Remote Sensing and Passive Geophysical Techniques in Clark County, Nevada

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Acknowlegements

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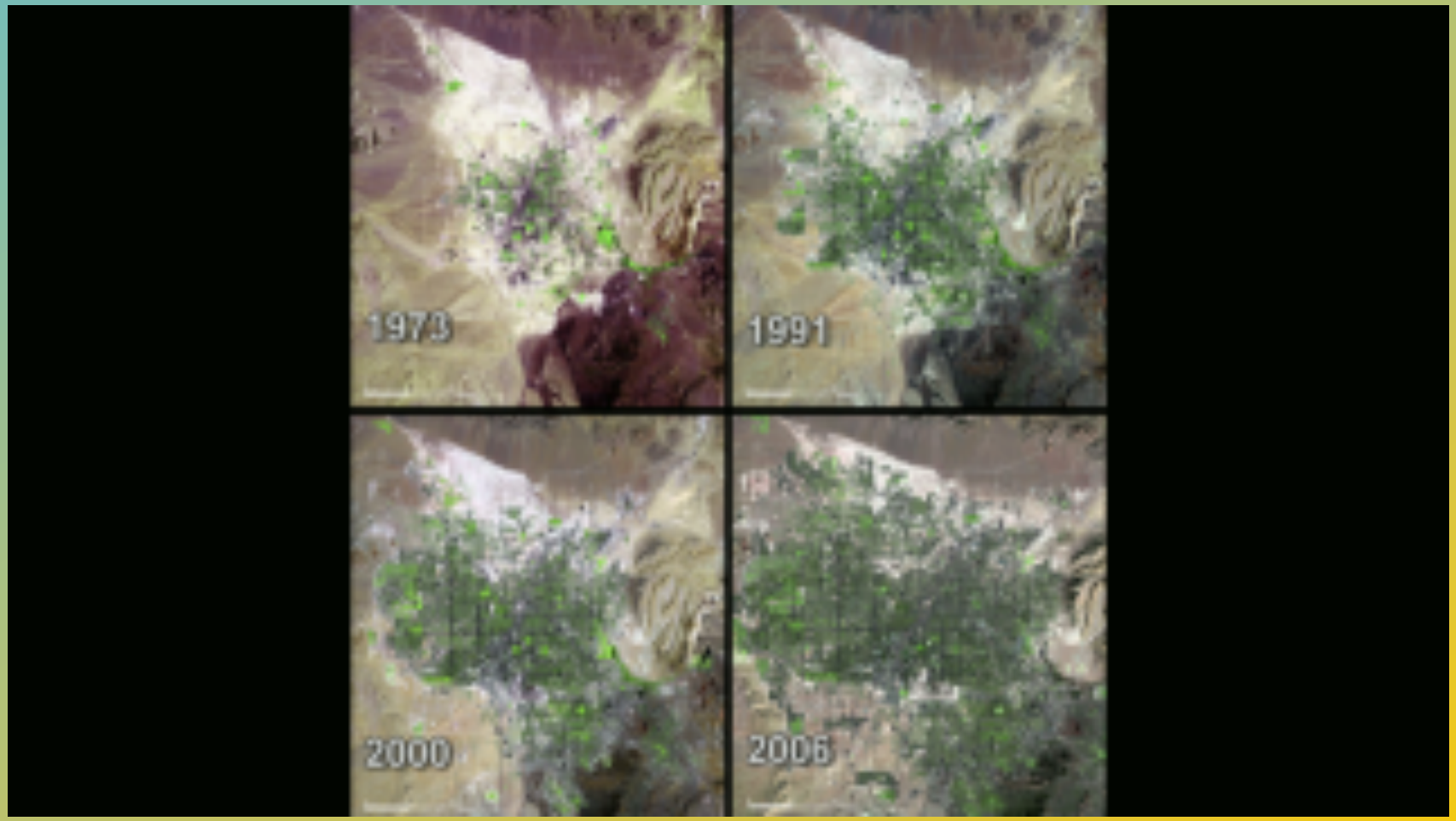
Overview

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

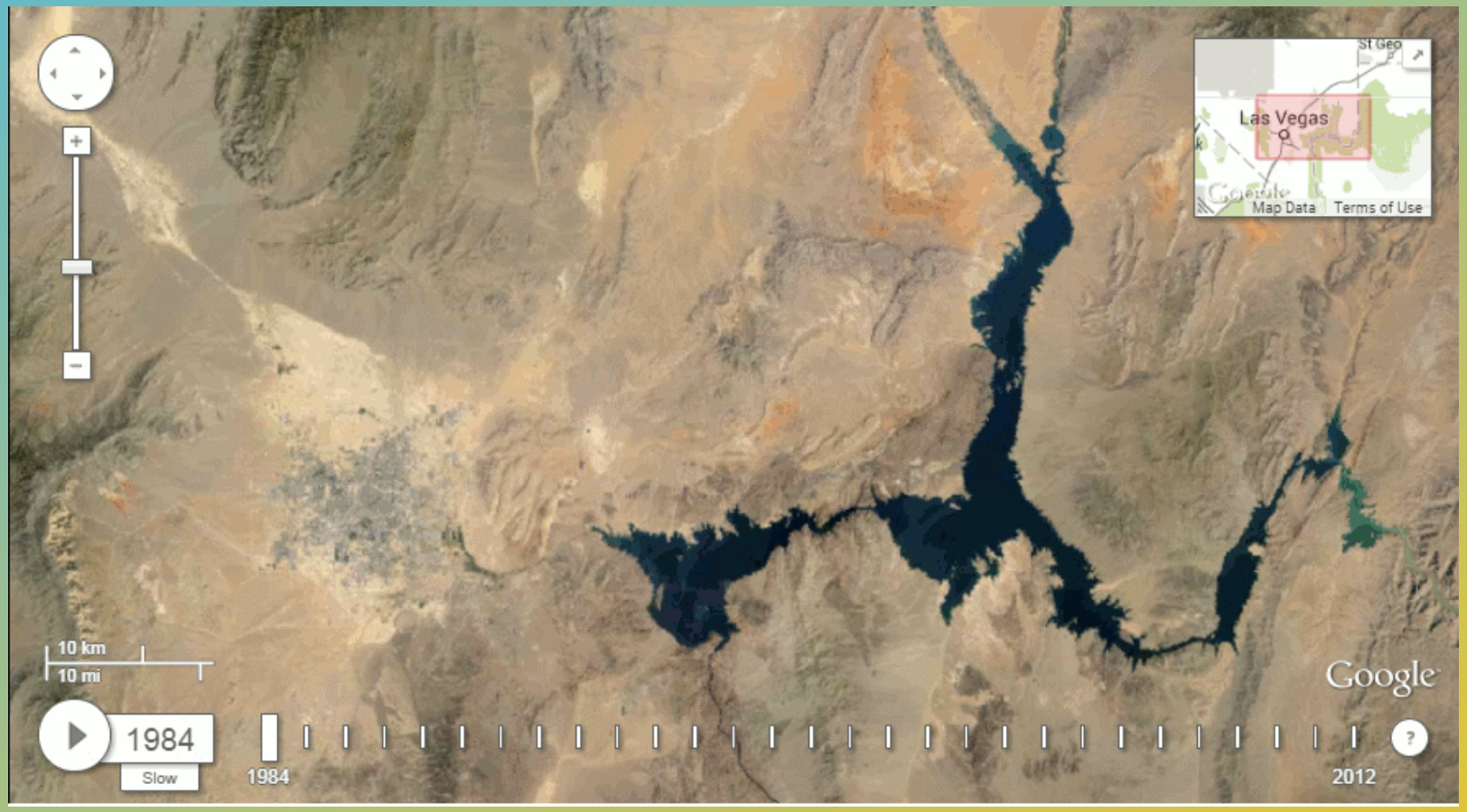
Landsat and Google Earth

- 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

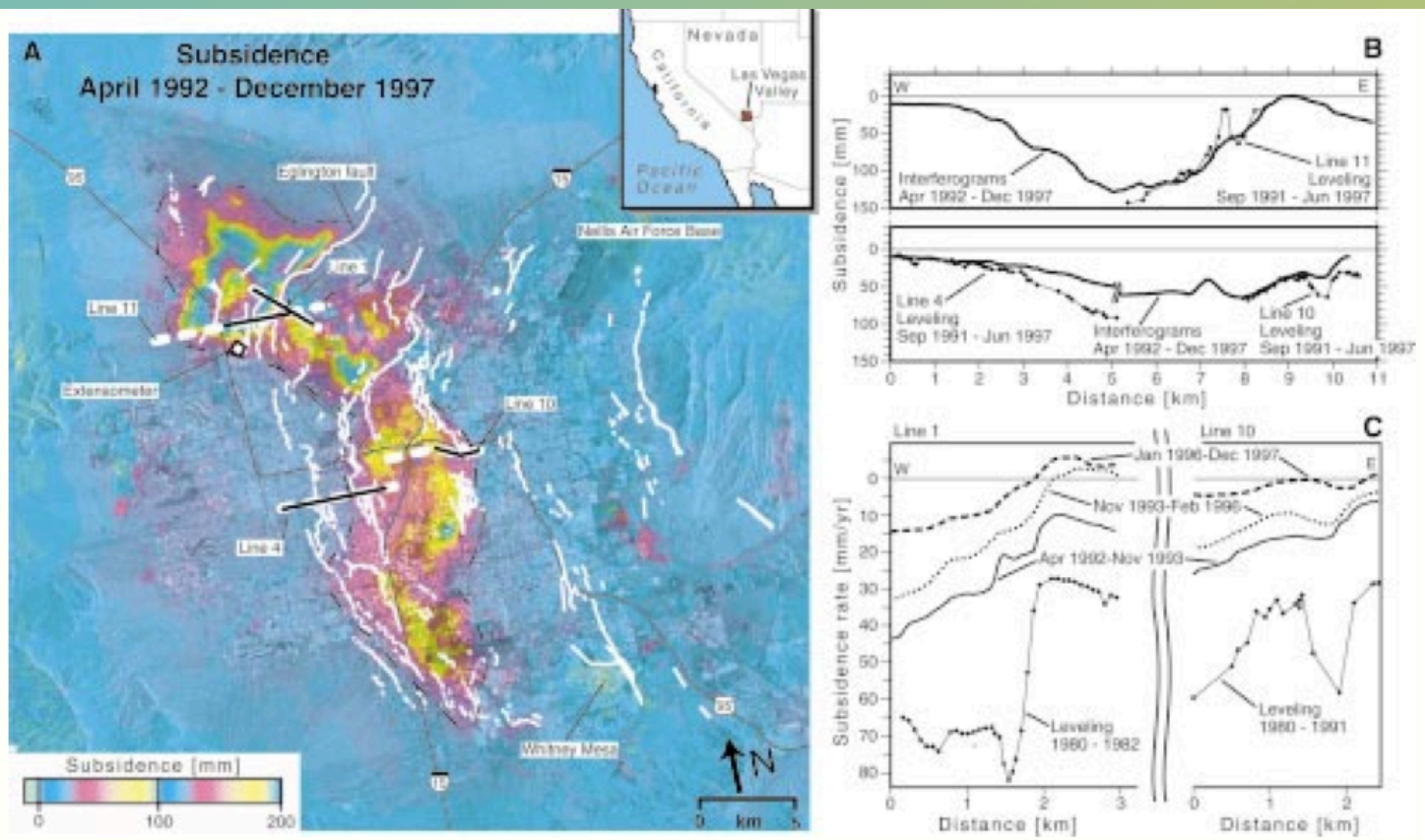
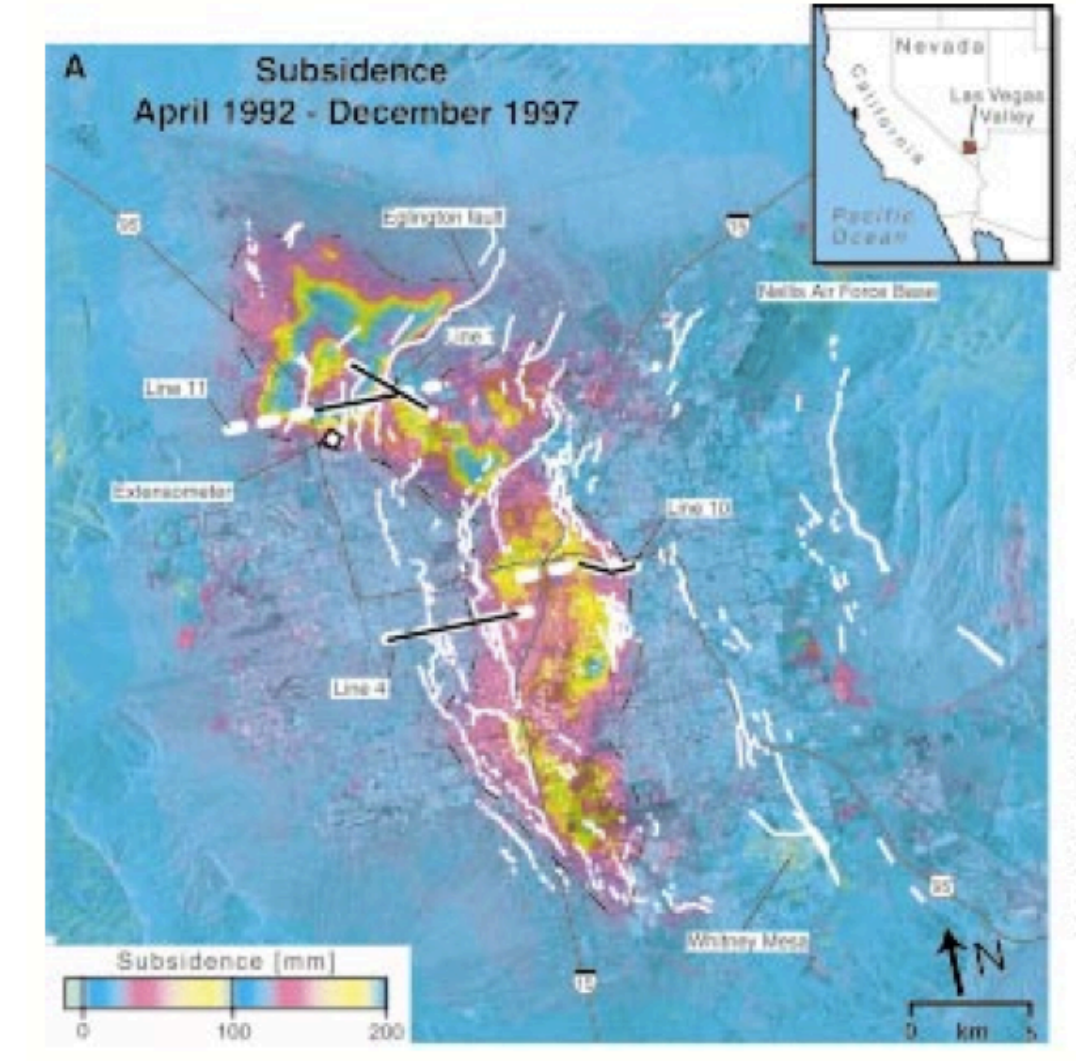
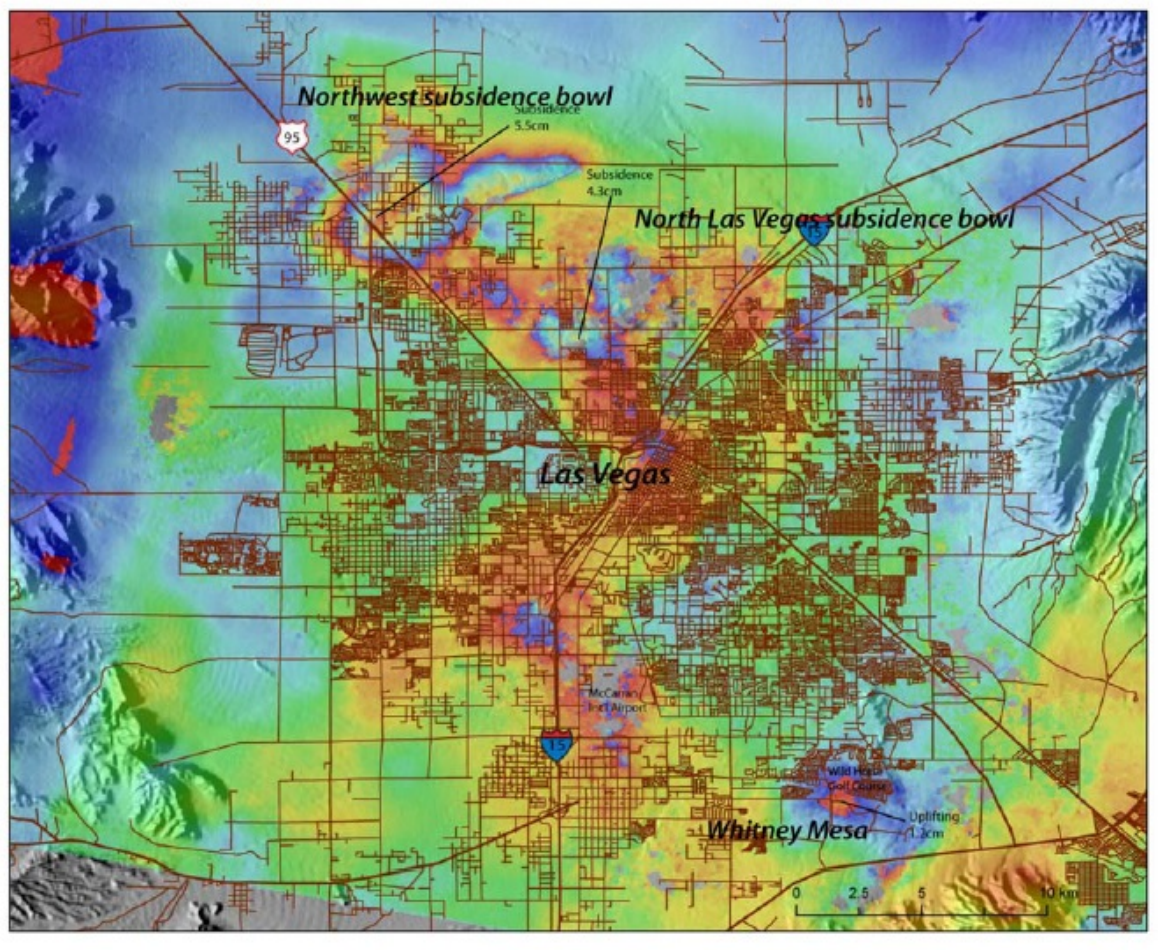


Figure 1. A: Subsidence in Las Vegas Valley between April 1992 and December 1997, obtained from interferograms (Fig. 2, A, B, and C) by unwrapping phases using Zebker and Lu (1998) algorithm, projecting range displacement onto equivalent vertical displacement, and summing interferograms; and mapped surface faults. Dashed line indicates 30 mm subsidence contour. Pixel size is 1600 m^2. 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.

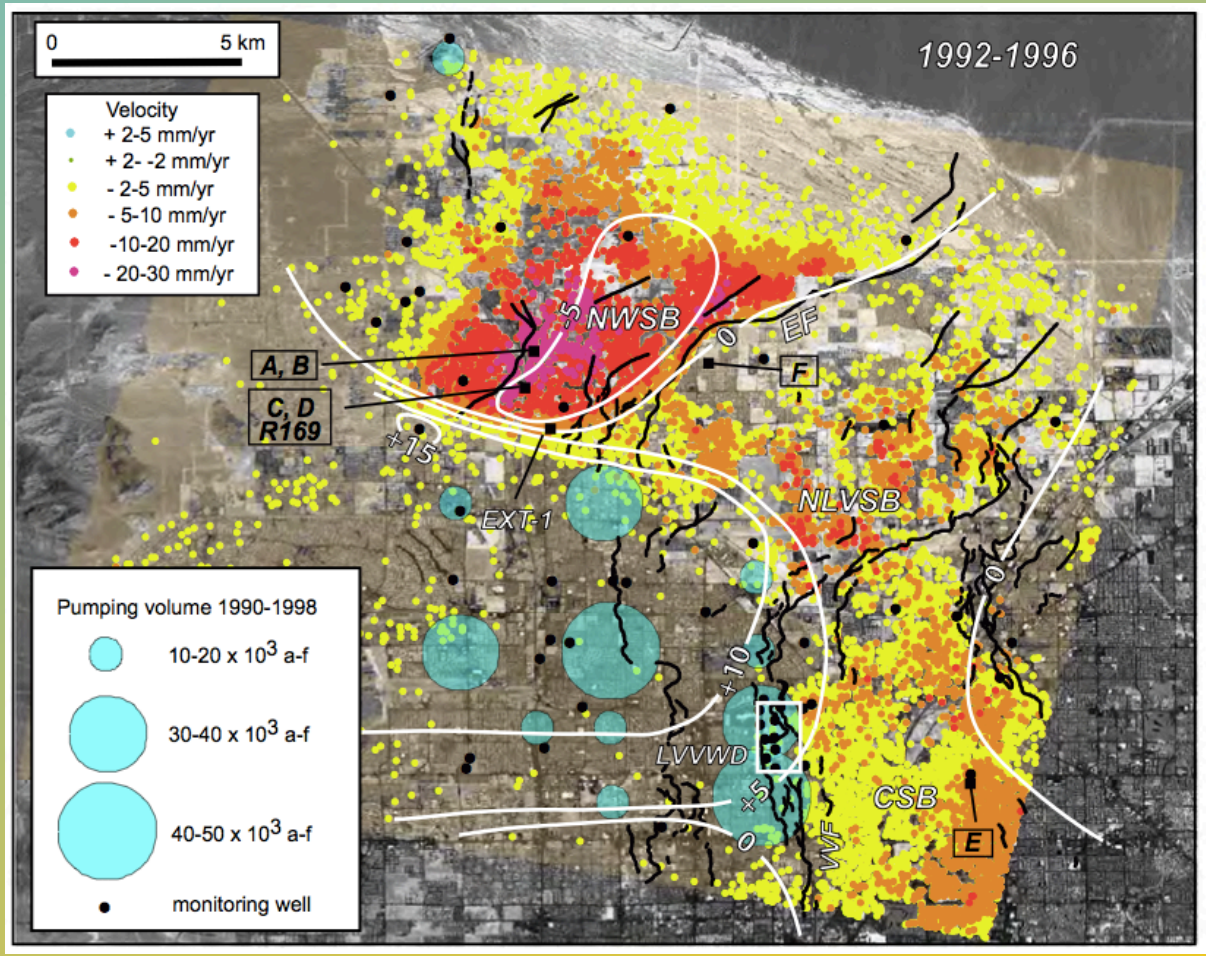
Amelung et al. 1999



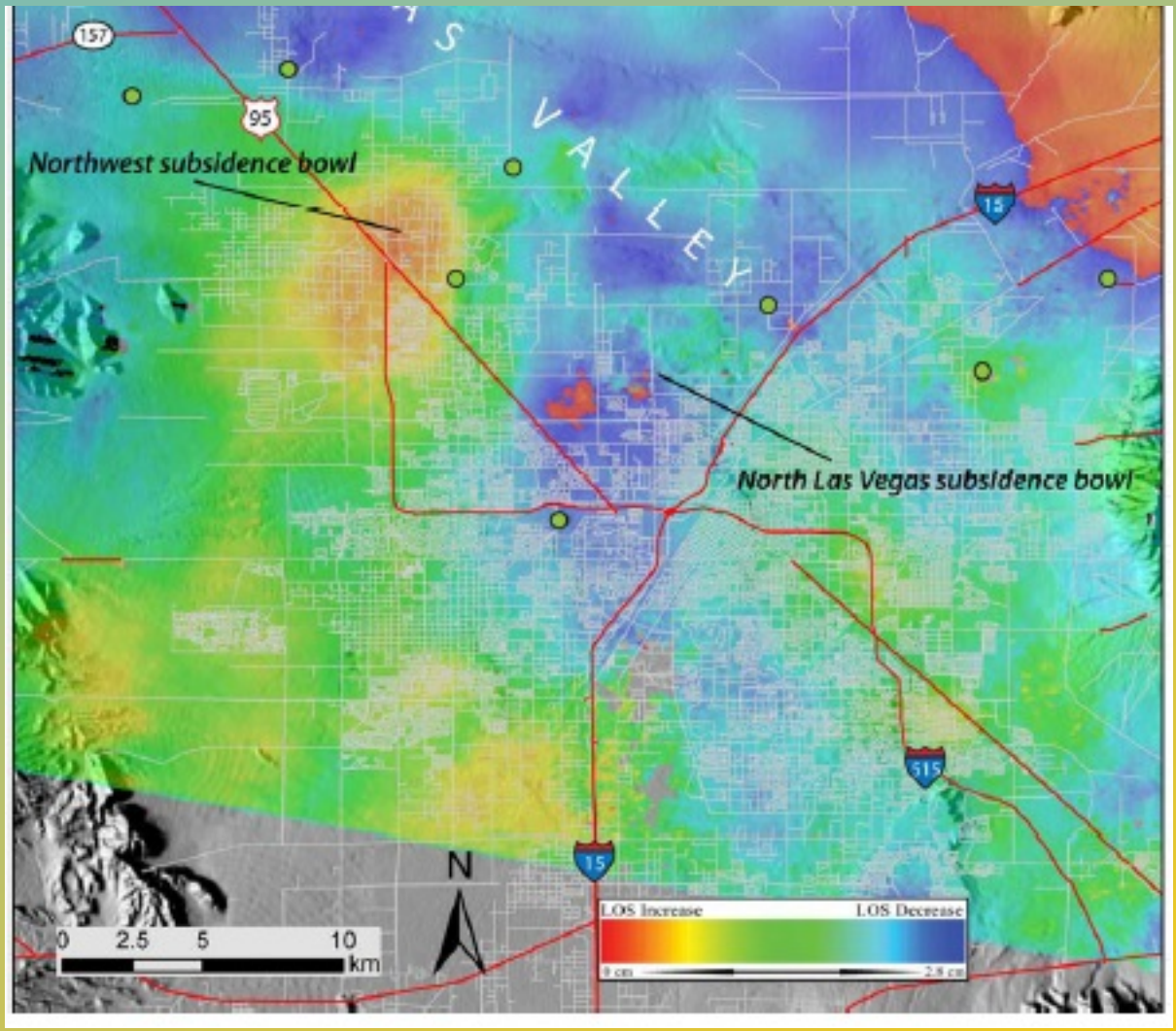
Bell et al. 2008 (95-97)



Bell et al. 2008 (92-96)

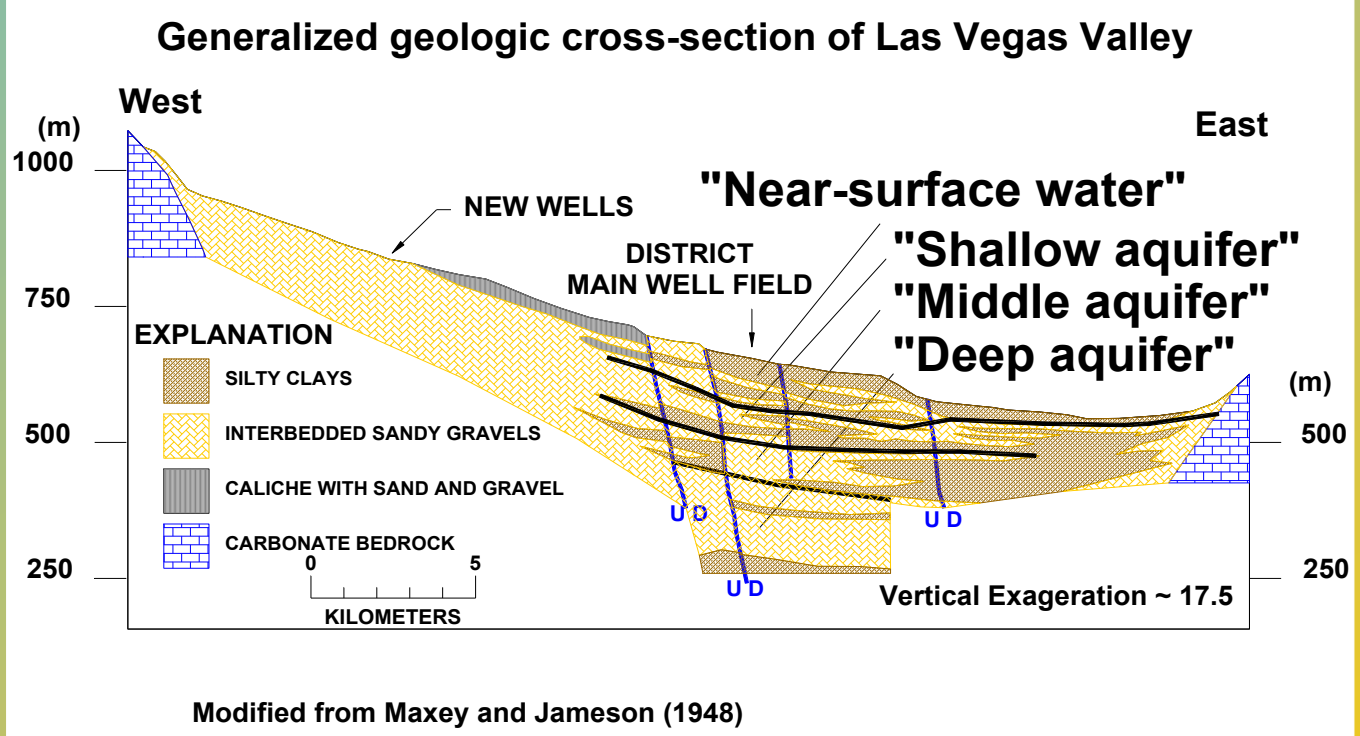


Bell et al. 2009 (06-07)



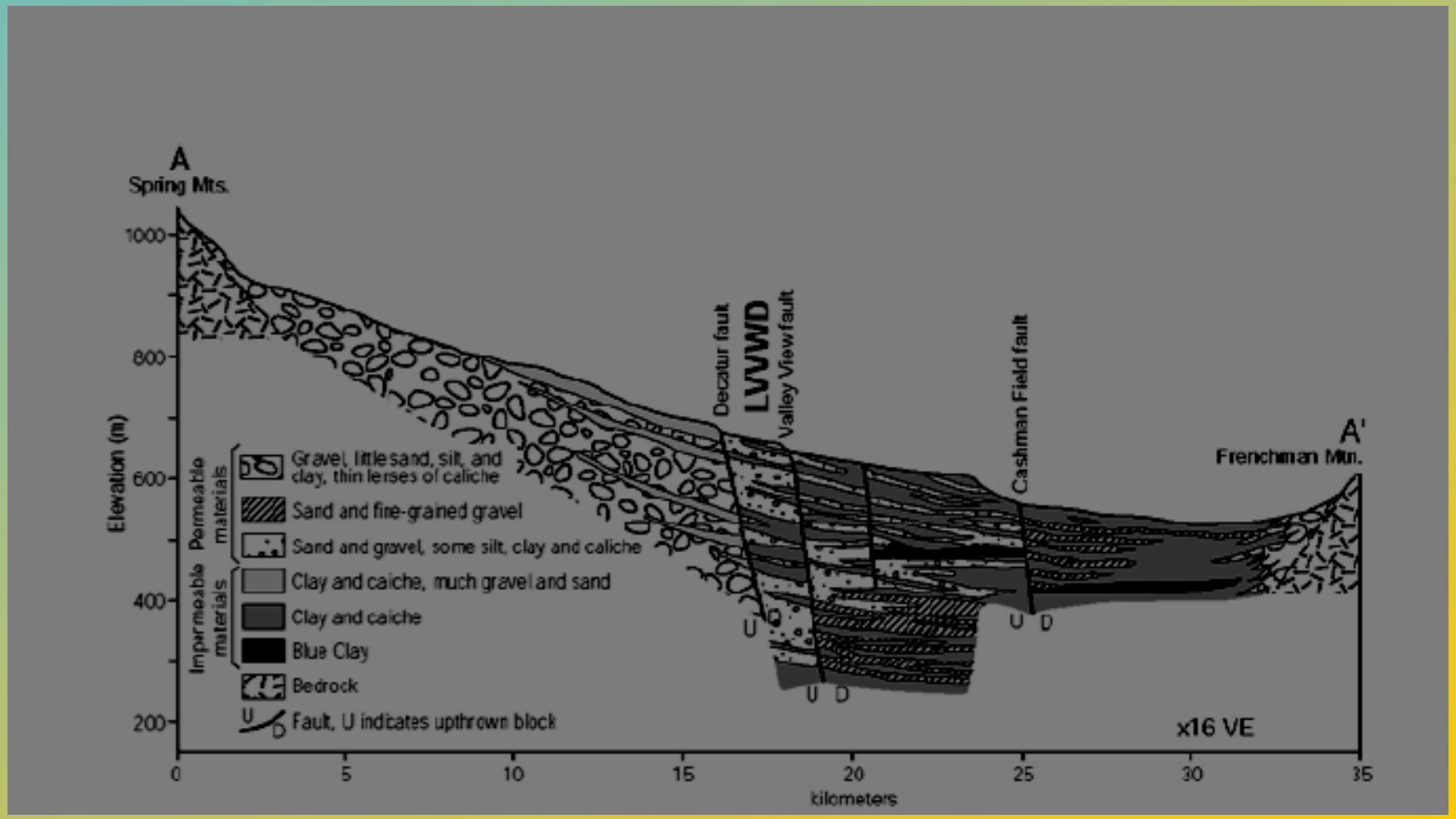
Hydrogeology of Las Vegas Valley

Maxey and Jameson Cross-section Along Charleston Blvd

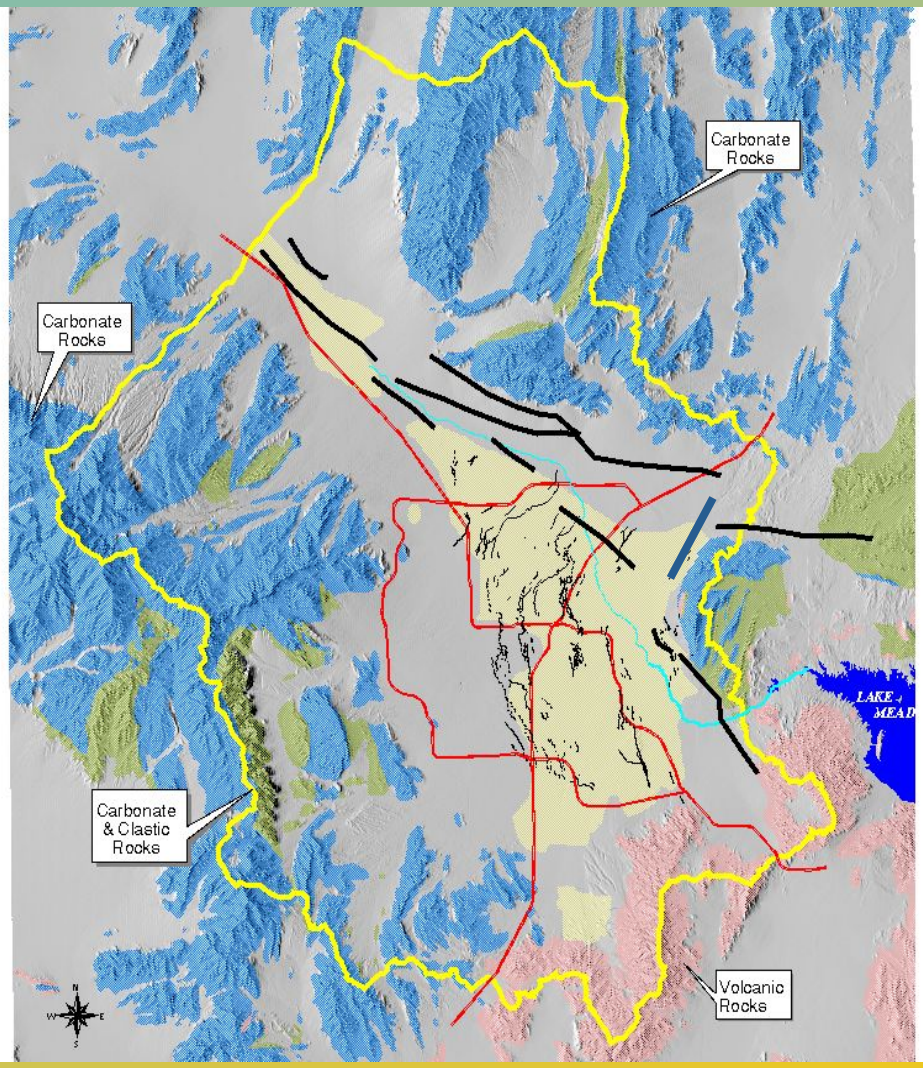


Modified from Maxey and Jameson (1948)

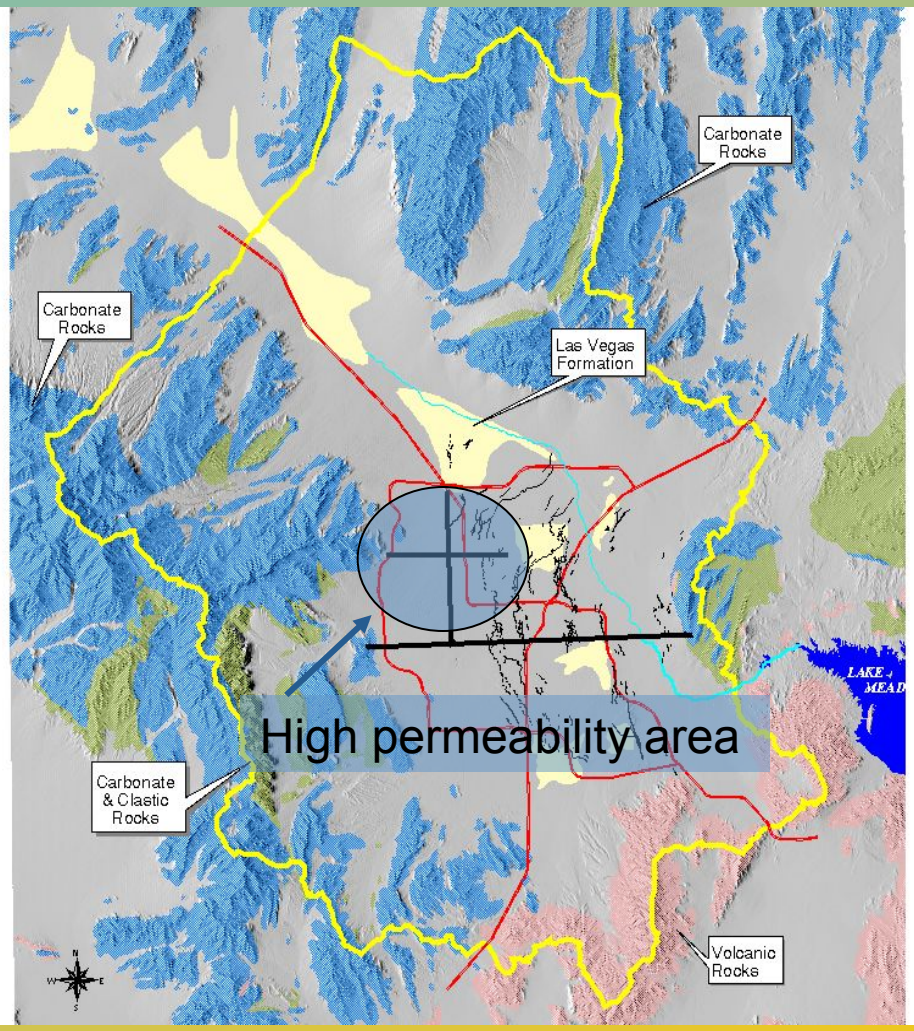
Bell et al. 2008



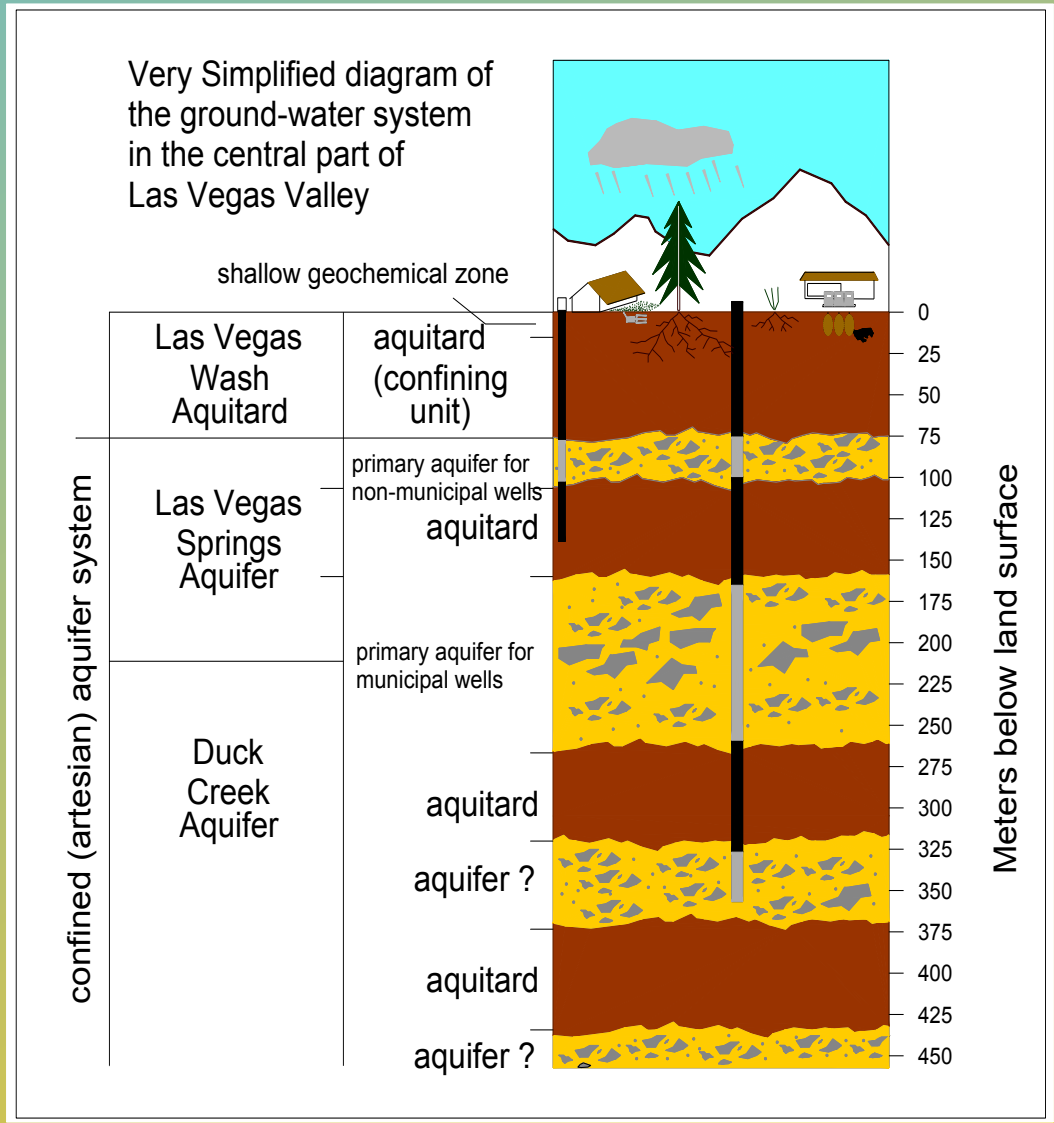
Major Structures and Lithologies in Las Vegas Valley



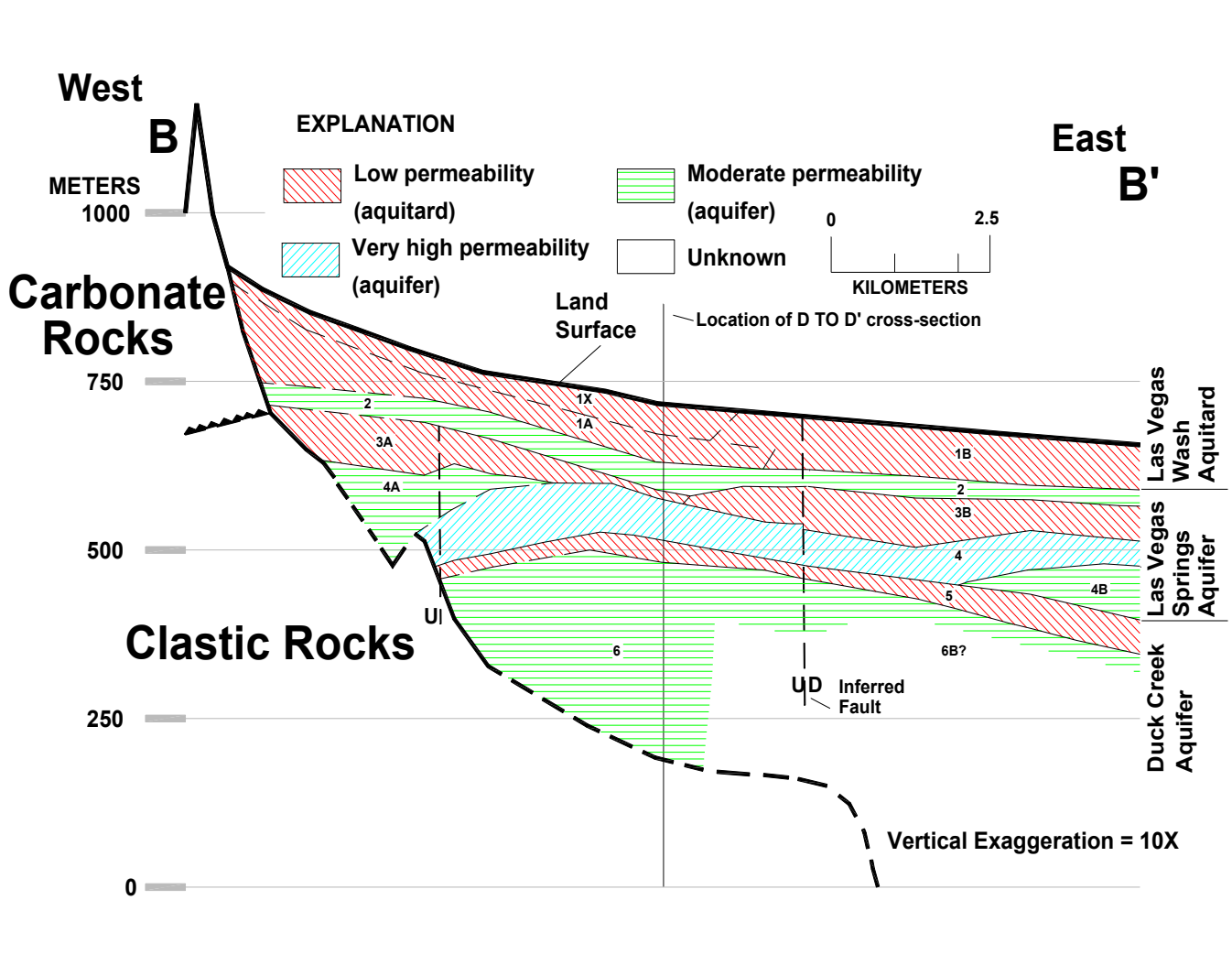
High Permeability Area in Las Vegas Valley



Hydrostratigraphic Units

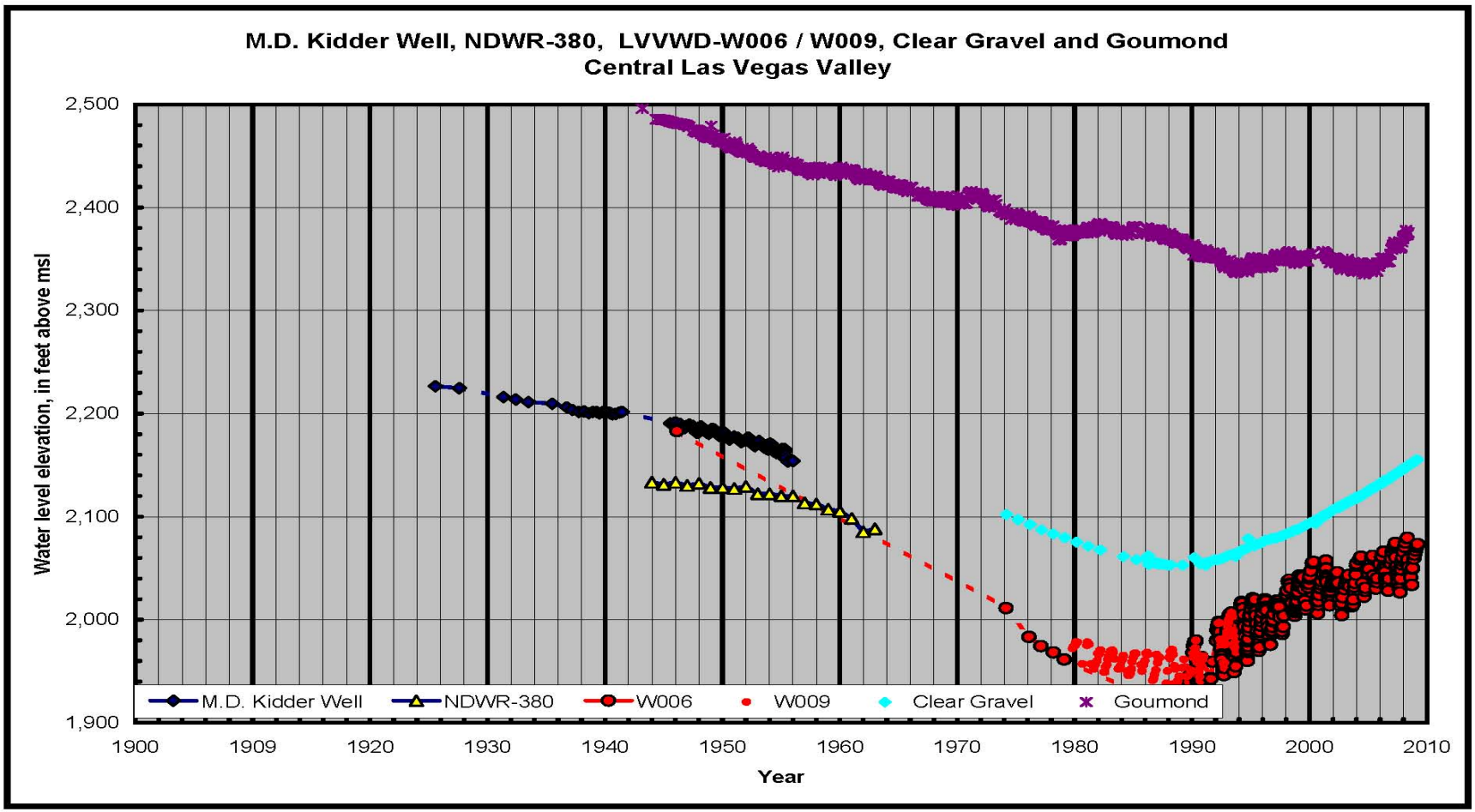


Hydrostratigraphic units cross-section

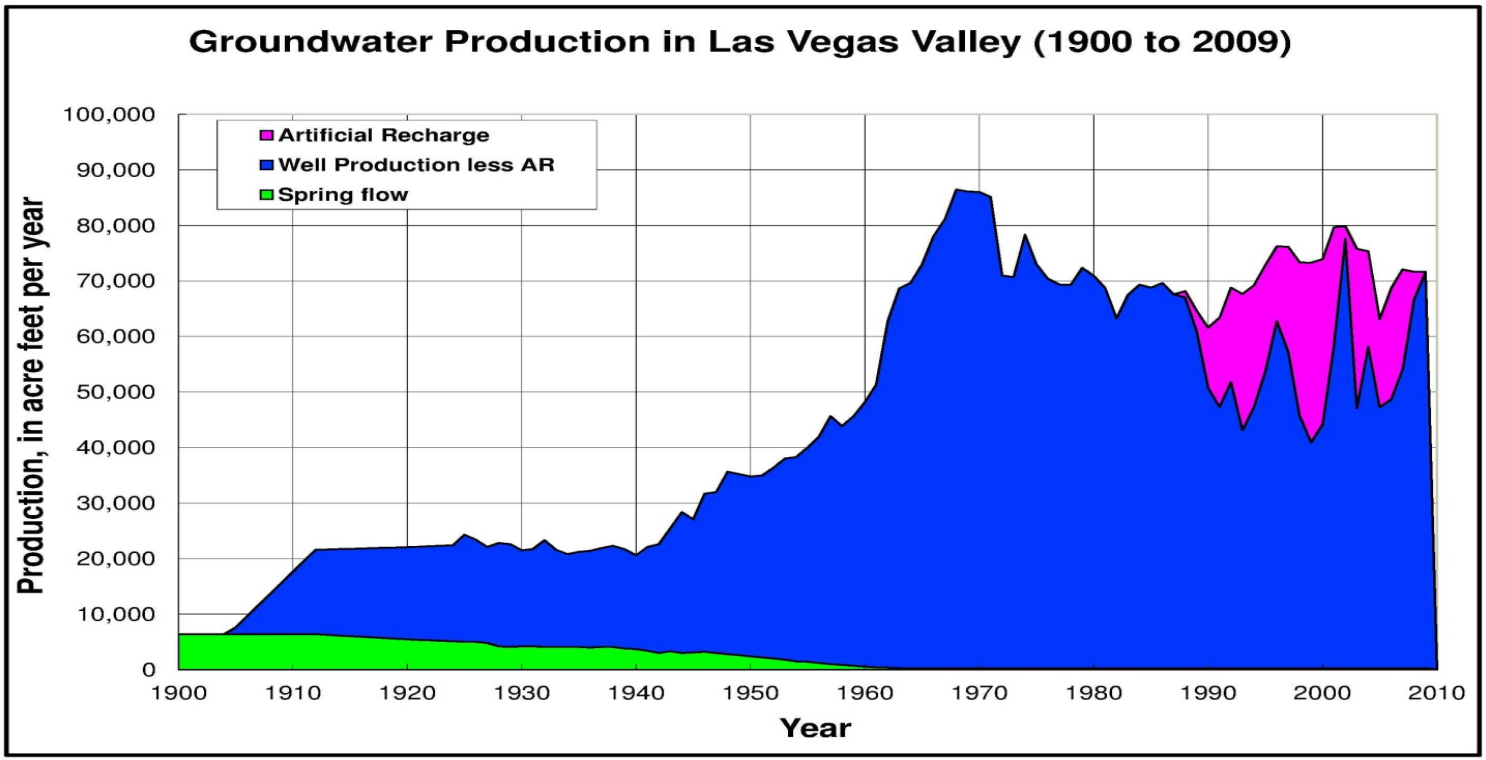


Hydrology of Las Vegas Valley

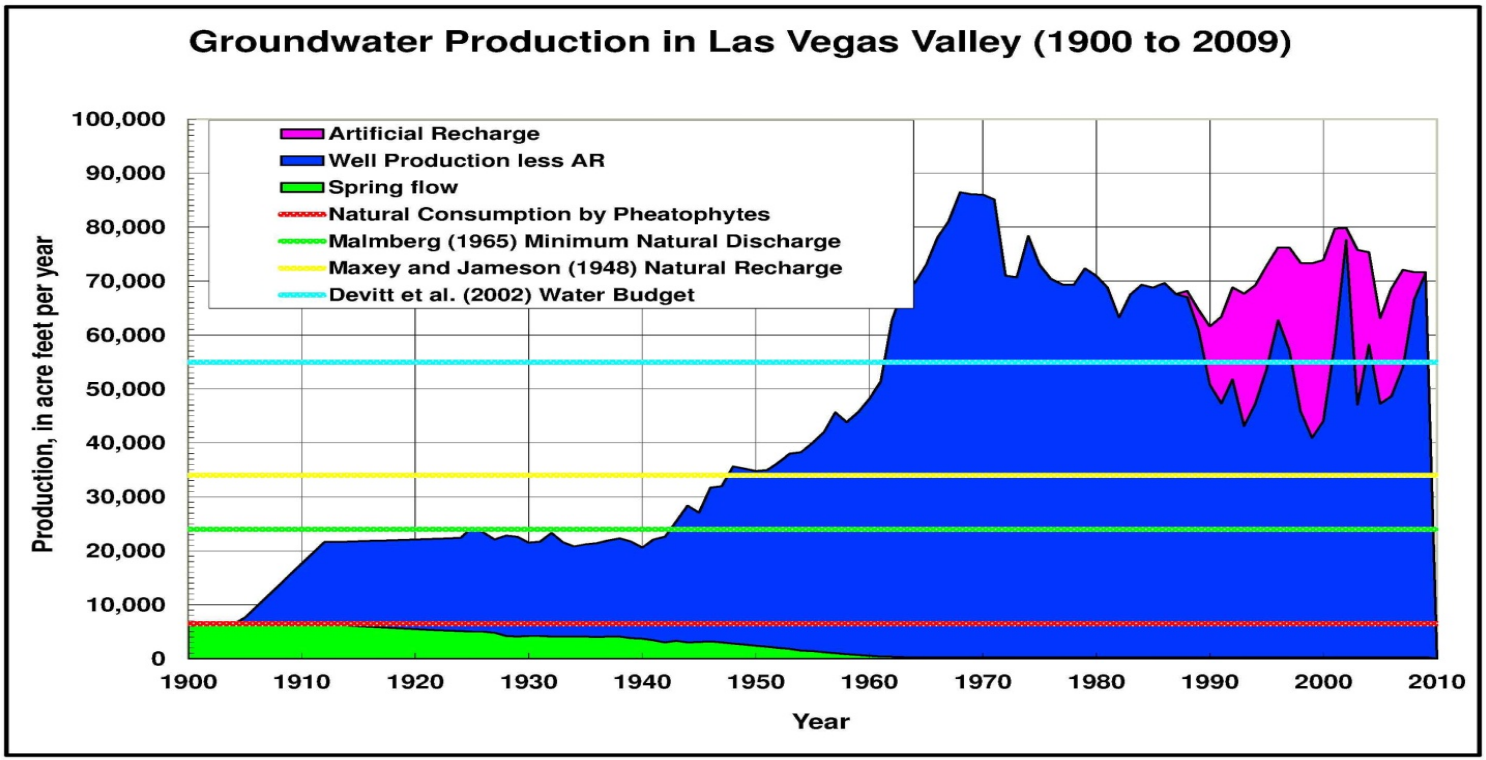
Central LVV Hydrographs



Ground Water Use



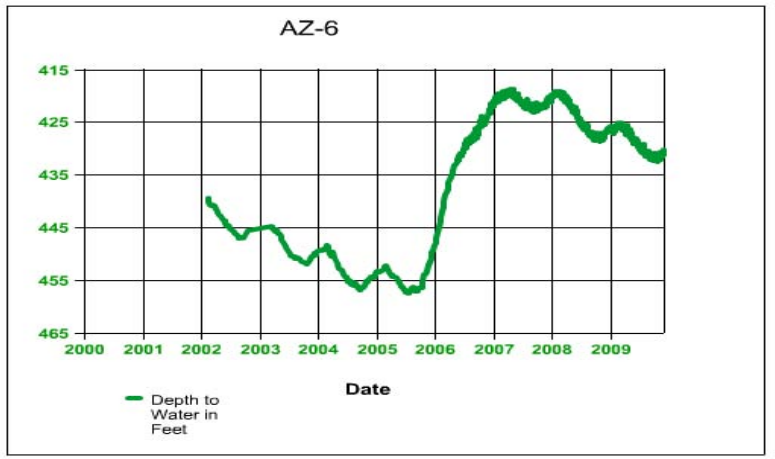
Water Use and Estimated PY

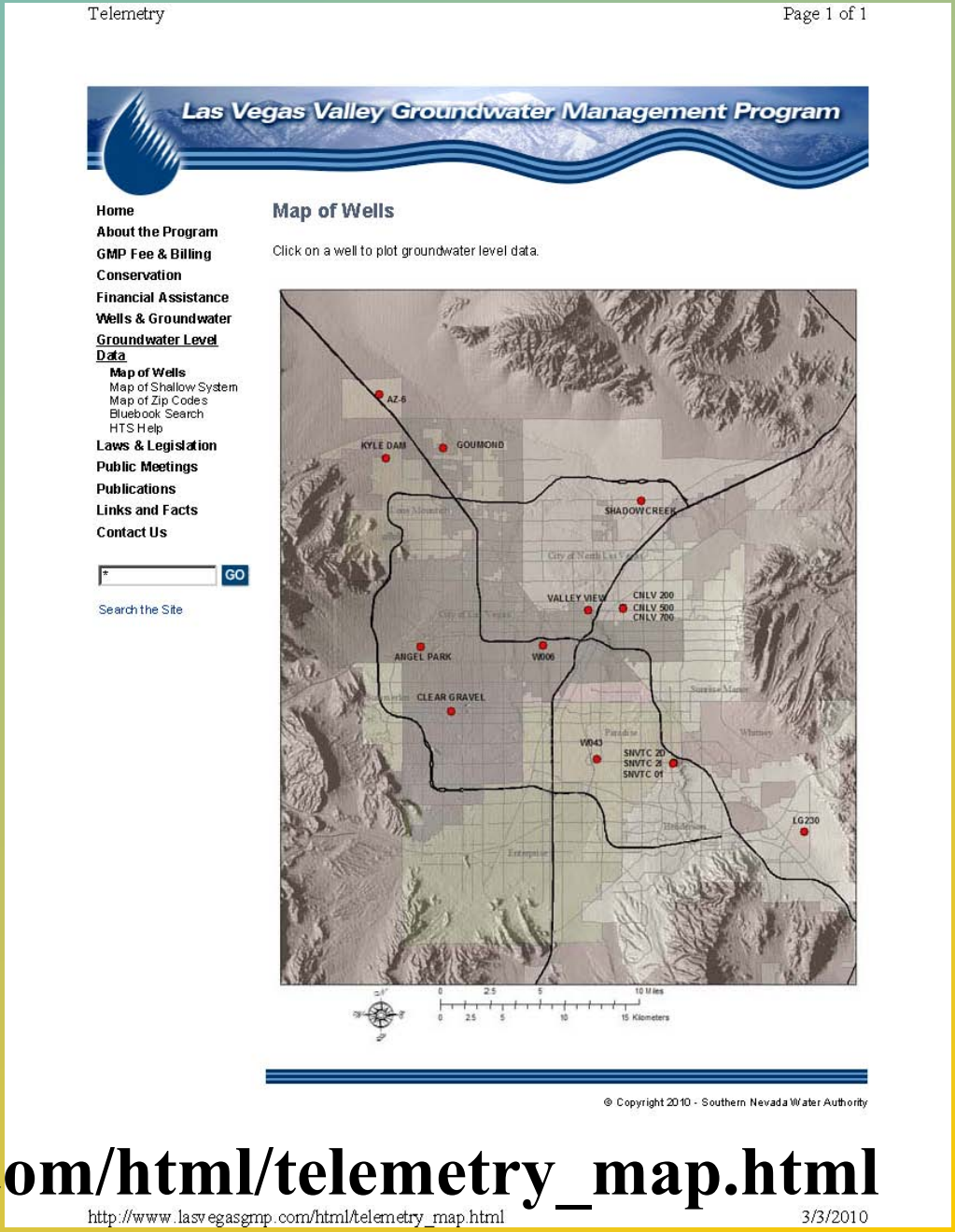


Hydrologic Telemetering System

Las Vegas GMP

- HTS Network
  - Cell Modem
  - Websites



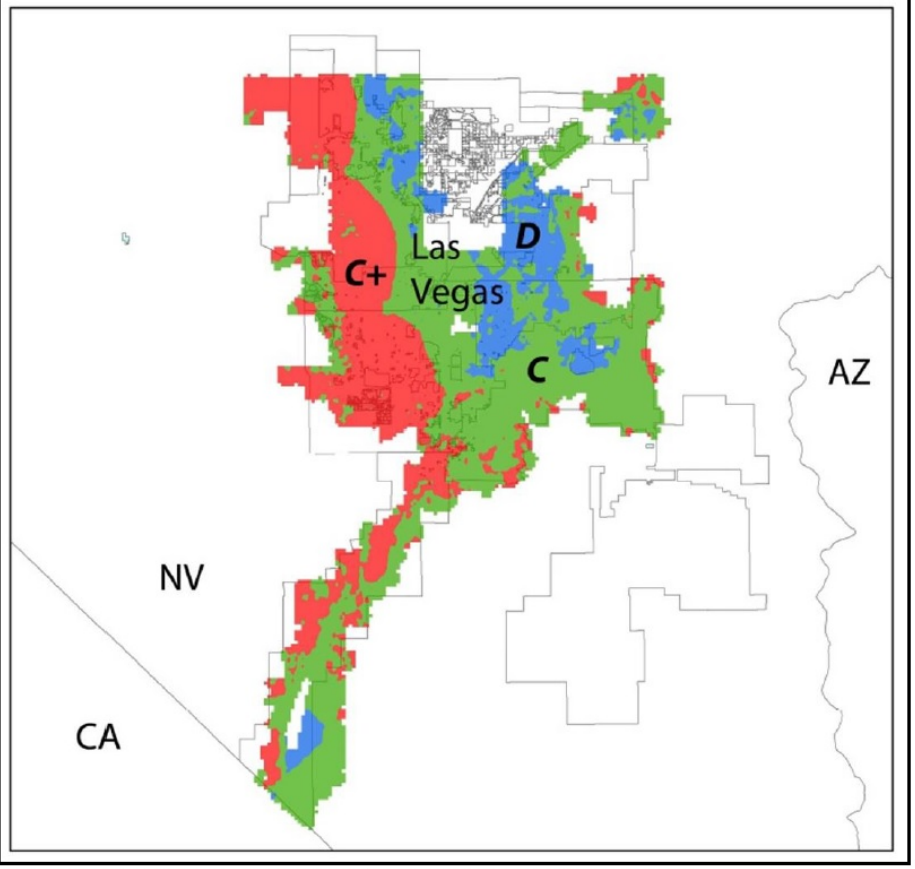


http://www.lasvegasgmp.com/html/telemetry_map.html

Refraction Microtremor (ReMi)

Louis et al. 2012

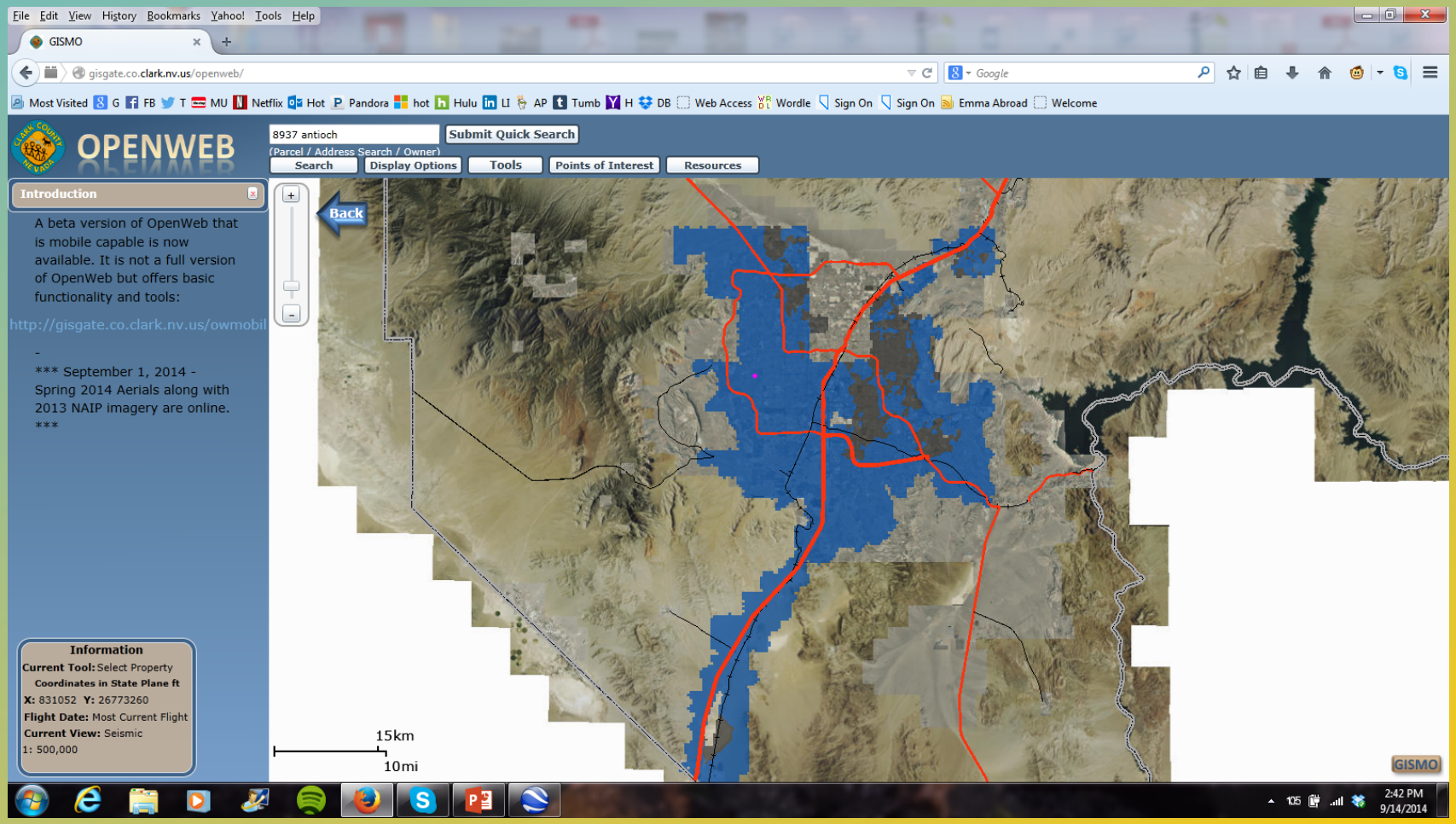
SITE CLASS	Soil shear wave velocity $\bar{v}_s$ (ft/s)
A	$\bar{v}_s$ > 5,000
B	2,500 < $\bar{v}_s$ ≤ 5,000
C	1,200 < $\bar{v}_s$ ≤ 2,500
D	600 ≤ $\bar{v}_s$ ≤ 1,200



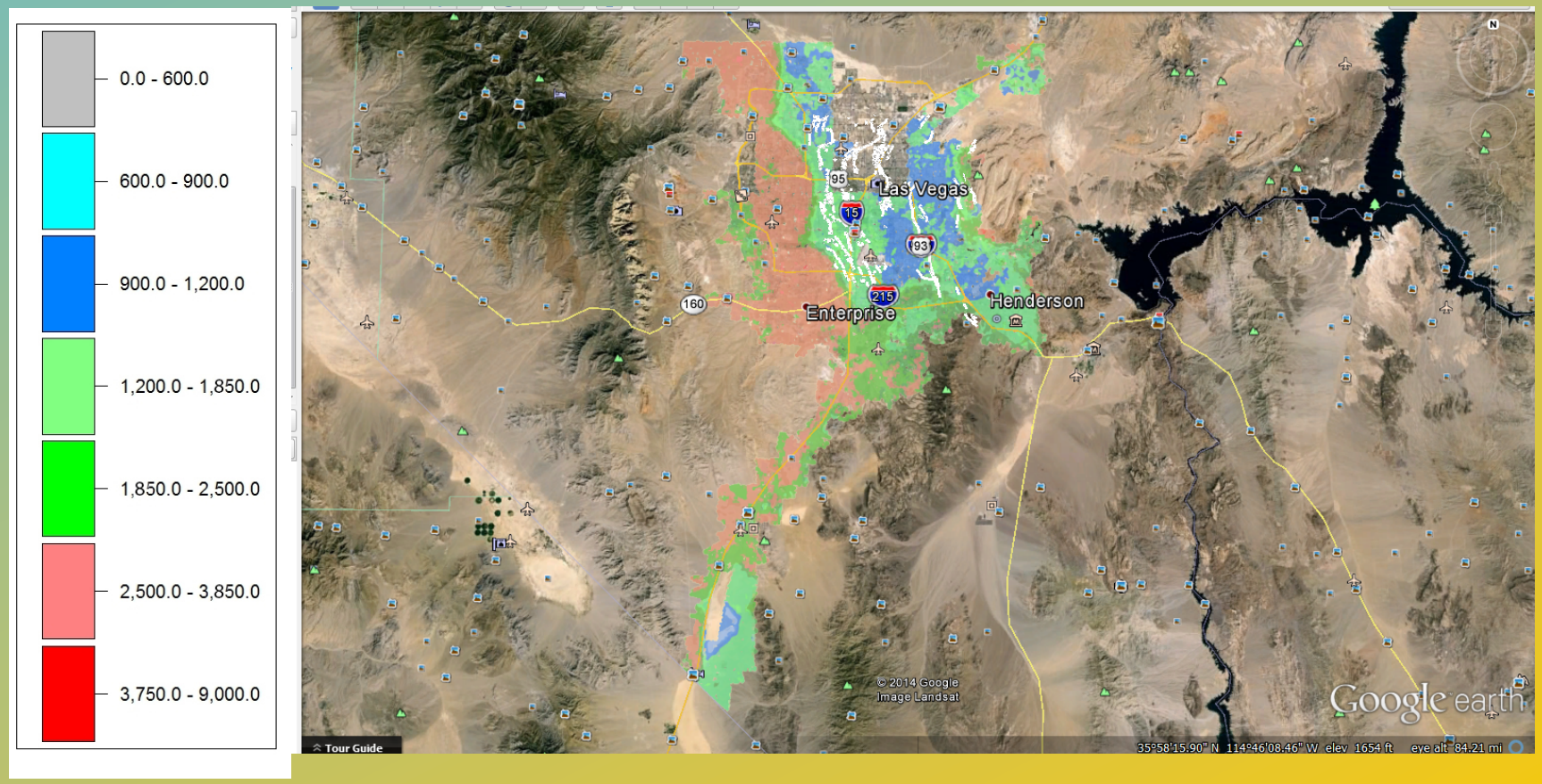
Modified from **TABLE 1613.5.2 SITE CLASS DEFINITIONS**

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

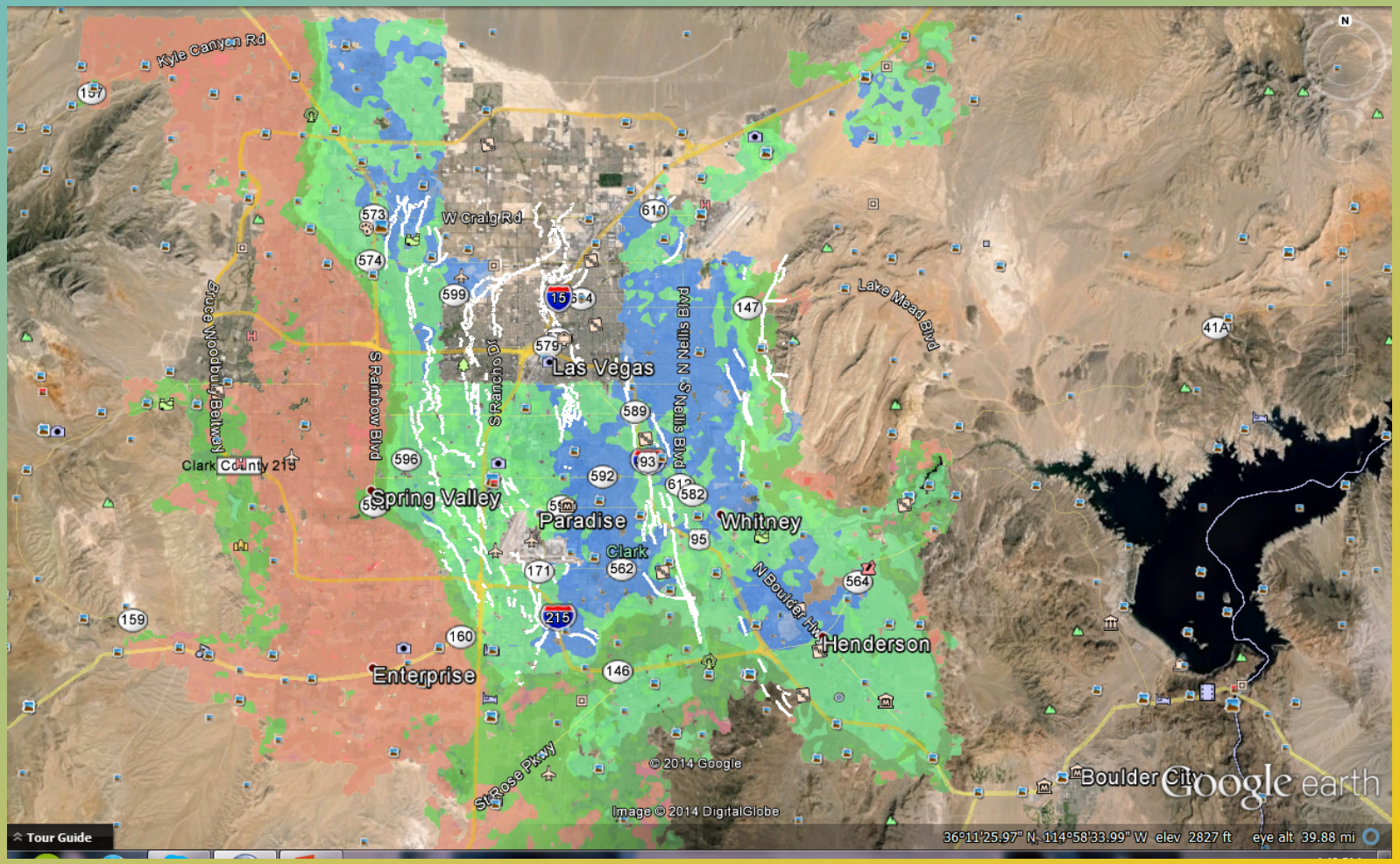
http://gisgate.co.clark.nv.us/openweb/



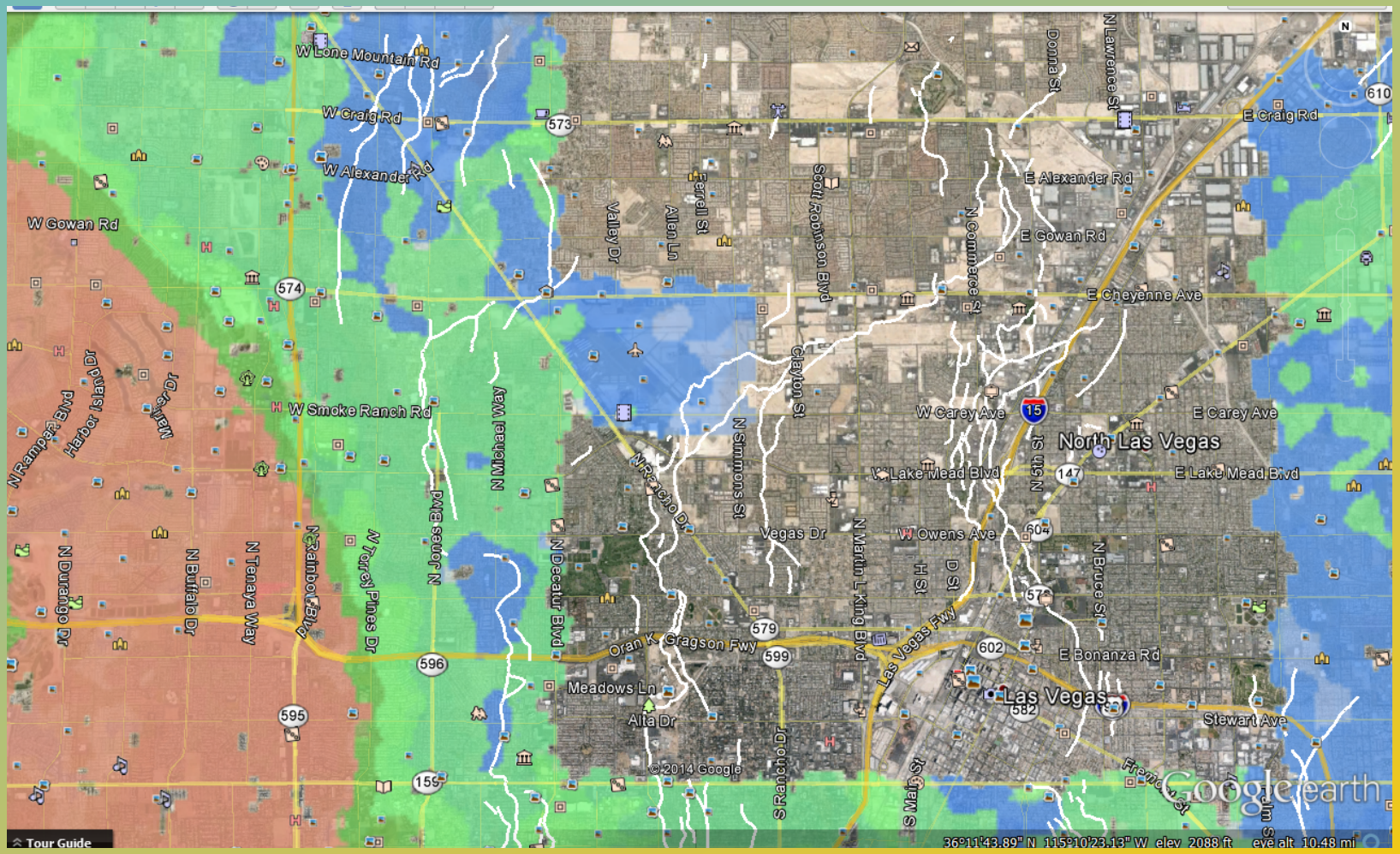
ReMi Seismic Data in GE



Central Las Vegas



Northern Las Vegas



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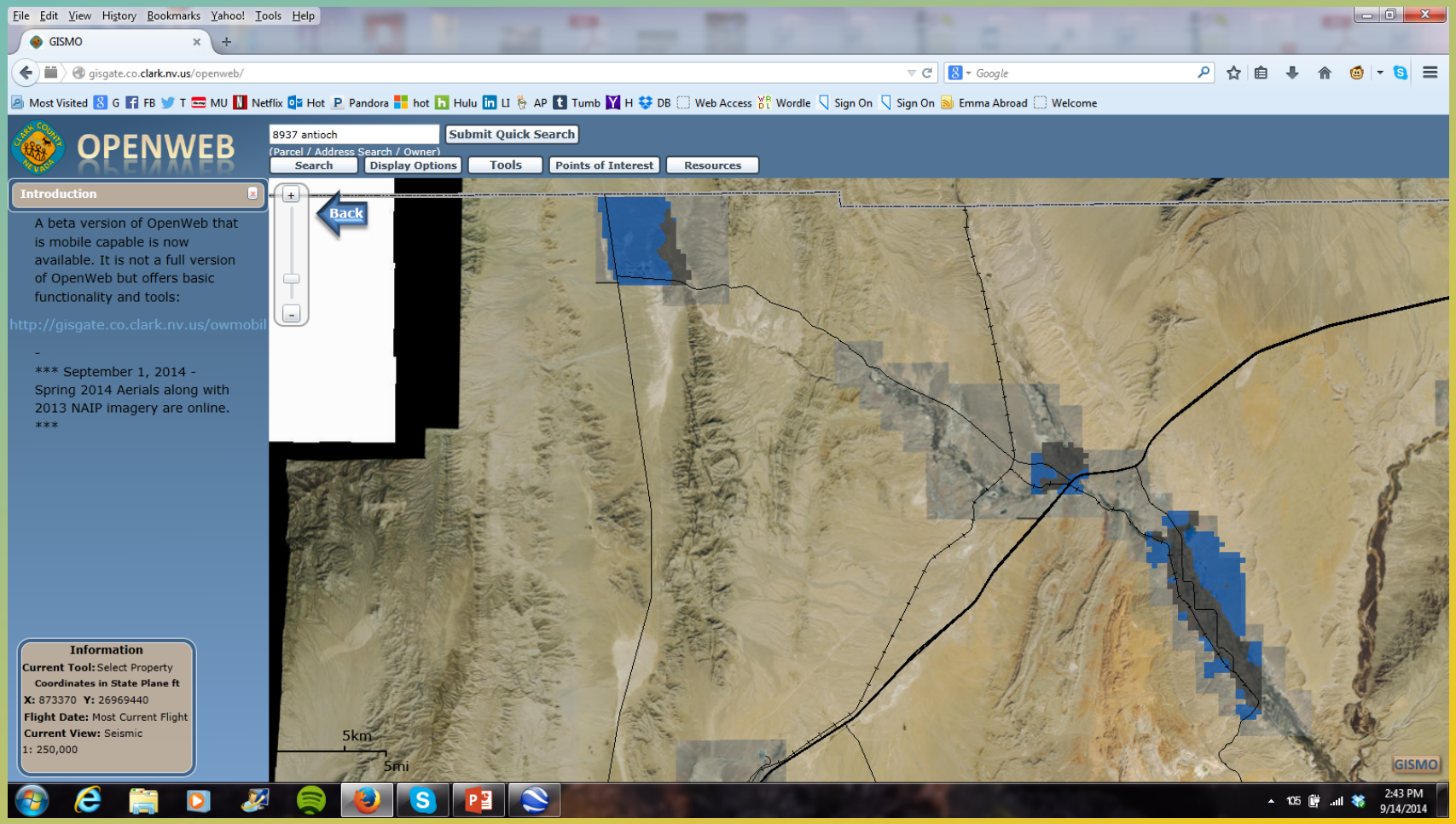
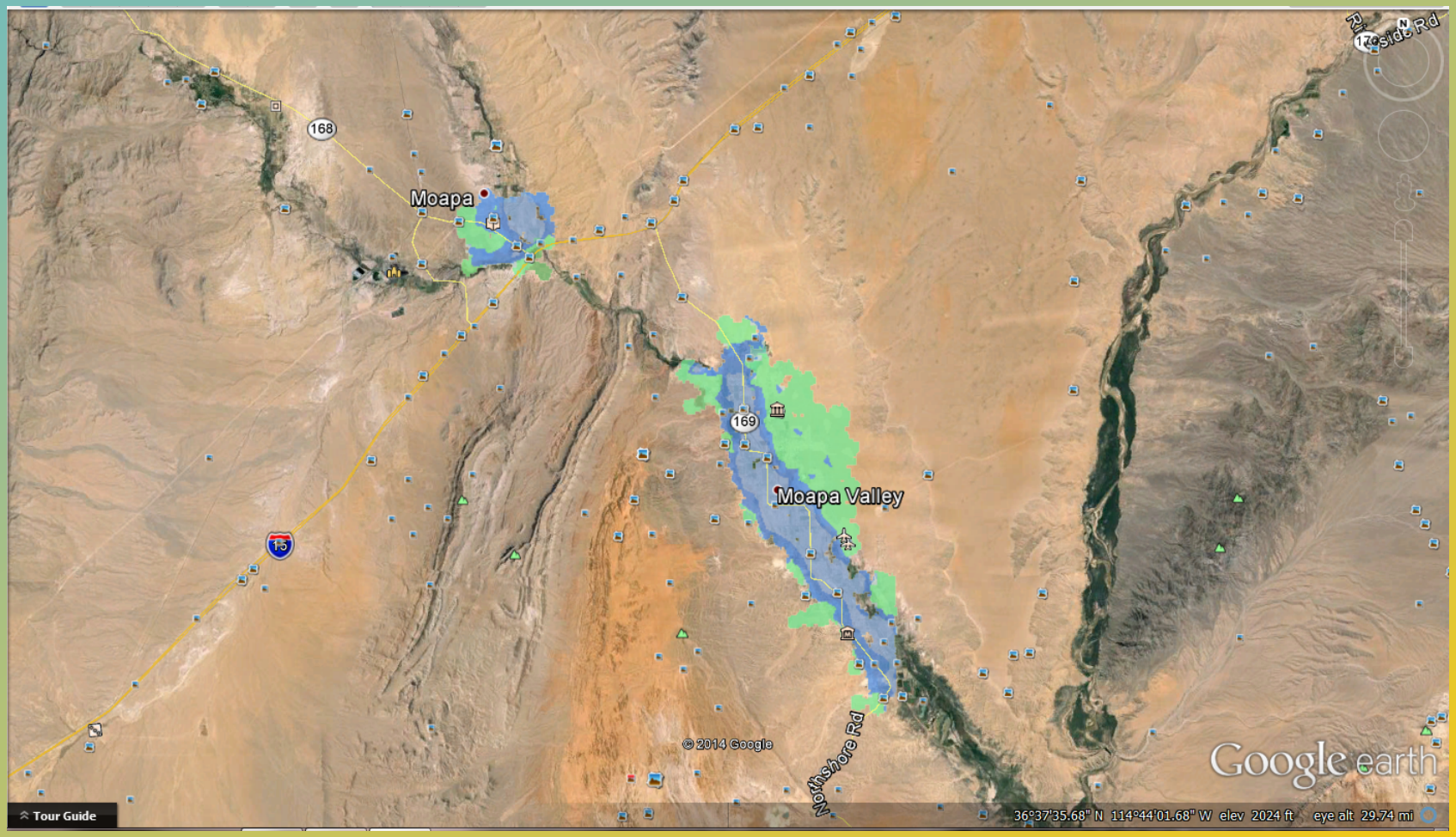
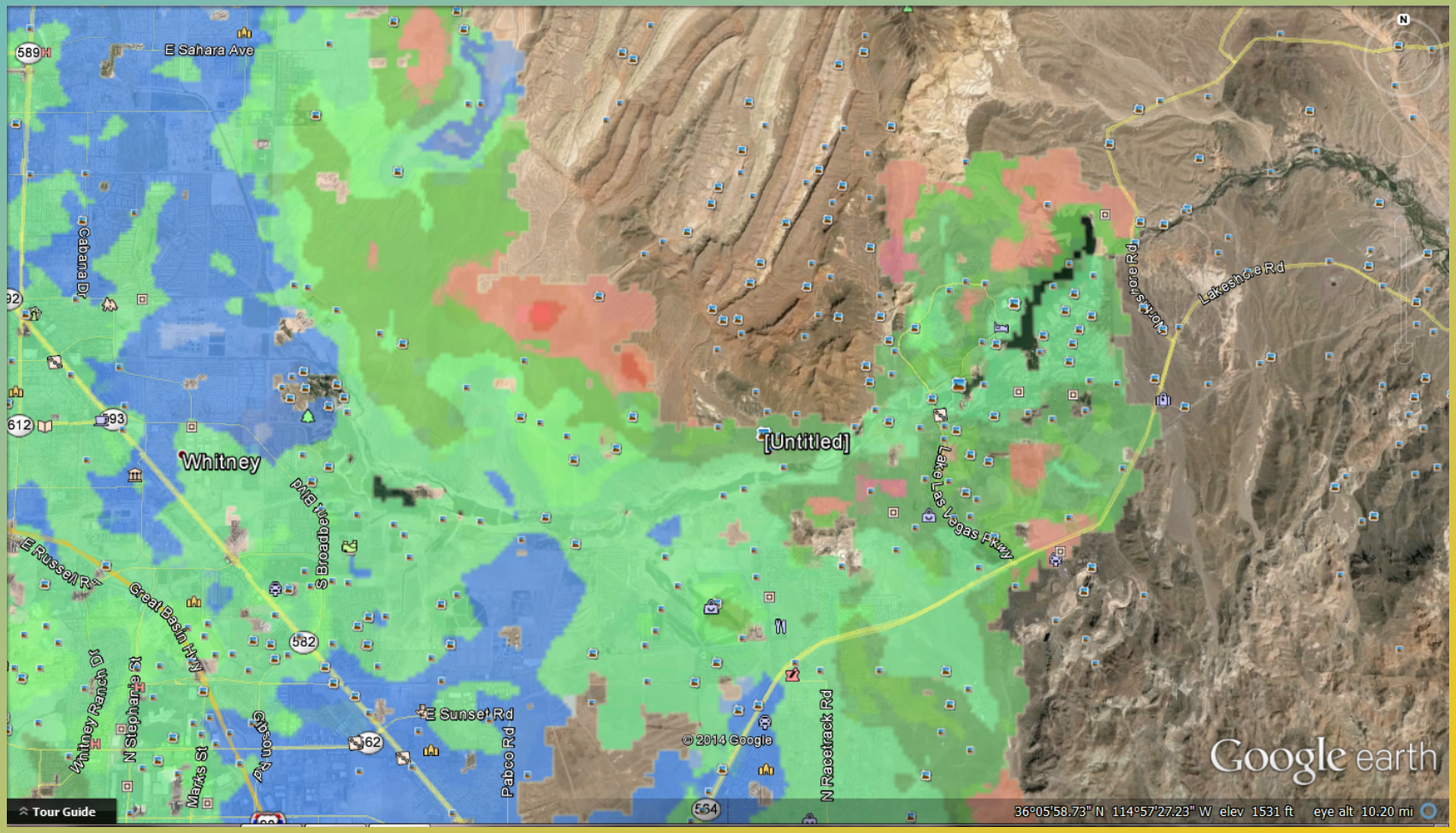


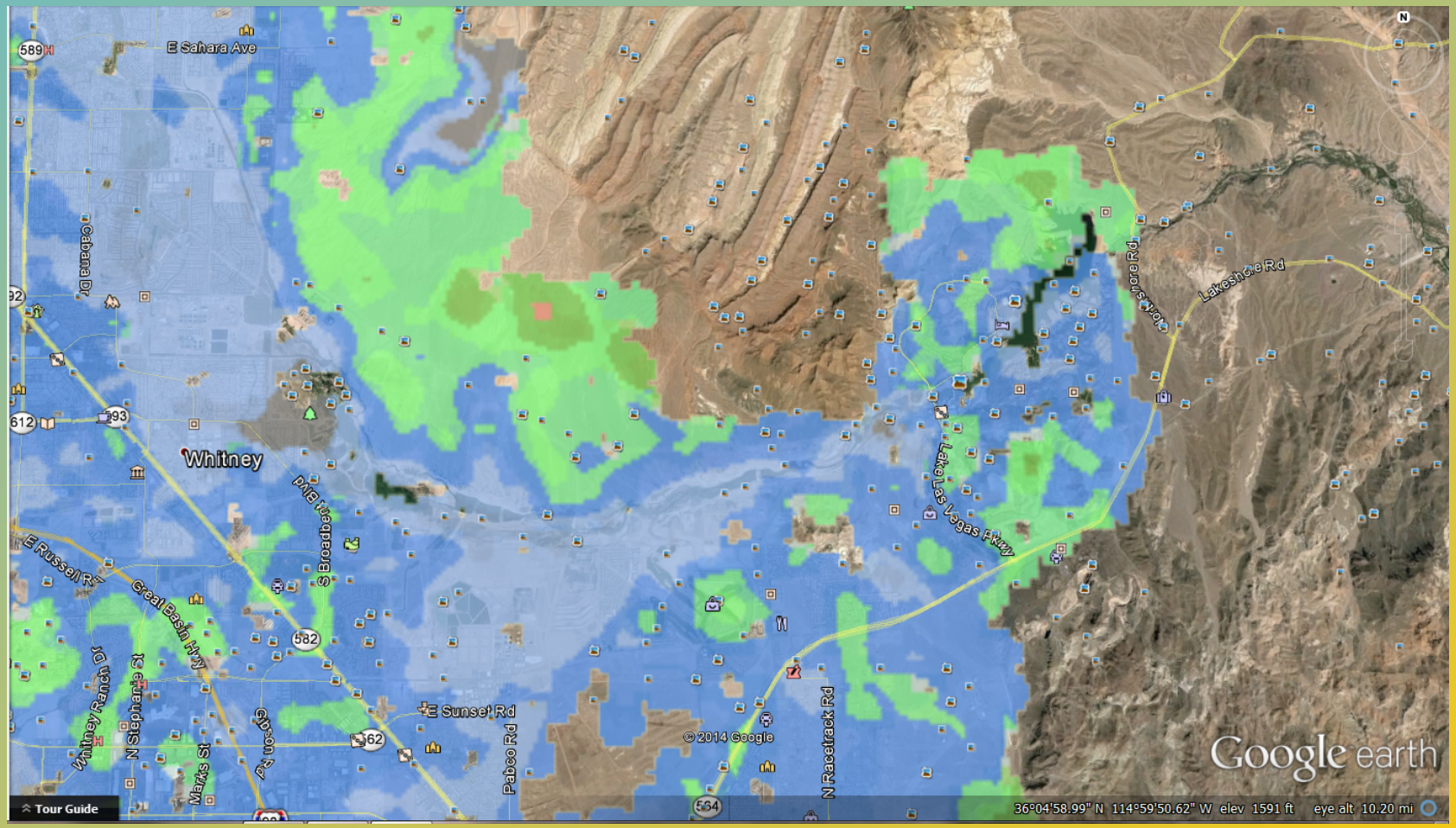
Moapa Area


Moapa
Moapa Valley
168
169
15
Northshore Rd
© 2014 Google
Google earth
Tour Guide
36°37'35.68" N 114°44'01.68" W elev 2024 ft eye alt 29.74 mi

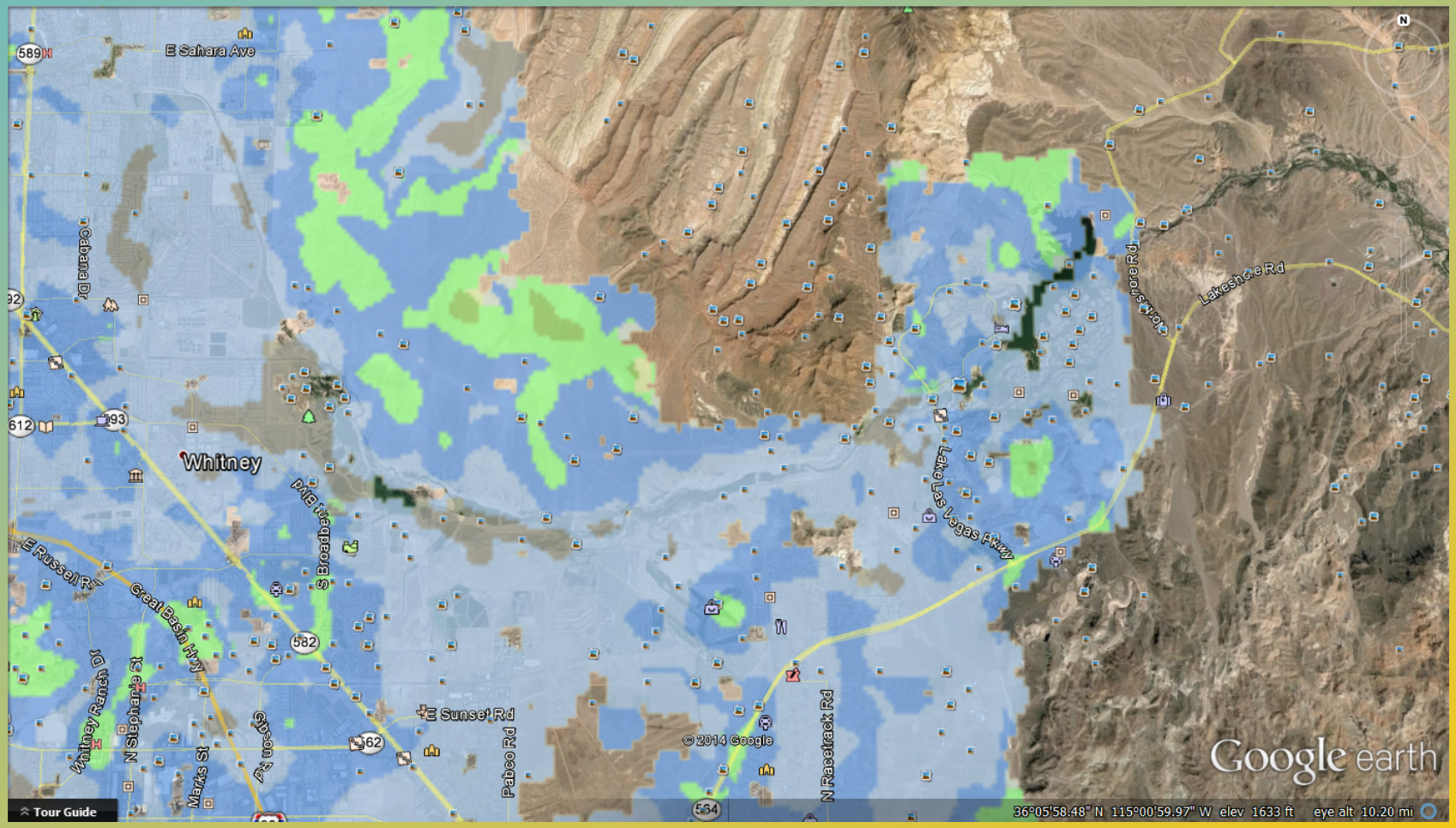
Las Vegas Wash 100 feet



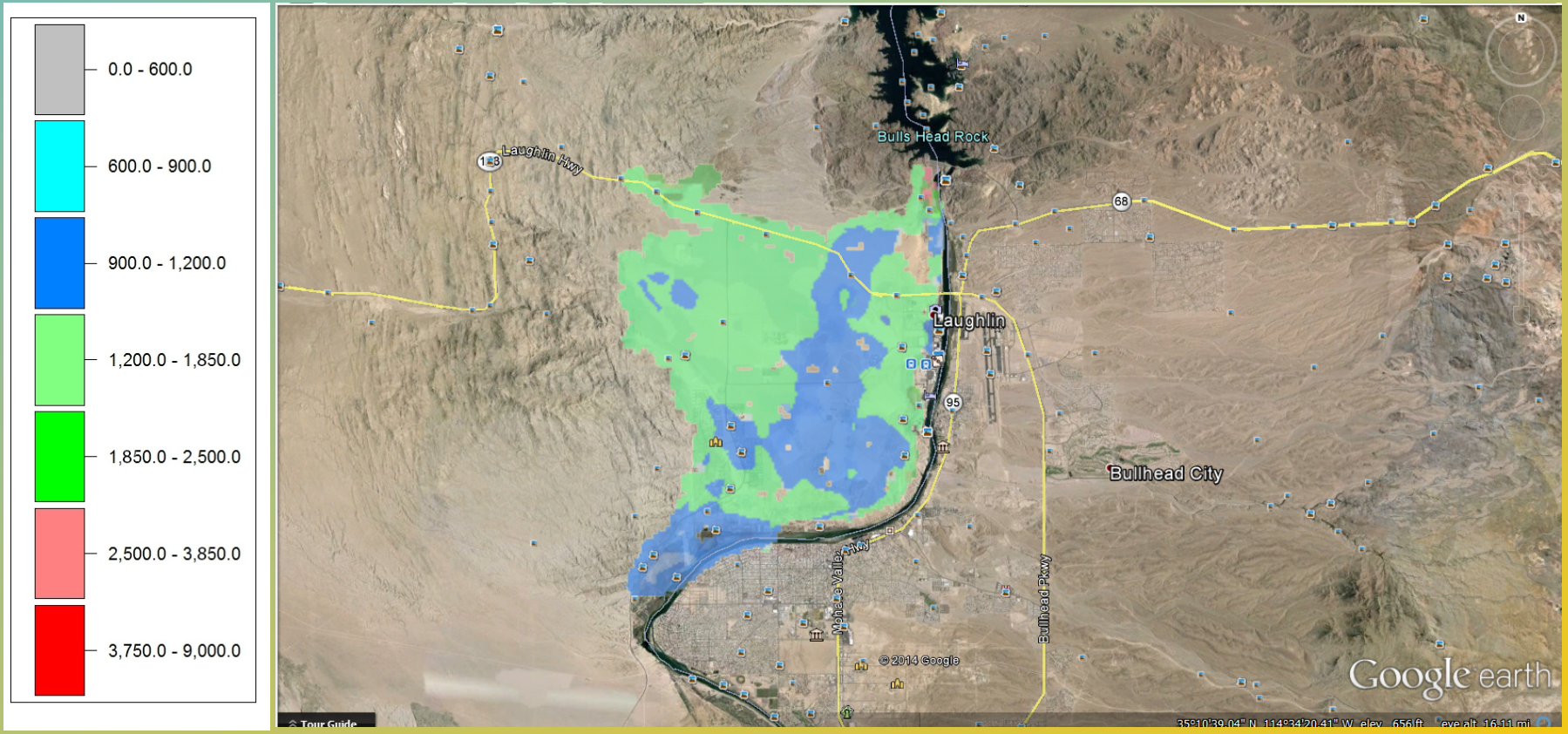
Las Vegas Wash 20 feet



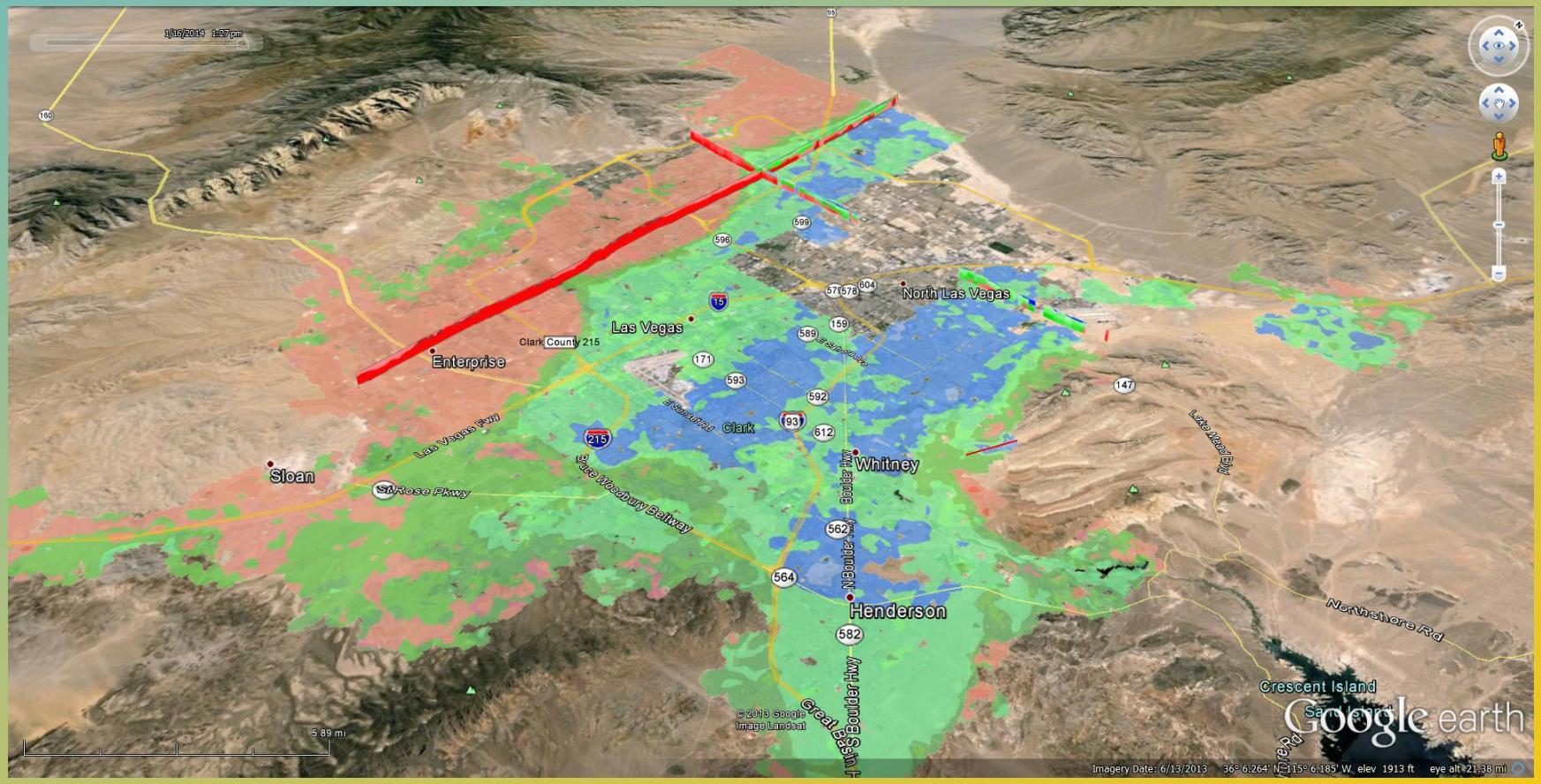
Las Vegas Wash 10 feet



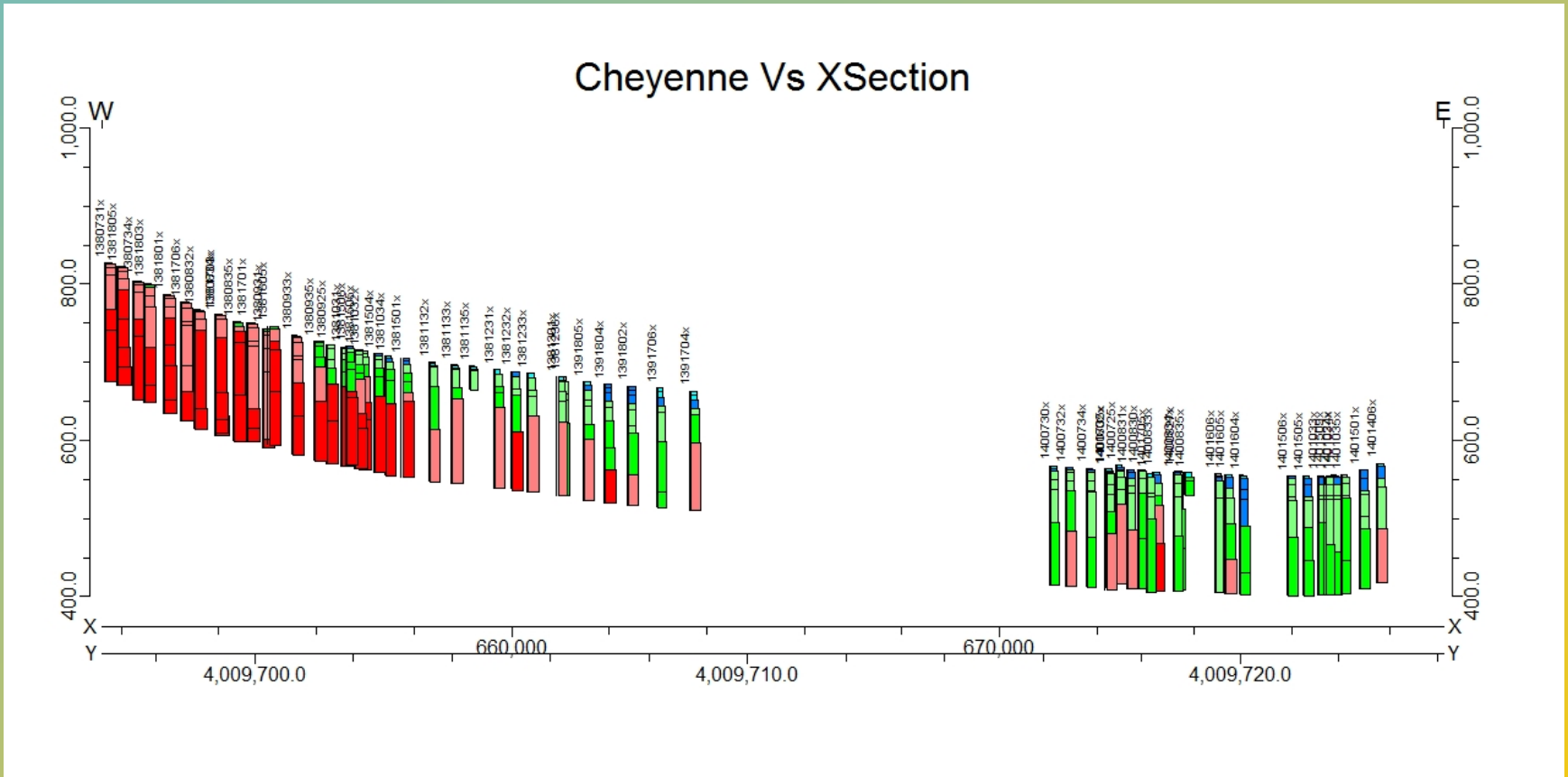
Laughlin Area



Cross Sections in GE



Cross Sections Plotted As 1D Models



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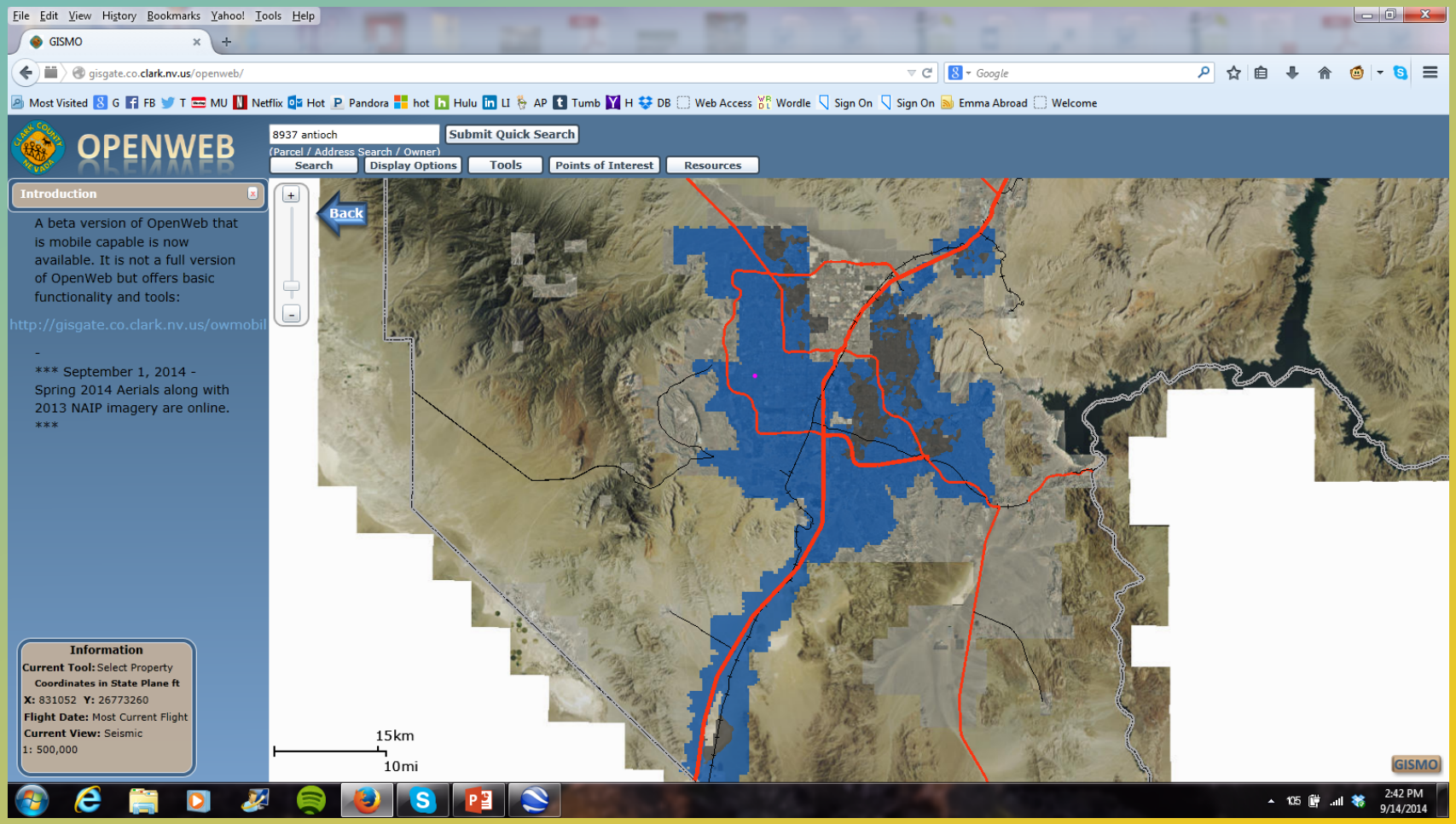
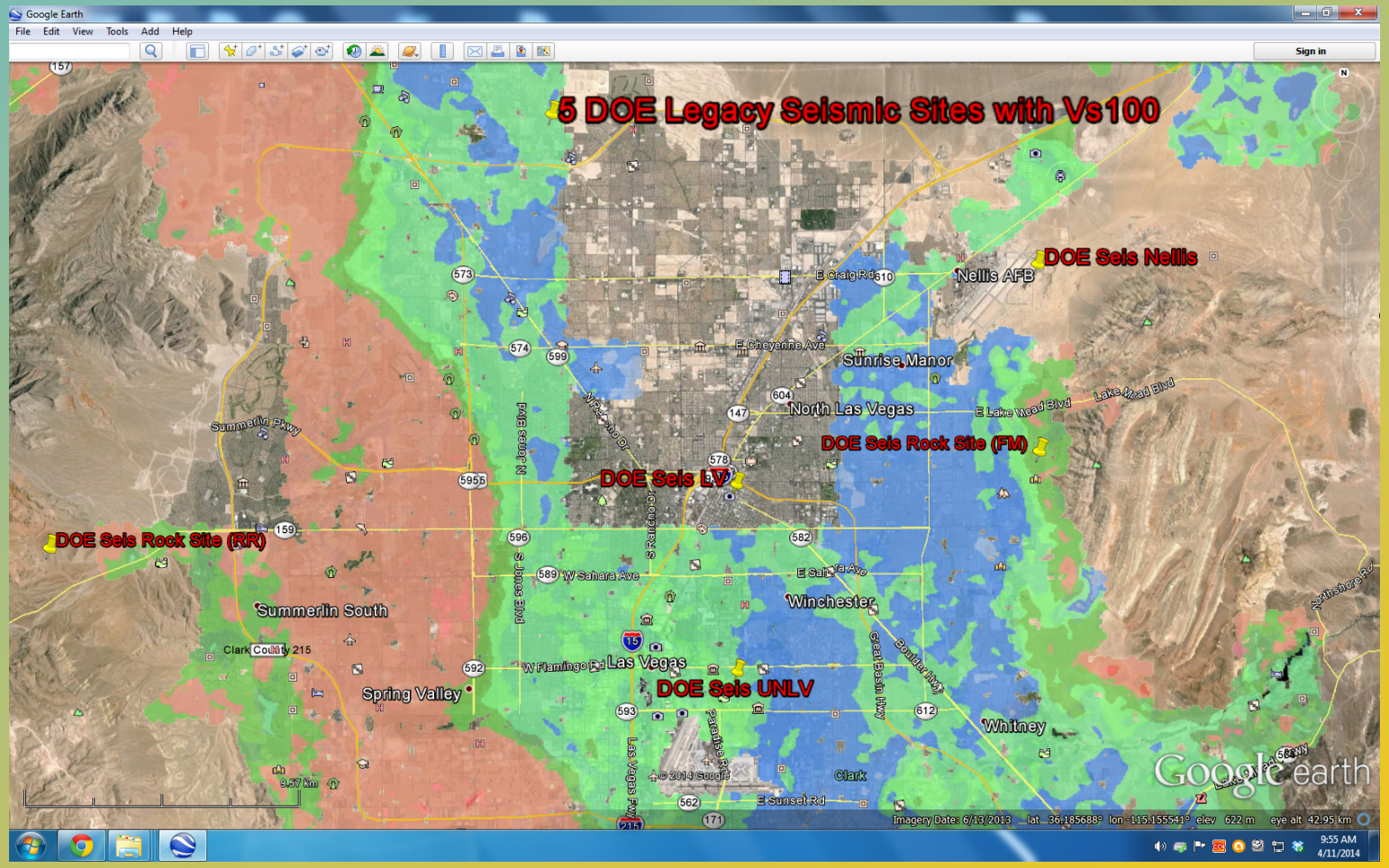


Legacy Data


5 DOE Legacy Seismic Sites with Vs100
DOE Seis Nellis
Nellis AFB
DOE Seis Rock Site (FM)
DOE Seis LV
DOE Seis Rock Site (RR)
DOE Seis UNLV
Sunrise Manor
North Las Vegas
Summerlin South
Spring Valley
Las Vegas
Winchester
Whitney
Clark
Google earth

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


WARNING
DO NOT ENTER
LANDSCAPE
Prescott Resort and Conference Center