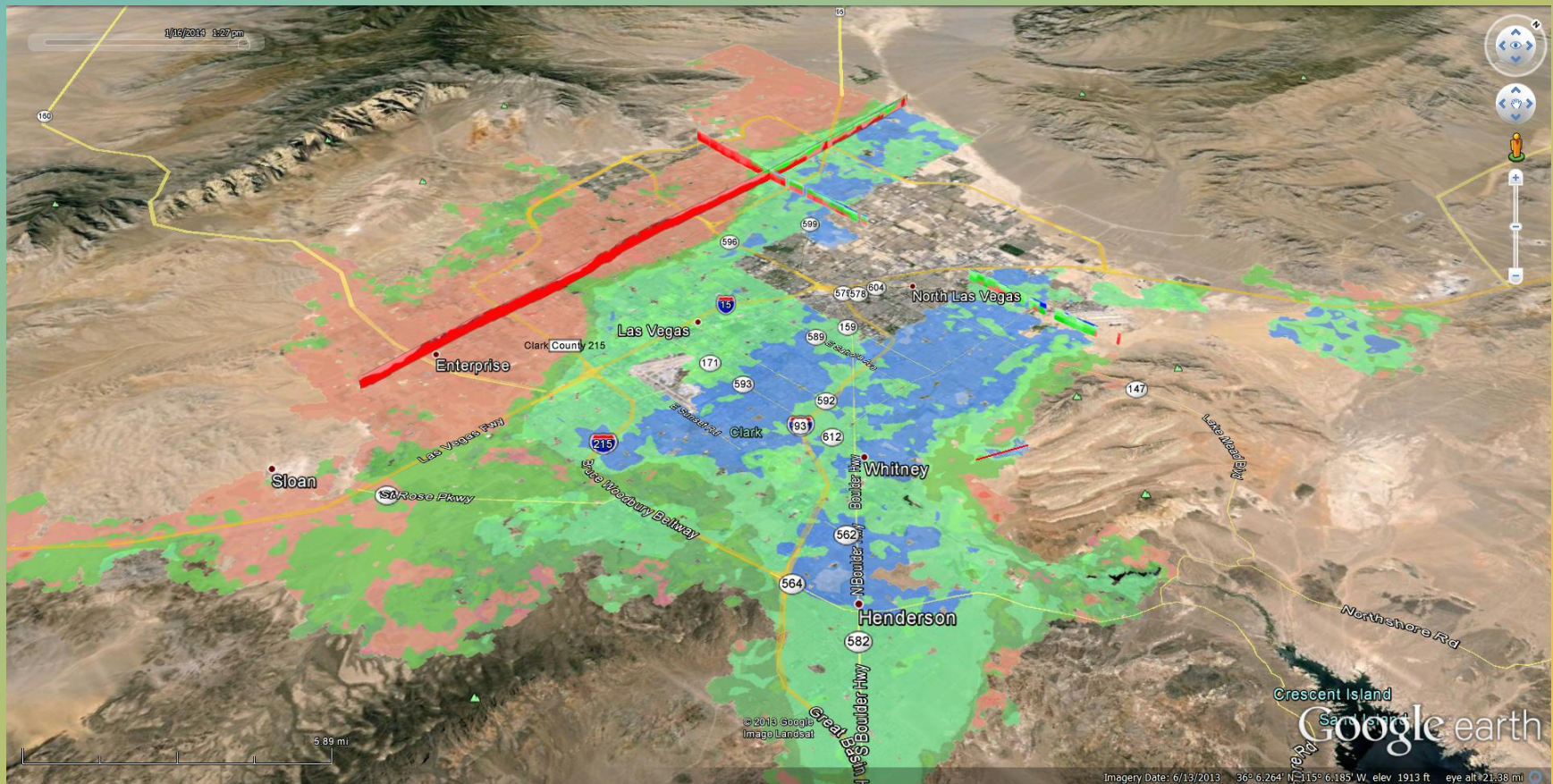
Las Vegas Wash 10 feet



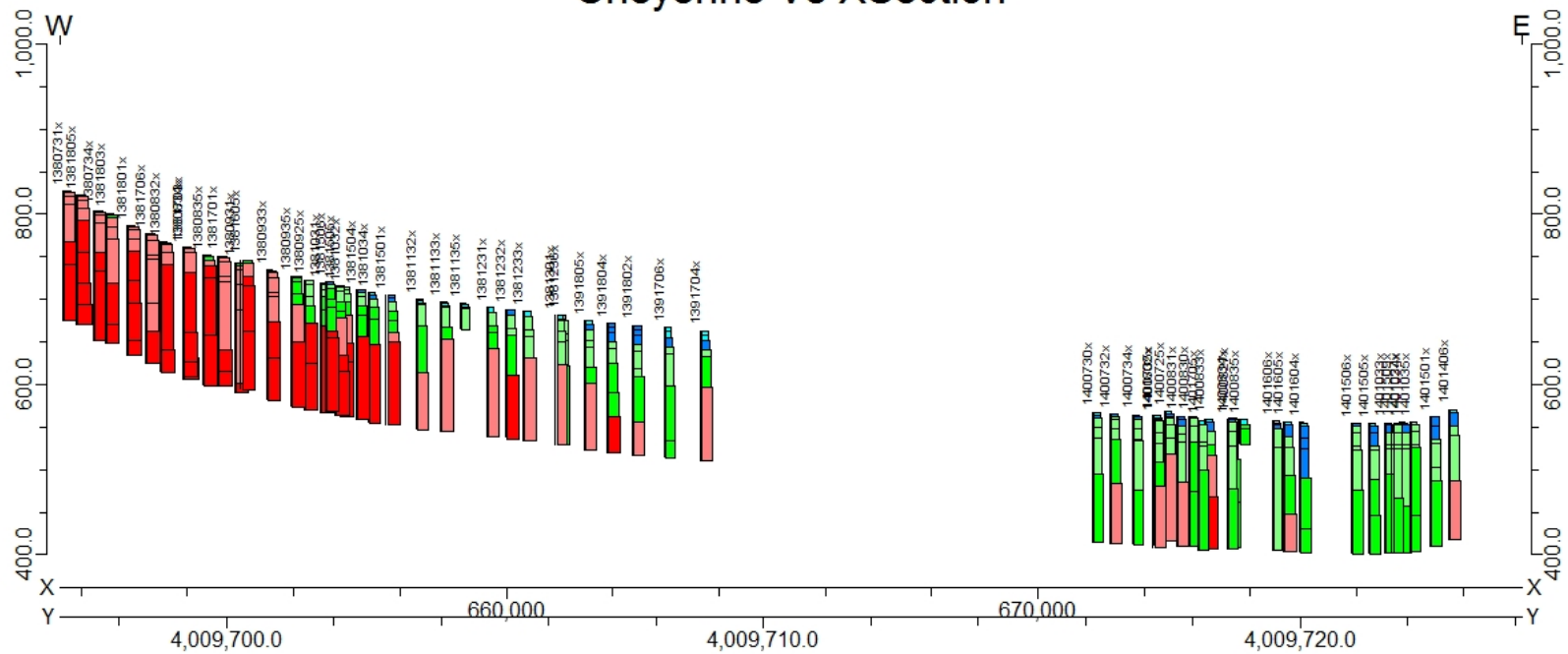
Laughlin Area



Cross Sections in GE



Cheyenne Vs XSection



http://gisgate.co.clark.nv.us/ openweb/

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*** September 1, 2014 - Spring 2014 Aerials along with 2013 NAIP imagery are online. ***

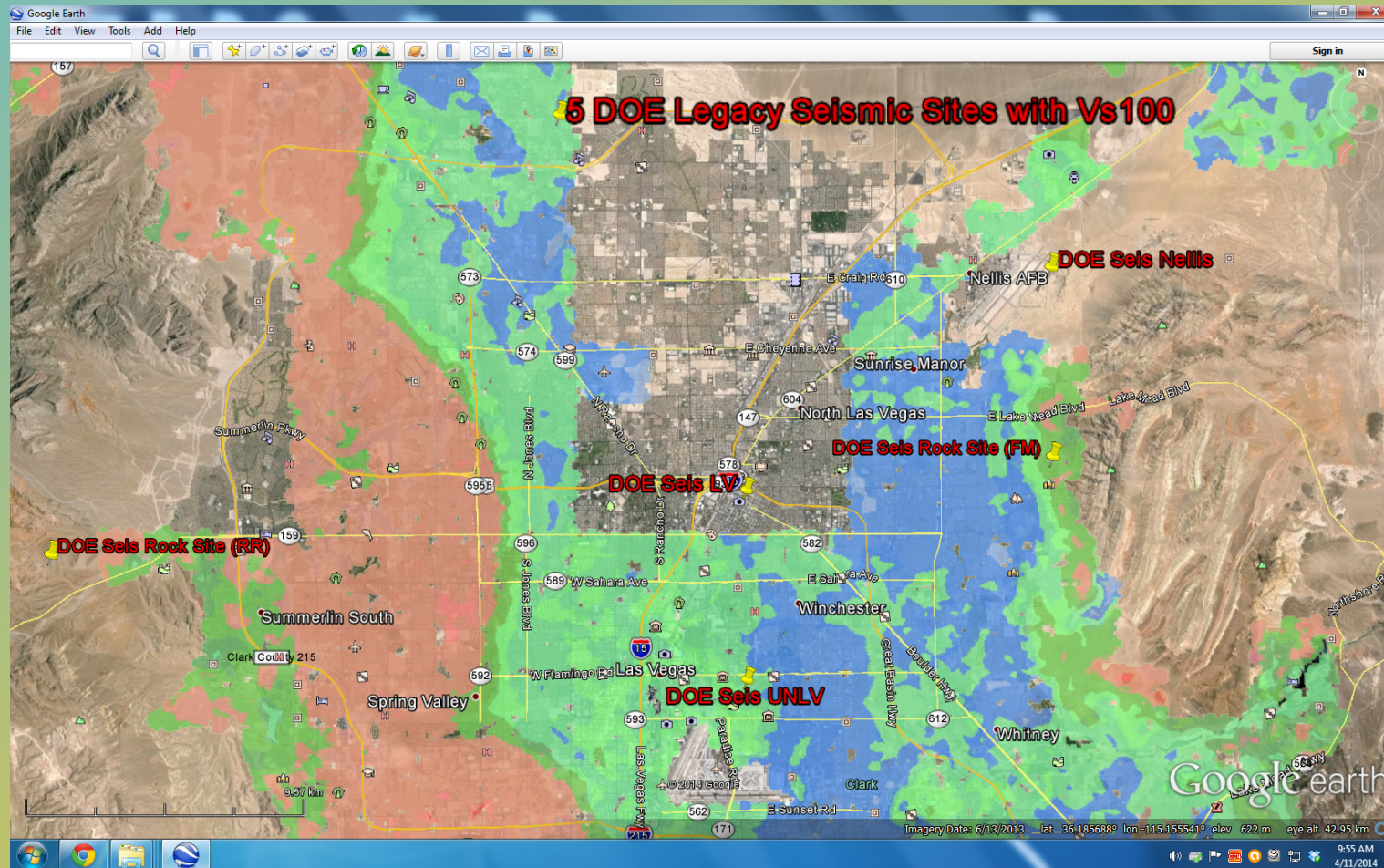
Below the introduction is an "Information" box with the following details:

- Current Tool:** Select Property
- Coordinates in State Plane ft**
- X:** 831052 **Y:** 26773260
- Flight Date:** Most Current Flight
- Current View:** Seismic
- 1:** 500,000

The main map area shows a satellite view of a desert landscape. A large blue-shaded region is overlaid on the map, with red lines indicating boundaries or roads. A "Back" button is visible on the left side of the map. A scale bar at the bottom left indicates distances of 15km and 10mi. The GISMO logo is in the bottom right corner of the map area.

The Windows taskbar at the bottom shows the system clock as 2:42 PM on 9/14/2014, along with various application icons.

Legacy Data



Passive ReMi Data Array



Key Points

- “Remote Sensing” has an evolving definition.
 - Mostly due to technology
- Interpretation of the data is improved by combining with conventional and legacy data.
- Recently developed “passive” geophysical data is likely to be more widely used.
 - Some techniques are better for urban environments
 - Technology is also improving Geophysical techniques

