

# WATER SURVEYS

14054 Sugar Loaf Road  
Grass Valley, CA 95949  
707/354-4618

[watersurveys@comcast.net](mailto:watersurveys@comcast.net)  
H2OSurveys.net

## VLF Survey Report

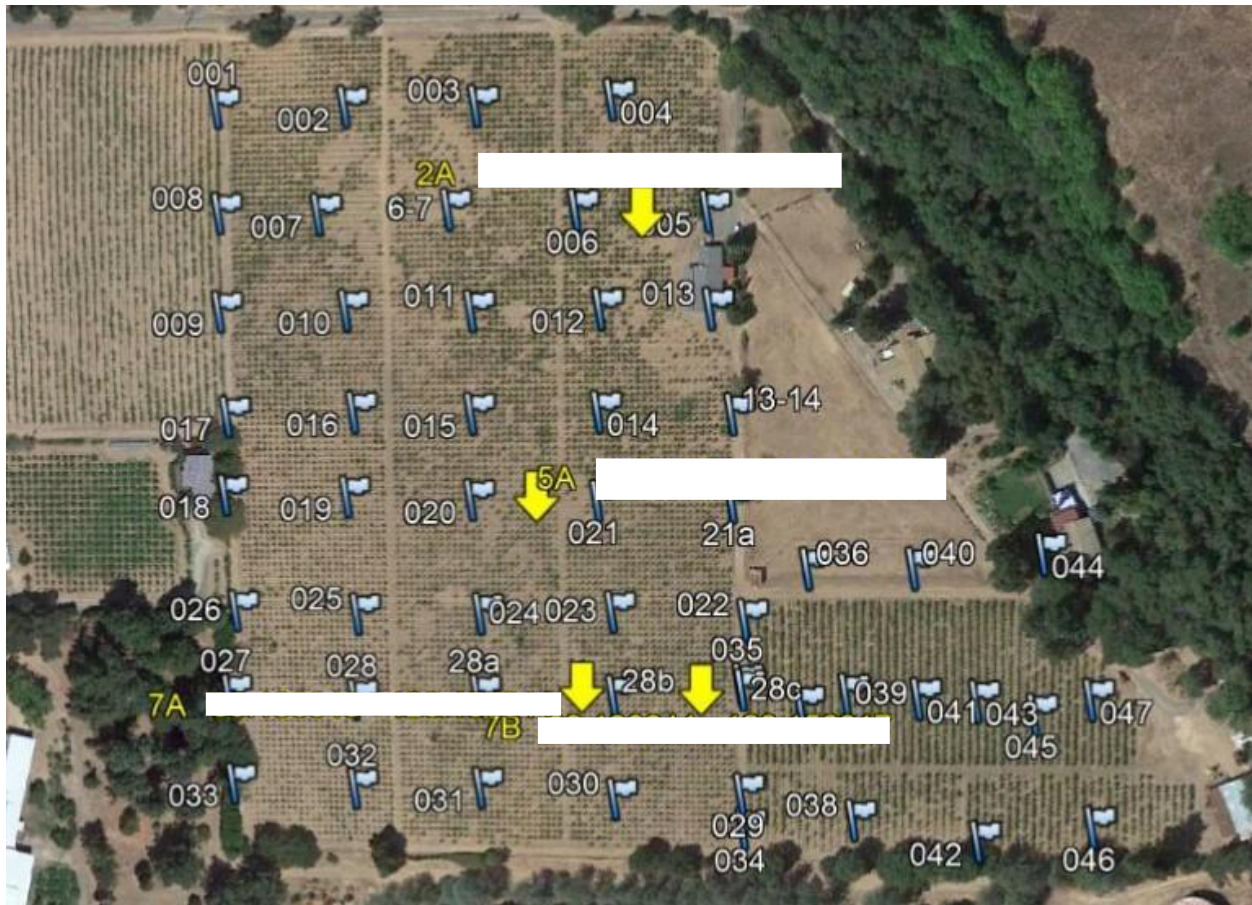
October 30, 2017

### SURVEY /METHOD

The exploration method Water Surveys used was the VLF (very low frequency - 15 to 30 kilohertz) method that can detect resistive zones at depths up to 100 meters. There are military VLF transmitters around the world operated to communicate with submarines. The VLF instrument measures the strength of a VLF signal, called the primary field, and compares it to the strength of a secondary field induced by the primary field in conductive bodies at depth. While holding the VLF instrument at a certain compass heading, the operator takes readings every 10 meters along a survey transect 100 to 1000 meters long. With this method geological structures beneath the surface can be discerned by their differences in resistivity. In areas of hard rock, only the fractures in the rock may yield enough water for a well. The contrast between the high resistivity of the hard rock and the low resistivity of the groundwater in a fracture allows the fracture to be detected. In sedimentary rock, the contrast will be between the high resistivity of dry clays and the low resistivity of saturated sand and gravel strata. Despite the good success rate of this method, Water Services cannot guarantee water will be found in the identified drill targets. Mineralized zones and long, linear metal conductors such as power lines and metal fences will mimic low resistivity zones and confuse the data inversion.

On October 14, 2017 we surveyed 15 transect lines on your property using the GSMV-19 state-of-the-art equipment manufactured by GEM Systems of Canada. The transects were done in a mature vineyard in which the plants are 8 feet apart. We took readings every fourth plant to get a uniform reading interval of 32 feet. For data presentation we made this 32 foot distance equivalent to 10 meters (32.8 feet). At the first reading location in a line and at 50 meter (160 feet) intervals thereafter, we recorded the reading location's GPS coordinates. We call these

GPS locations the station numbers of the transect line. The locations of the transects (shown by their station numbers), and locations of potential drill targets identified in this survey (shown by the colored arrows and GPS coordinates) are presented in the Google Earth image below

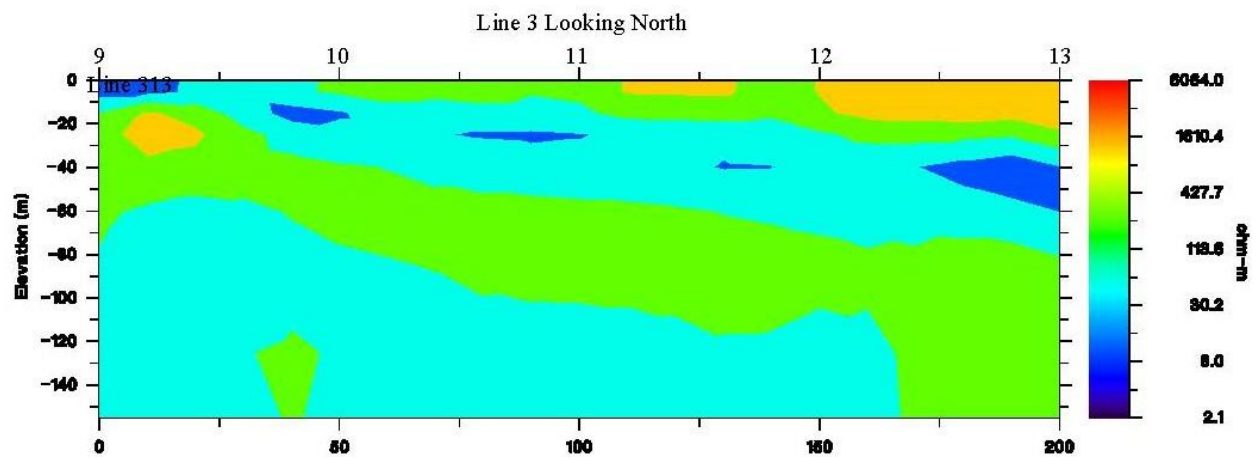
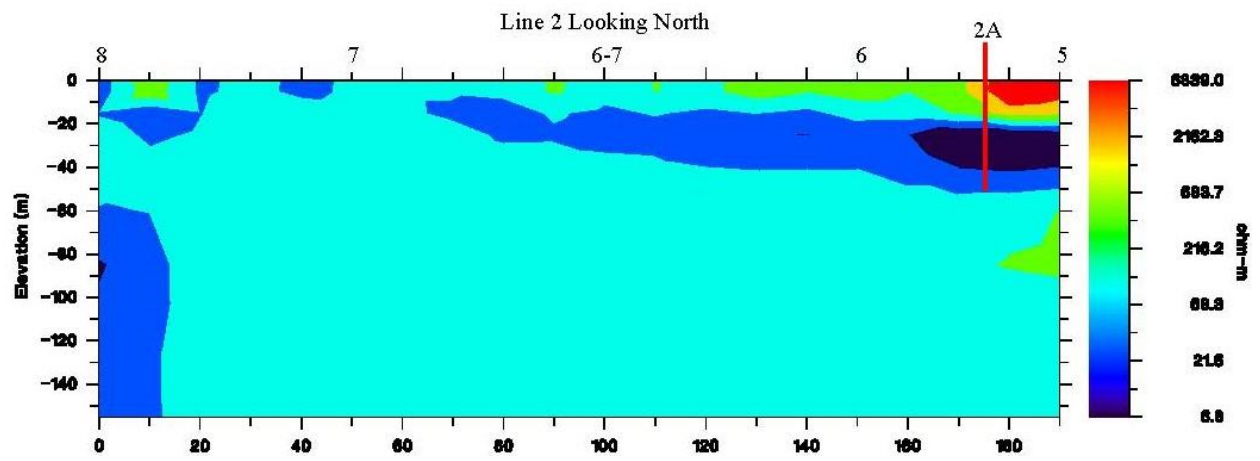
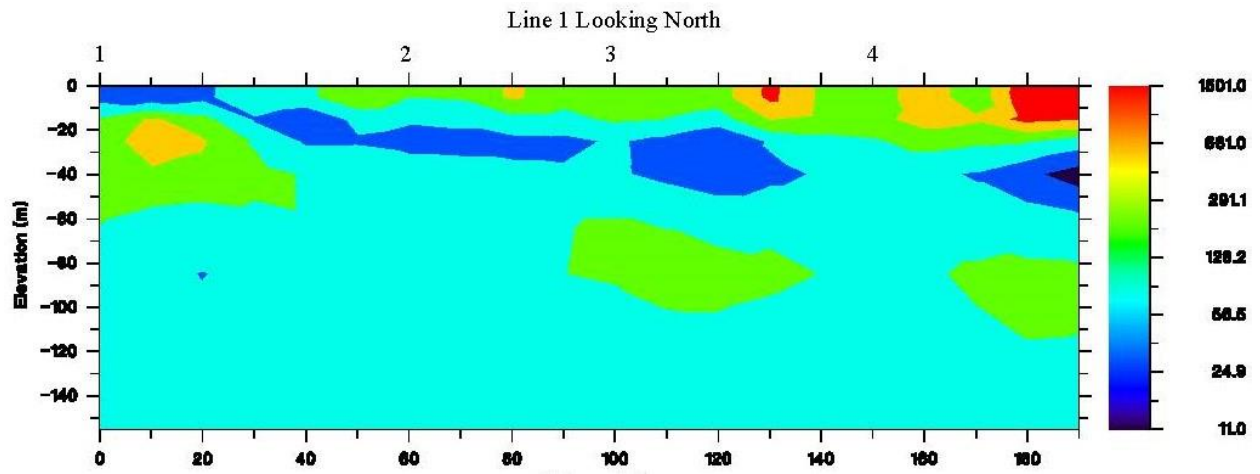


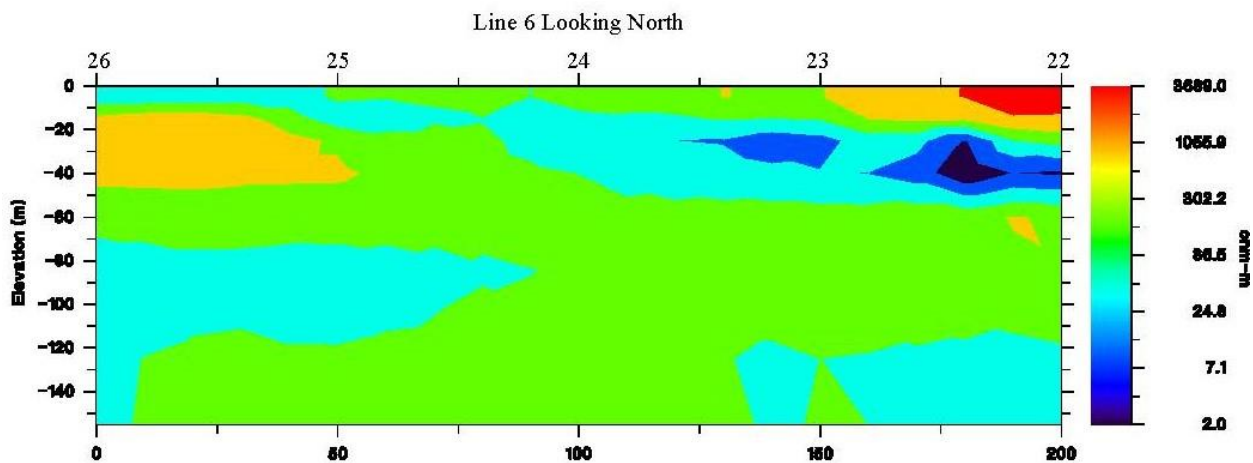
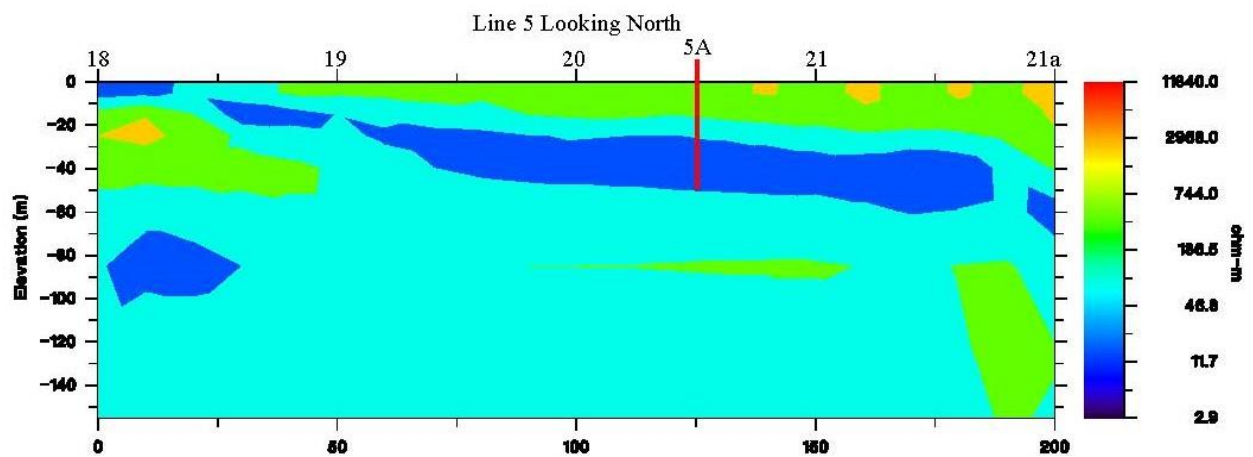
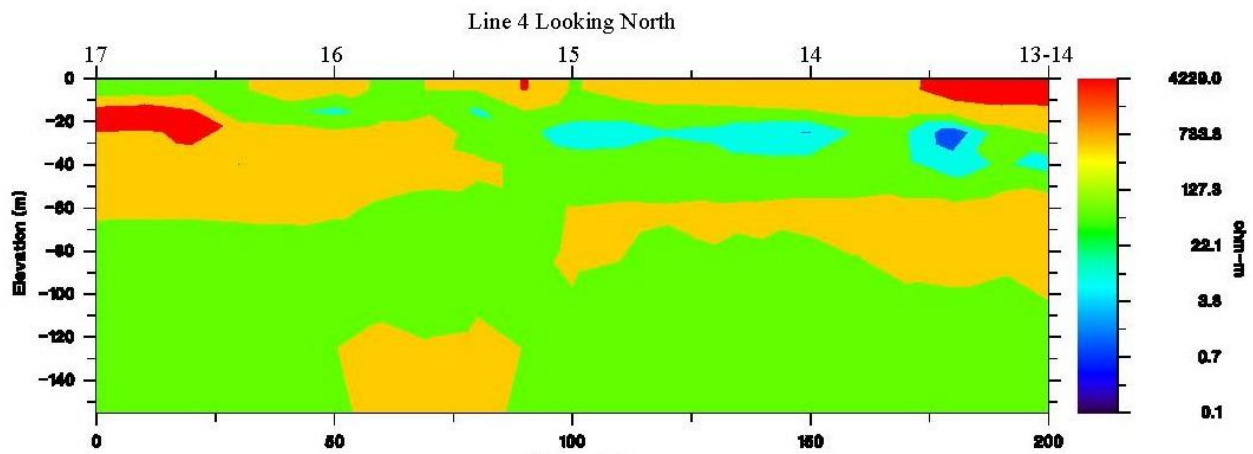
#### PROGRAM VLF2DMF

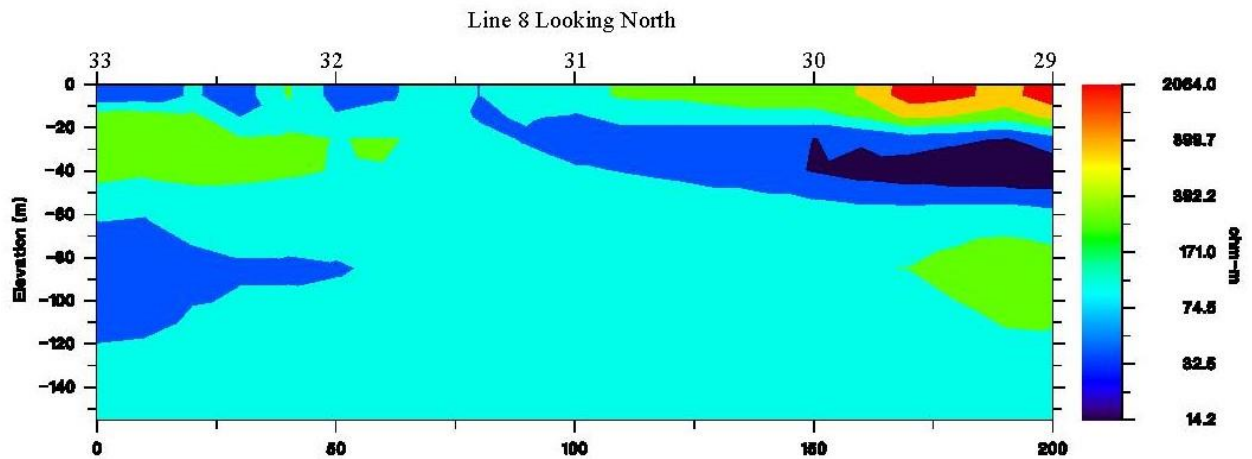
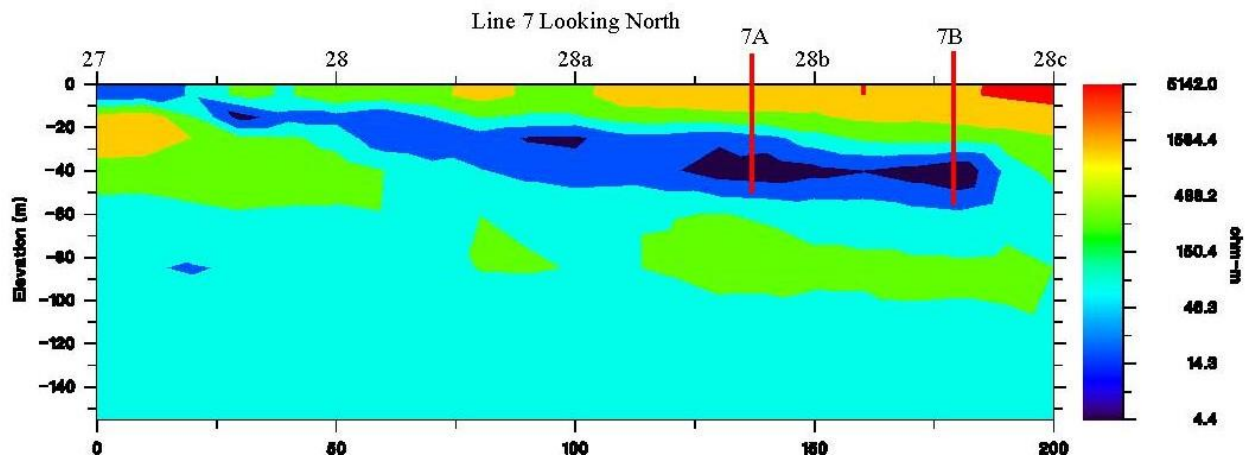
The VLF data were inverted using VLF2DMF, a commercial computer program based on the Occam technique (e.g. DeGroot and Constable 1990, Sasaki 1989, Sasaki 2001). VLF2DMF generates profiles of resistivity that deviate from an assumed background resistivity of 100 ohm-meters. The resistivity variations are presented in color gradation.

#### PROFILES OF RESISTIVITY AND DRILL TARGETS

Profiles of resistivity generated by VLF2DMF for transect lines 1 through 8 are shown below. Lines 2, 5, and 7 are also annotated with potential drill targets. The drill targets were selected based on their low resistivity and areal extent as seen in the profiles. They are named after the line they are in and their order of occurrence (A, B, etc.) going left to right in the presented profile. No useful data was obtained from transect lines 9 through 15 (stations 34 through 47) due to the interference of the metal fence located immediately south of these lines.

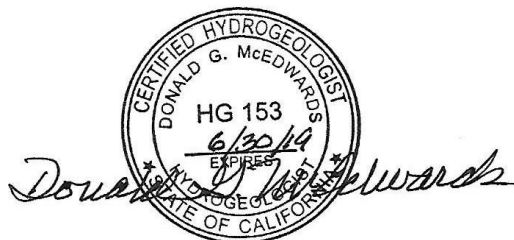






We appreciate the opportunity to be of service. If you have any questions, please call.

Very Truly Yours,  
WATER SURVEYS



Dr. Donald G. McEdwards, Certified Hydrogeologist No. 153