Geothermal Exploration in Long Valley Caldera
Geothermal System Requirements

Heat Source

Fluid

Hot Rock

Permeability

Hot Water

Rainwater
EXPLANATION

Recent Inyo Craters Eruptives

Gradient Holes / Shallow Core Holes

Deep Exploration Wells

Shallow and deep wells drilled within Long Valley caldera.
Shallow and deep wells penetrating Bishop Tuff (orange) or bottoming in caldera rocks of the caldera floor (red) within Long Valley caldera.

**EXPLANATION**
- Recent Inyo Craters Eruptives
- Wells Completed in Bishop Tuff
- Wells Completed in Caldera floor
Shallow and deep wells penetrating Bishop Tuff (orange) or bottoming in caldera rocks of the caldera floor (red) within Long Valley caldera. Probable distribution of Paleozoic landslide block in blue.
Structural cross-section of southern caldera showing the landslide block encountered in exploration corehole 38-32 and the Mammoth-1 deep test well at Casa Diablo. (after R.A. Bailey 1992)
Lithology of southern caldera wells.

Explanation:
- **Qtill**: Glacial till (Casa Diablo?)
- **Qab**: Moat Basalt
- **Qer**: Early Rhyolite
- **Qbt**: Bishop Tuff
- **Pz ms**: Metasedimentary Landslide Block

(Lithologic units after Bailey, 1989)
Lessons learned:

• Context
  o Extreme variability
  o Limited resource models
• Goals (what are you testing?)
  o Anomalies
  o Geologic concepts
• Context dictates methodology
• Target
  o Upflow
  o Permeability control(s)
• Phased exploration
  o Geology
  o Geochemistry
  o Geophysics
  o Geothermics
    • Shallow/Intermediate/Deep
After Farrar et al, 2003
After Sorey et al, 1991
Long Valley wells penetrating Bishop Tuff (orange) or the caldera floor (red).
Mammoth-1 Temperature Gradient Data:

Temperature (°F)

Depth (ft)

Stratigraphic units after Bailey, 1989

Drilled: 7/1979
Surface elev.: 7304 ft
TD: 5265 ft
EID: 5200 ft
Max T: 315°F @ 400 ft
BHT: 216 °F
Status: Suspended Injector

TD: 5265 ft
LVEW Temperature Gradient Data

Temperature (F)

Depth (ft)

Drilled: 1998
Surface elev.: 7805 ft
TD: 9825 ft
EID: 9150 ft
Max T: 216.92°F @ 7820 ft
BHT: 213.51°F
Status: Monitoring

Stratigraphic units after Bailey, 1989

TD- 9825 ft
EXPLANATION

Recent Inyo Craters Eruptives

STRUCTURAL CALDERA MARGIN
(AFTER HILDERETH, 2004; SUENNICHT, 2002; BAILEY, 1989)
Quartz-Hosted Fluid Inclusions

Boiling Point Depth Curve

Temperatures from Clay Minerals

Boiling Point post Bishop Tuff

BC 12-31 Temperature Survey

BC 12-31 Fluid Inclusion Data
Lithology of southern caldera wells.

- **Shady Rest (RDO-8)**
  - **Qtil**
  - **Qer**
  - **Qbt?**
  - **TD-488m**
- **57-25**
  - **Qab**
  - **Qer**
  - **Qbt**
  - **TD-496m**
- **66-25**
  - **Qtil**
  - **Qab**
  - **Qer**
  - **TD-496m**
- **BC 12-31**
  - **Qtil**
  - **Qab**
  - **Qer**
  - **TD-610m**
- **CD 66-31**
  - **Qtil**
  - **Qab**
  - **Qer**
  - **TD-353m**
- **Mammoth -1**
  - **Qer**
  - **TD-732m**
  - **2000m**

**Explanation**:
- **Qtil**: Glacial till (Casa Diablo?)
- **Qab**: Moat Basalt
- **Qer**: Early Rhyolite
- **Qbt**: Bishop Tuff
- **Pz ms**: Metasedimentary Landslide Block

(Lithologic units after Bailey, 1989)
Long Valley Caldera
South Moat Wells

Temperature (°C)

Elevation (m above mean sea level)

Shady Rest-1

57-25

Mammoth-1

BC 12-31