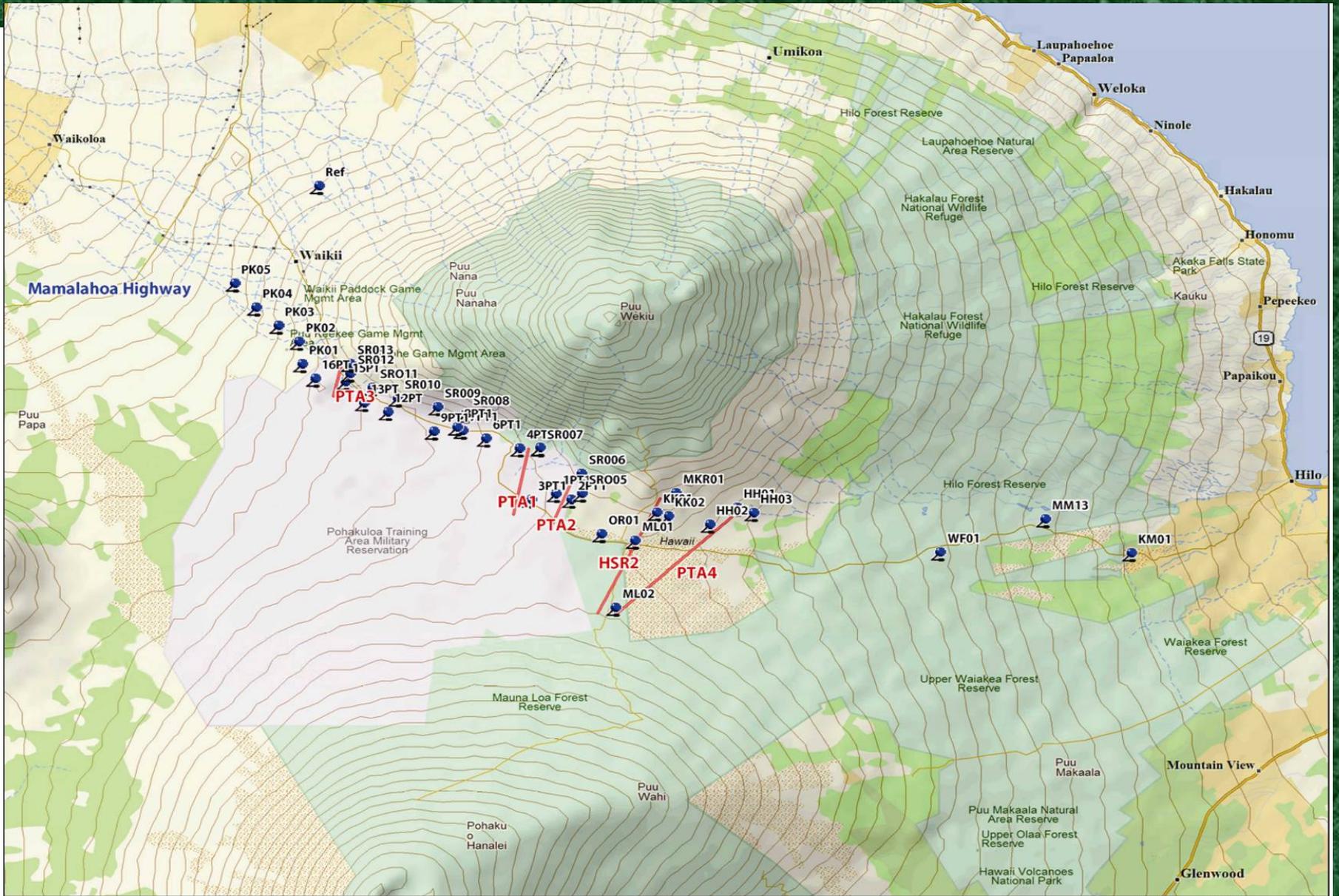


# The Humu'ula Groundwater Hydrology Investigation

- ❖ Summary of Drilling
- ❖ Well Testing Results
- ❖ Next Steps

Donald Thomas  
Center for the Study of Active Volcanoes  
University of Hawaii



Scale 1 : 325,000



Based on the positive indications of high level water, decision was made to proceed with a test well

Objectives of the drilling effort were:

- ❖ Determine depth to groundwater within mid-Saddle region
- ❖ Determine water quality
- ❖ Develop a better understanding of regional hydrology

# Drilling Program

- ❖ Small diameter hole
- ❖ Continuous coring to recover rock properties
- ❖ Determine depth to water
- ❖ Collect fluid samples
- ❖ Drilling was initiated in March, 2013 at an elevation of 6375' (1943 m) and was completed at ~5786' (1763 m) depth in late June

TOP

TOP

bottom

bottom

R164  
3.0

R164  
7.0

R164  
8.0

R164  
5.0

R164  
6.0

R164  
4.0

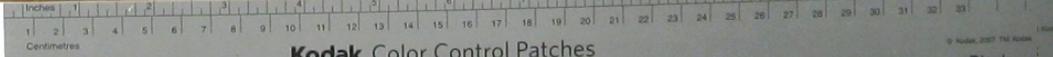
BOX  
261  
+  
262

GSA



IN  
CM

Grain Size Scale  
1 2 3 4 5  
mm



Kodak Color Control Patches





BOX  
918



End Points  
7746.0

R505  
2.0

R510  
3.0

R505  
1.0

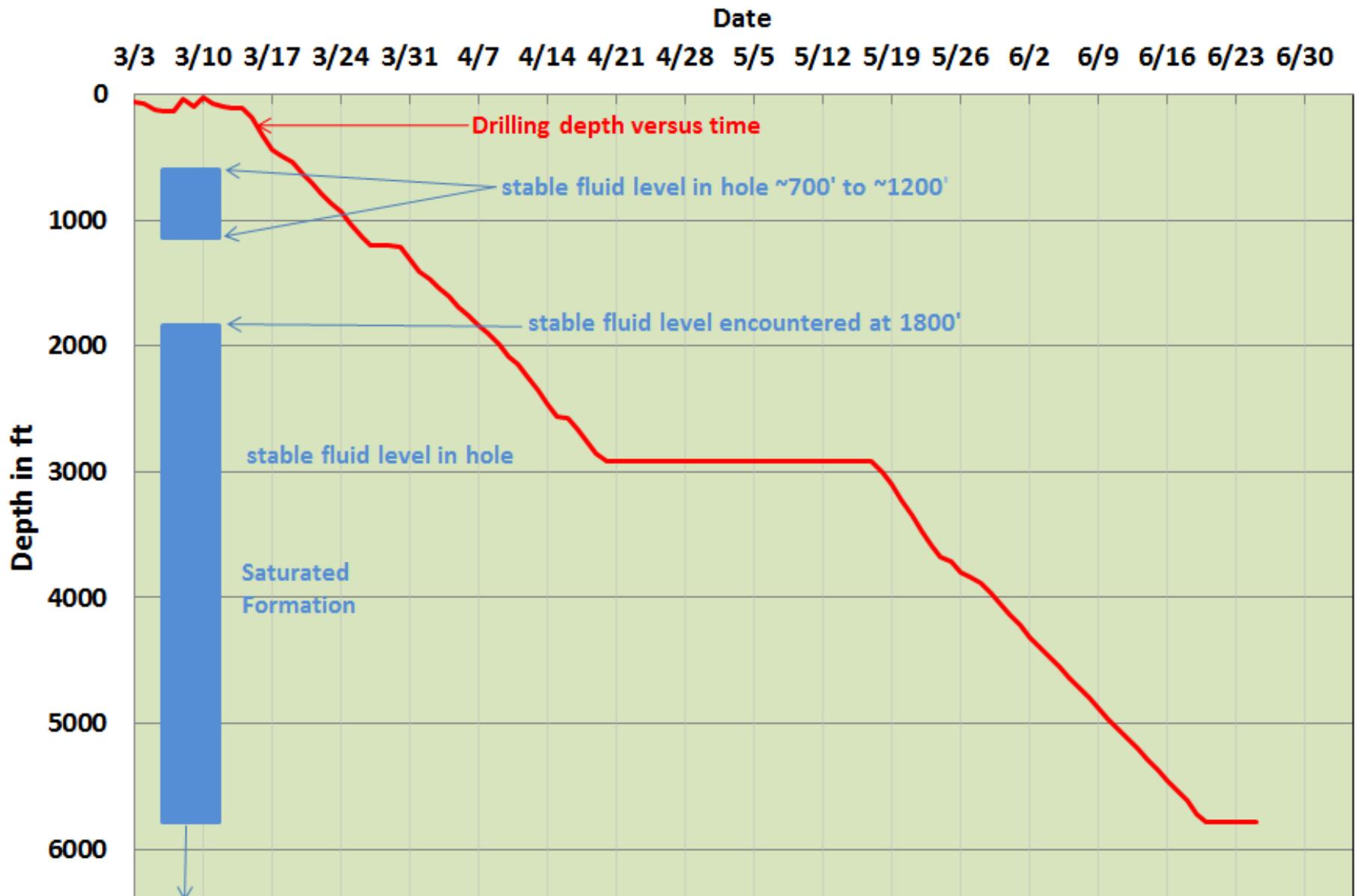
R505  
8.0

R505  
5.0

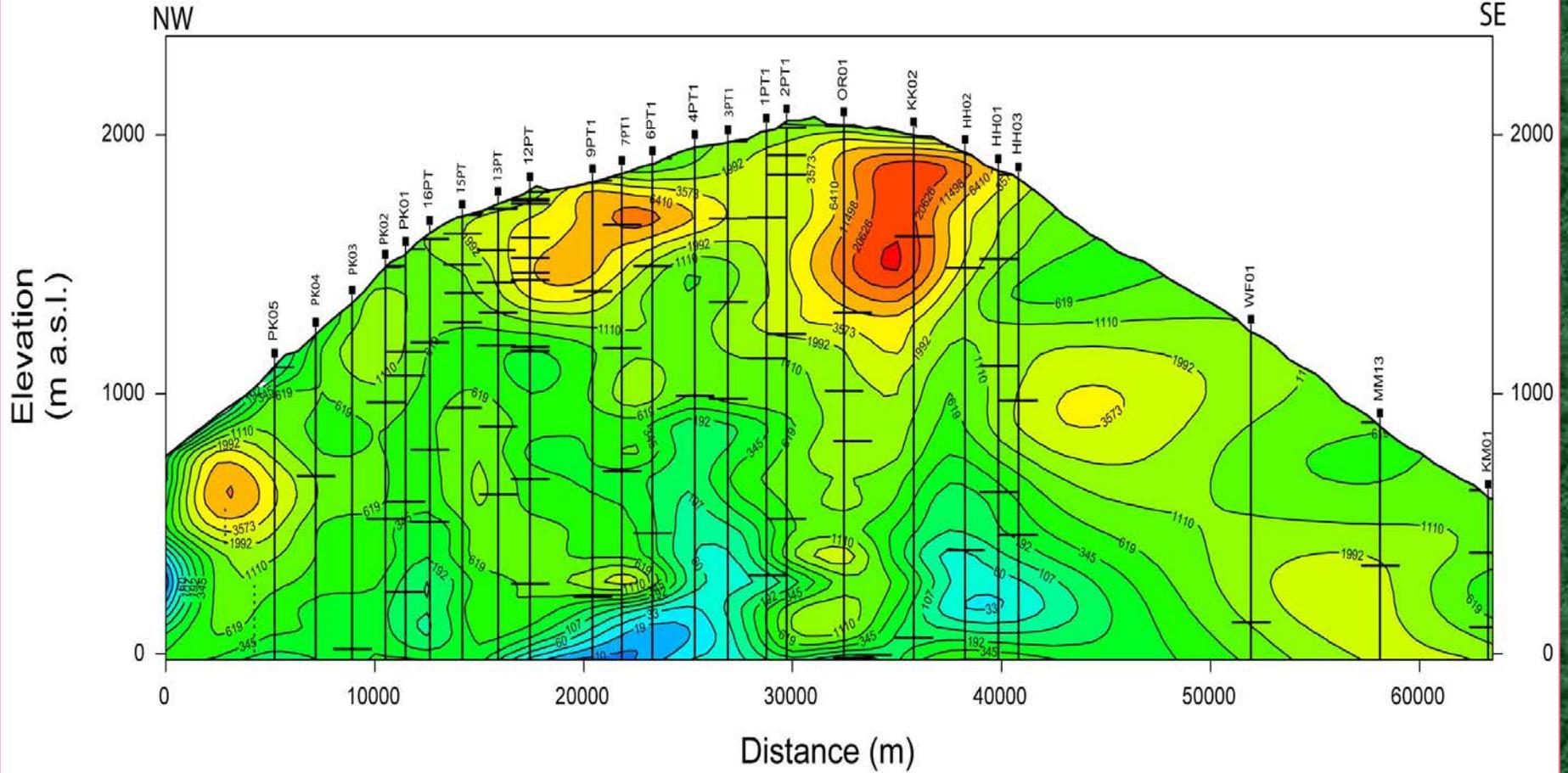
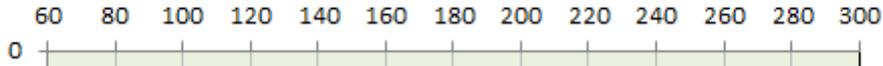
BOTTOM

TOP

# Depth versus Time



Temperature  $^{\circ}$ F



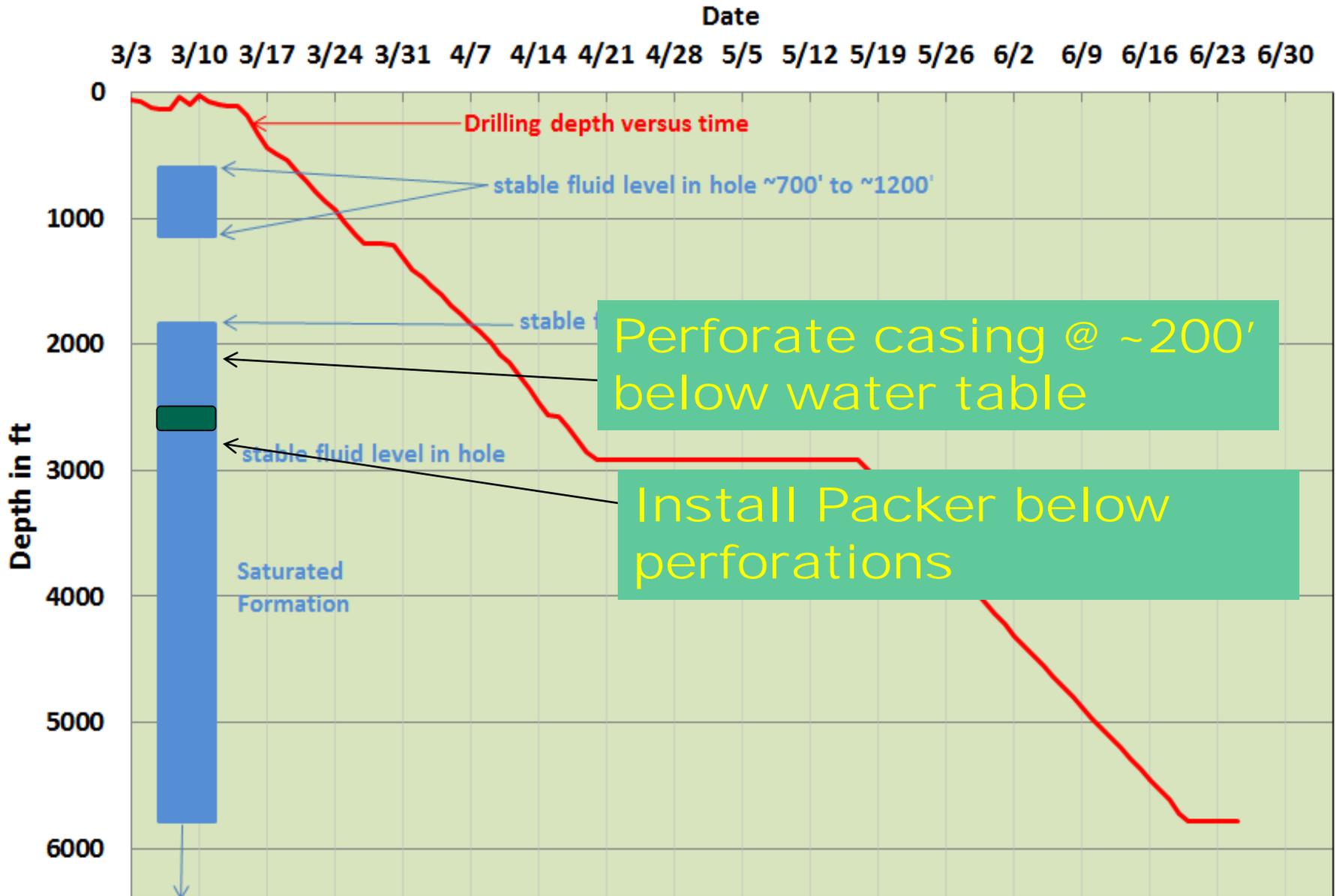
6000



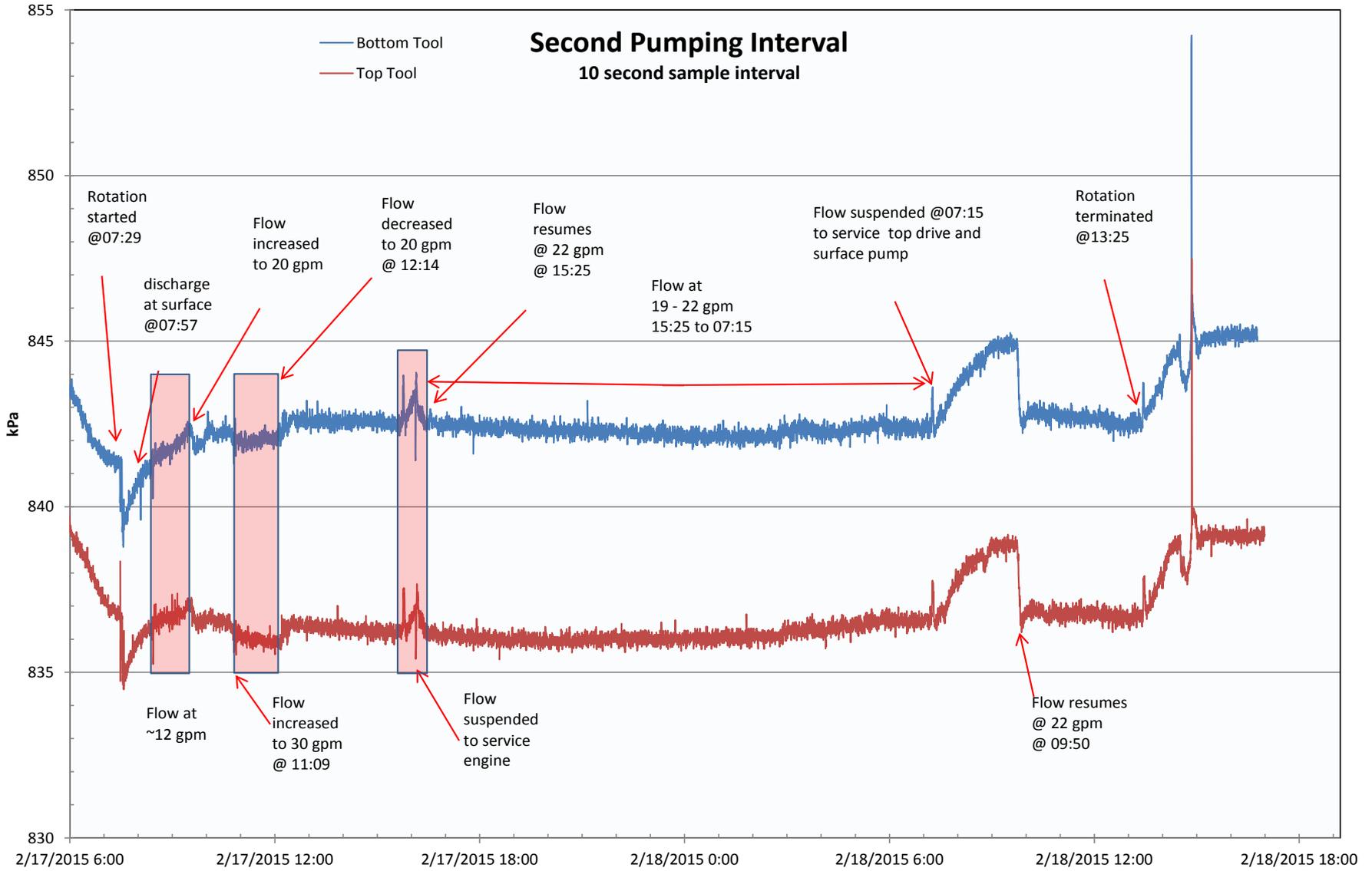
40 $^{\circ}$ C



# Depth versus Time



## Second Pumping Interval 10 second sample interval



# Chemical Analysis Results

	Sodium	Potassium	Calcium	Magnesium	Chloride	Sulfate	SiO <sub>2</sub>
#1	70.3	10.3	3.8	2.31	43.7	28.6	104.4
#2	70.5	9.92	3.35	2.14	46.9	28.9	101.5
HNL	60.1	2.63	12.9	12.9	94.1	16.5	~30 - 50
Waimea	10.9		8.8	6.8	6.5		

pH of the water is unusual ~8.4

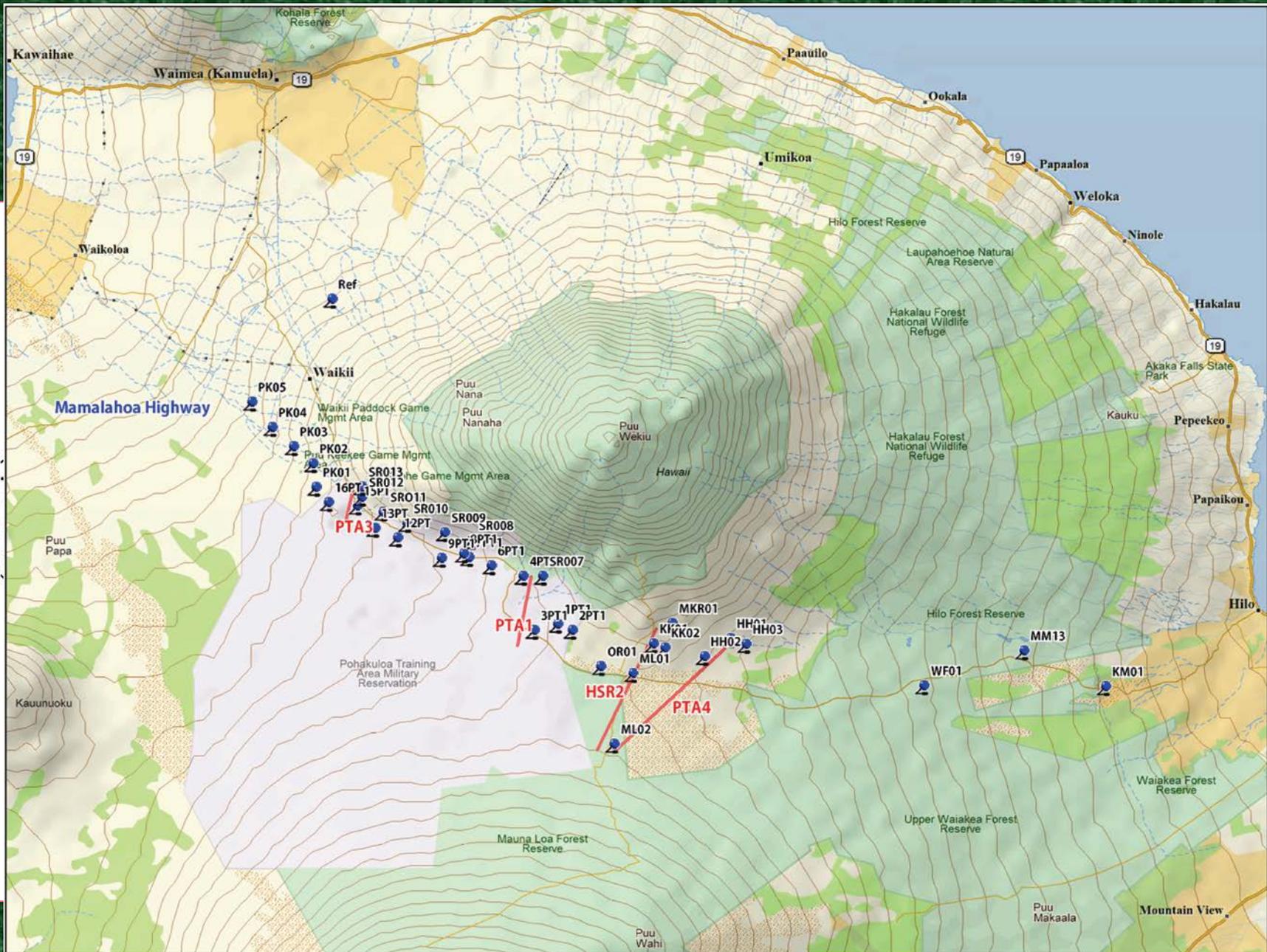
No "hits" on SDW contaminant screen

Age of the water was greater than we were expecting – averaging ~ 9500 years

# Summary Findings

- The resource at 700' appears to be substantial but not as large as the 1800' aquifer
- The water quality is expected to be very good as it is not affected by underlying geothermal activity
- The age of the water is likely to be considerably younger
- We will need to conduct a second pump test to verify production characteristics

Elevation



2000

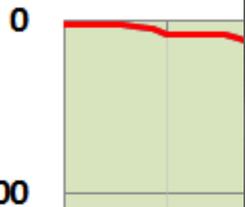
1000

0

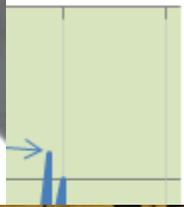
Scale 1 : 325,000



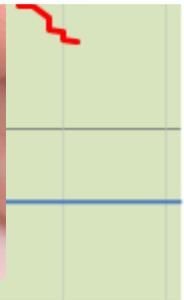
4/10 4/17 4/24



7/17 7/24



5000



# Preliminary Findings

- Sequence of perched and/or confined aquifers beginning at 1000' BGS
- Confined aquifers present progressively higher hydrostatic heads
- Confining formations are mostly soil and ash intervals
- May have just missed the western edge of Saddle dike impounded aquifer – fewer dikes deeper & lower T

# Next Steps

- Conduct water sampling to determine isotopic and chem compositions
- Conduct geophysical logging in the test holes
- Analysis of the stratigraphic "structure" of the core from 2<sup>nd</sup> hole to get a better understanding of their source and extent
- Determine ages of the water

<http://www.higp.hawaii.edu/hggrc/projects/>



**Hawai'i Groundwater & Geothermal Resources Center**

University of Hawai'i at Mānoa

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## Humu'ula Groundwater Research Project Progress Updates

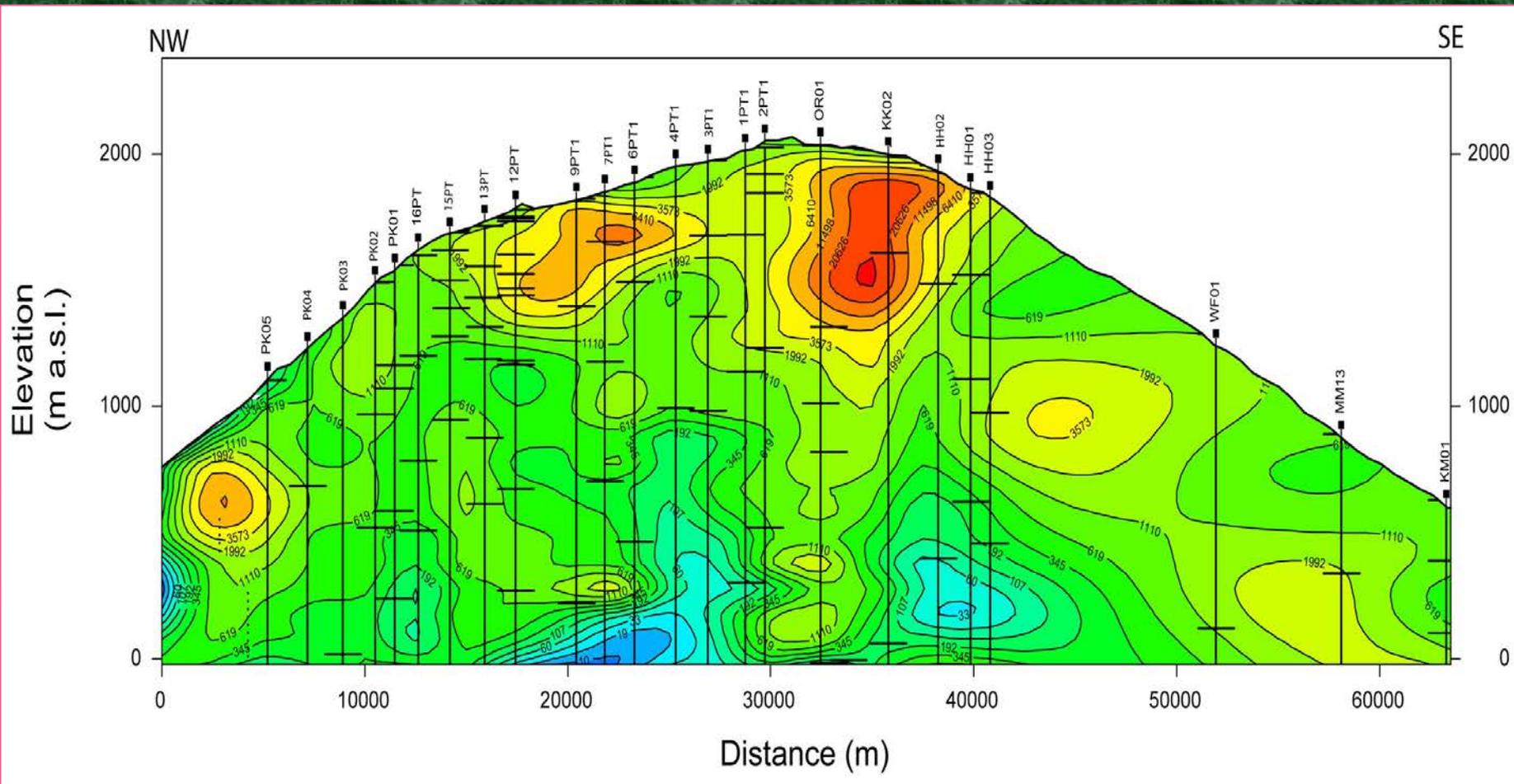
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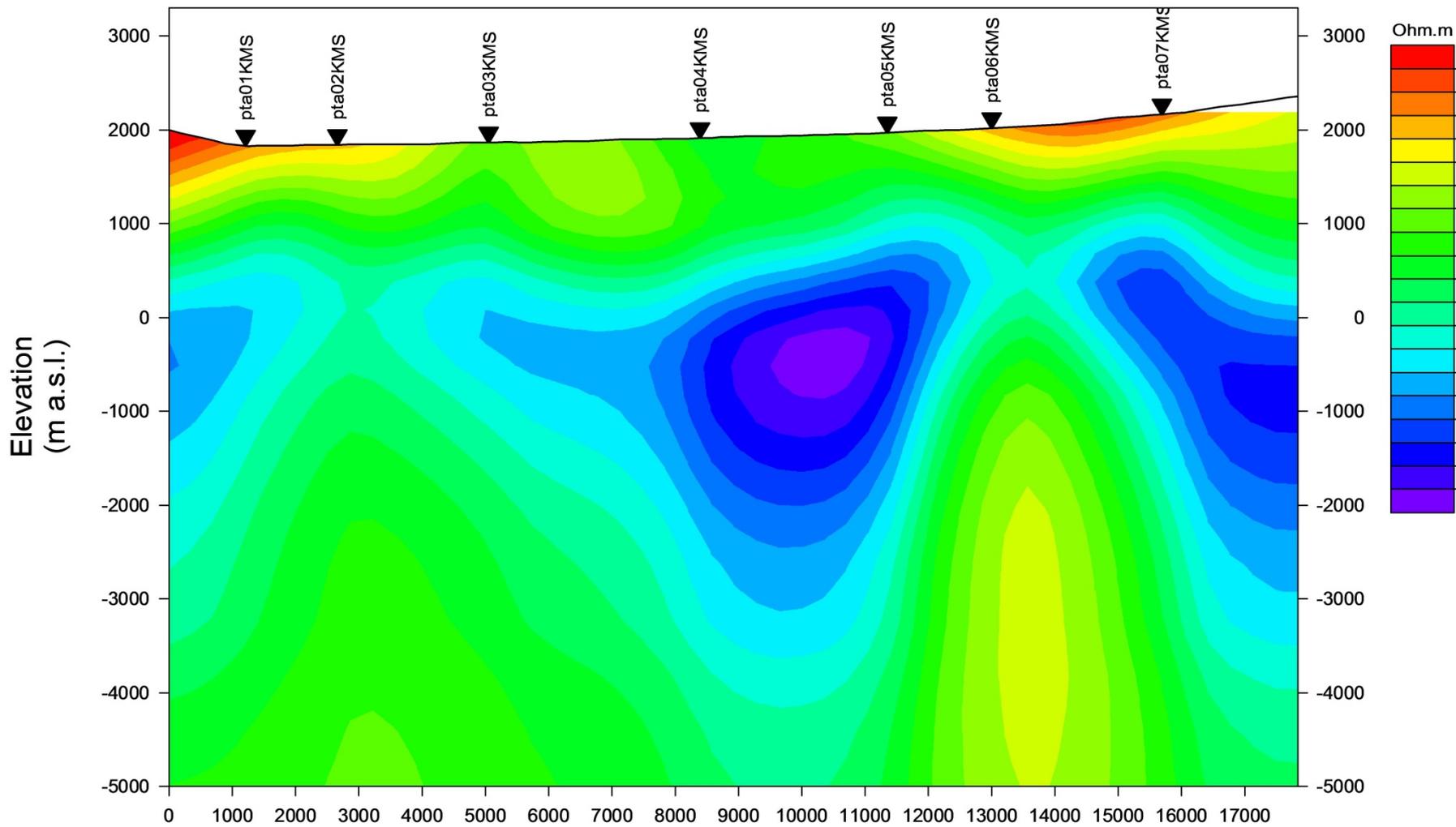


Pau

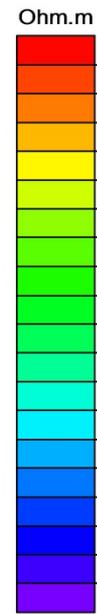
# Recommendation

- Conduct testing of 700' aquifer
- Based on production characteristics and chemistry proceed to production well at 1000' or 2000' adjacent to PTA-1
- Complete PTA-1 as a monitoring well for the aquifer developed





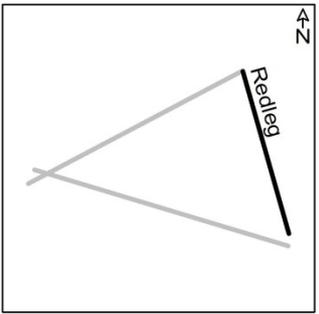
Elevation  
(m a.s.l.)



0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000

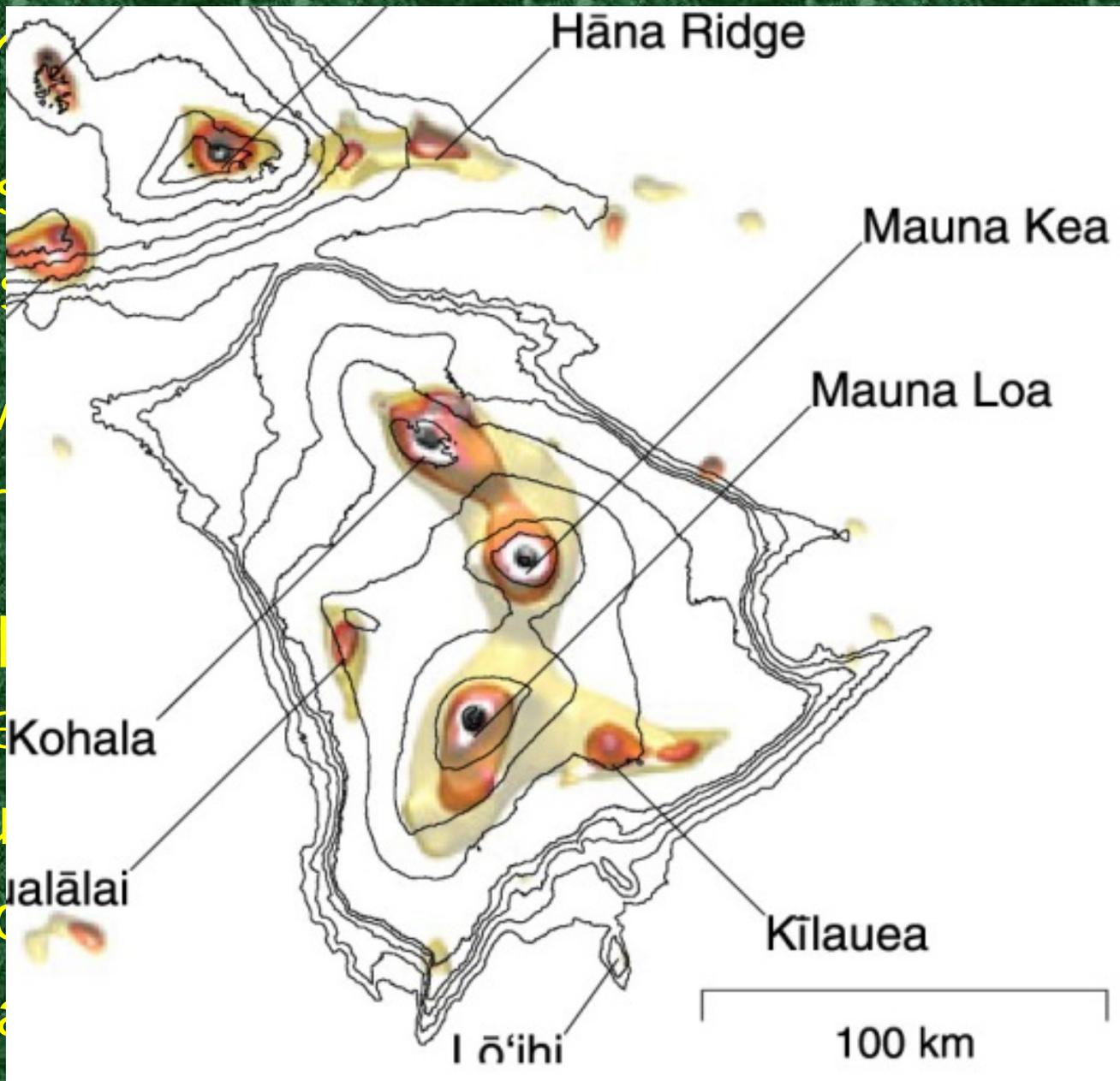
Distance (m)

▼ MT Sounding



<b>Hawaii</b>
PTA_2014
Redleg

Im  
Subs  
are s  
New  
sour  
Geop  
unde  
grou  
regio  
Koha



gs  
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e  
e