

Geothermal Heat Exchange Well Standards Update

March 21, 2012

Department of Water Resources

History of Standards

- 1949 First directive to investigate and report
- 1967 Procedures for implementation
- 1968 Bulletin 74, Water Well Standards
- 1974 Bulletin 74-1, Cathodic Protection Well Standards
- 1981 Bulletin 74-81, Water Well Standards Update
- 1986 Implementation; Monitoring wells added
- 1991 Bulletin 74-90, Supplement
- 1996 GHEW added
- 1999 Draft GHEW Standards, April 1999
- 2010 CCDEH WWTAC Standards Subcommittee

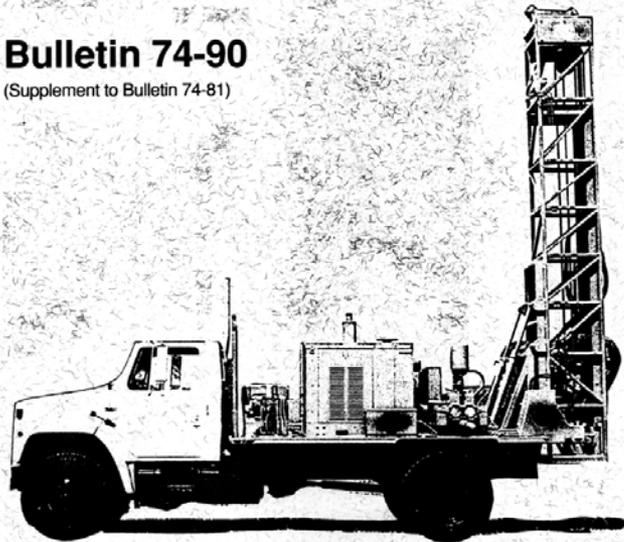
California Well Standards Documents

California Well Standards

Water wells • Monitoring wells • Cathodic protection wells

Bulletin 74-90

(Supplement to Bulletin 74-81)



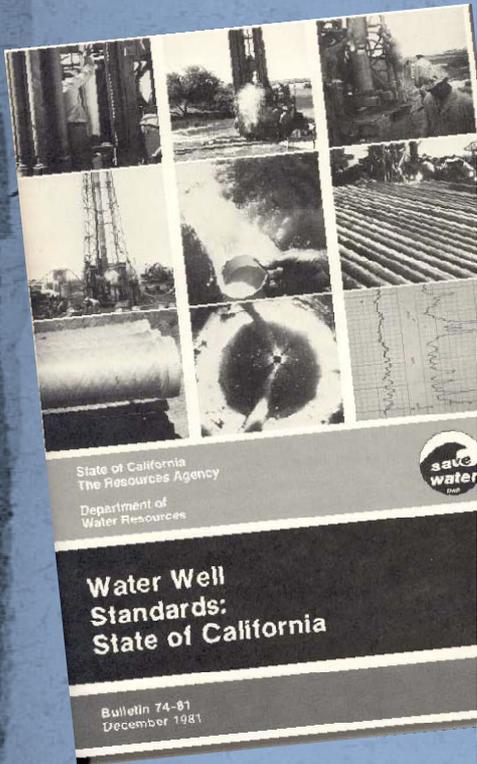
California
Department
of Water Resources
June 1991

GEOTHERMAL HEAT EXCHANGE WELLS

WELL STANDARDS

DRAFT

April 1999



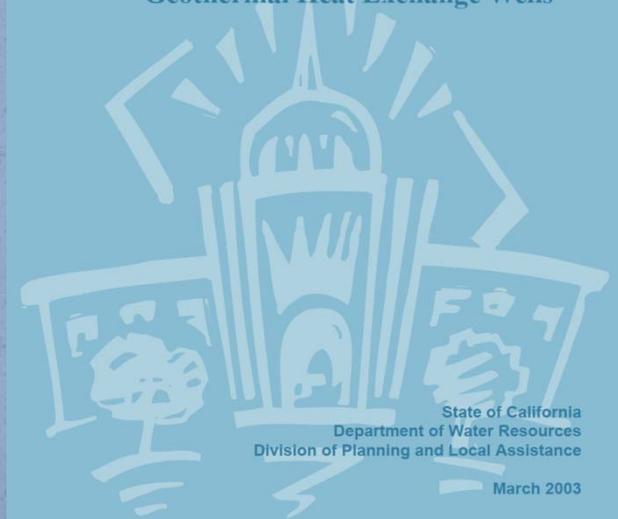
Statutory Responsibilities

Water Code §231 and 13800 et seq:

- DWR develops Standards
- DWR recommends to SWRCB
- SWRCB adopts Model Well Ordinance
- Cities, counties or water agencies adopt Local Well Ordinances
- Local Enforcing Agencies administer and enforce

California Laws *for*

Water Wells
Monitoring Wells
Cathodic Protection Wells
Geothermal Heat Exchange Wells



Why Groundwater is Important

- Provides 25 - 40% of water supply during a normal year; more in a drought
- ~43% of Californians rely on GW as a drinking source
- Widely available
- In many areas there is no alternative
- Generally good quality, requires little treatment
- Limited resource

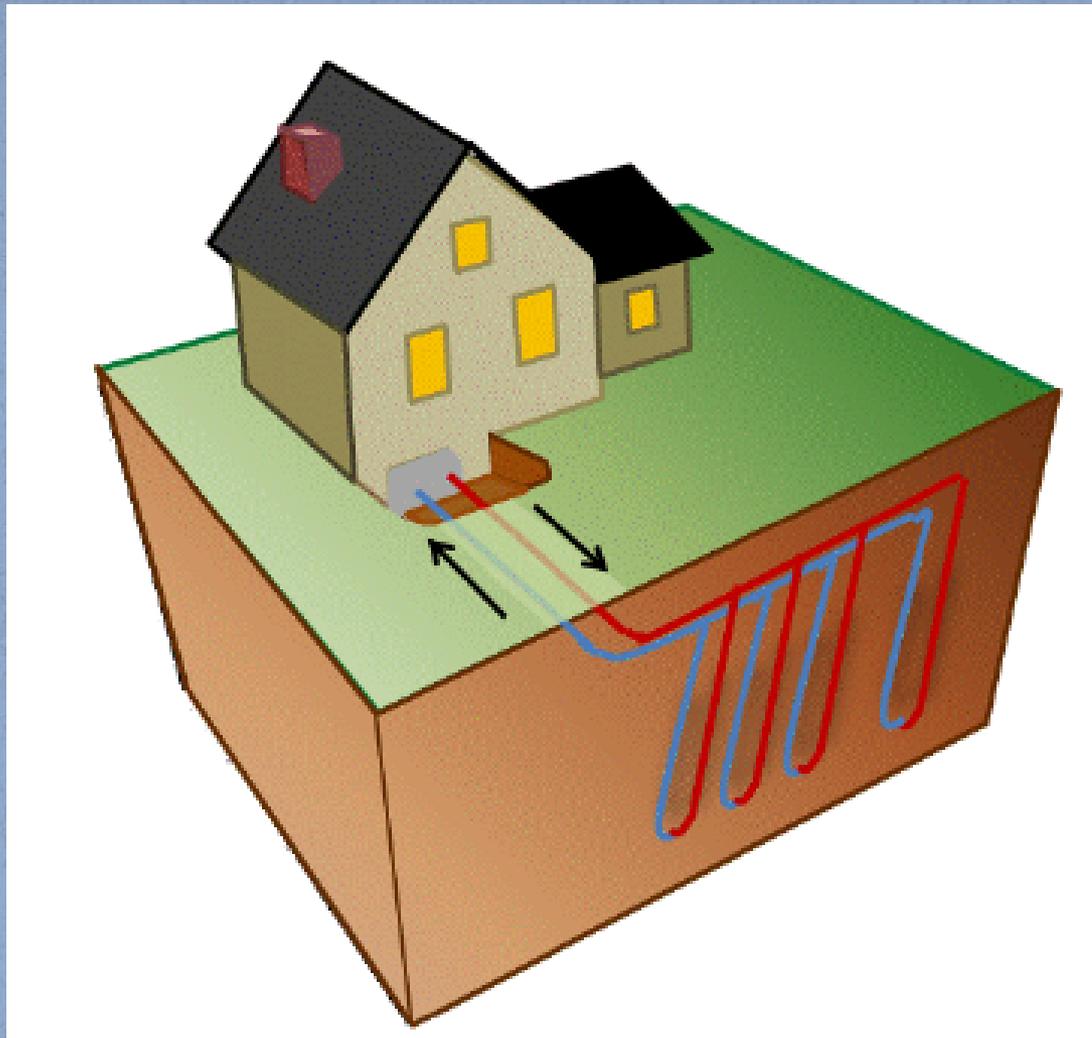
Standards Protect Groundwater

- Every boring is a potential conduit for contamination
- Remediation is expensive and can take a long time (100s – 1000s of years)
- Standards are written to prevent wells from becoming conduits for contamination
- Standards are a minimum for construction and destruction of wells to protect groundwater quality

Project Scope

1. Develop minimum standards for construction, maintenance, abandonment and destruction to protect groundwater quality
2. Water Code definition:
“ ‘Geothermal heat exchange well,’ as used in this chapter, means any uncased artificial excavation, by any method, that uses the heat exchange capacity of the earth for heating and cooling, in which excavation the ambient ground temperature is 30 degrees Celsius (86 degrees Fahrenheit) or less, and which excavation uses a closed loop fluid system to prevent the discharge or escape of its fluid into surrounding aquifers or other geologic formations. Geothermal heat exchange wells include ground source heat pump wells.”
3. Open loop systems meet the definition of "water well," and Water Well Standards apply

Closed Loop Systems



Source: Ohio Water Resources Council

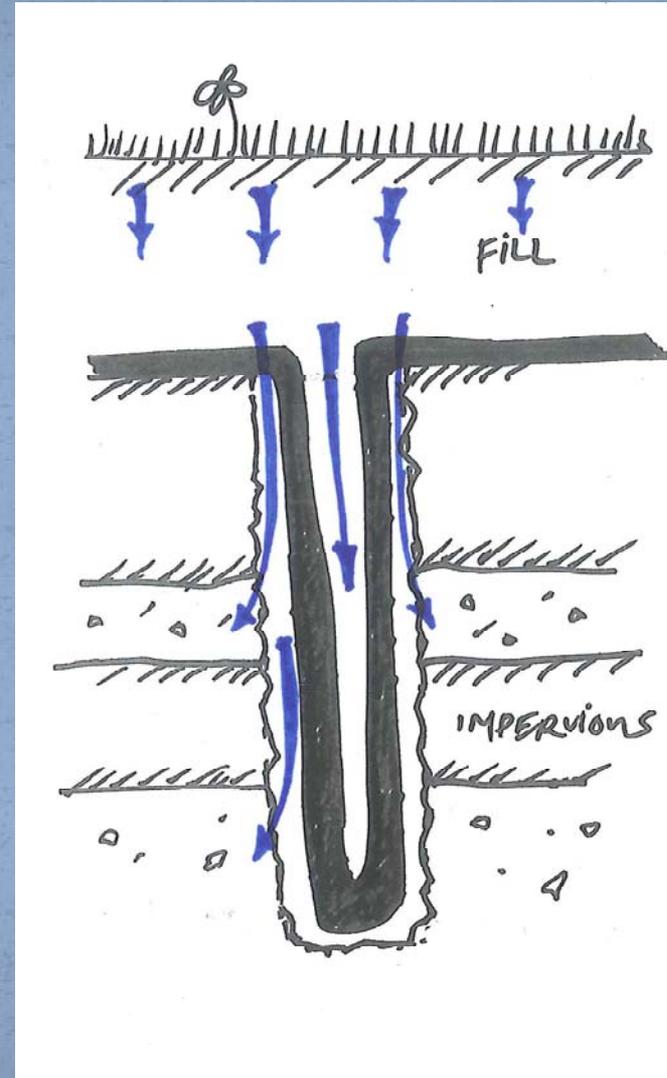
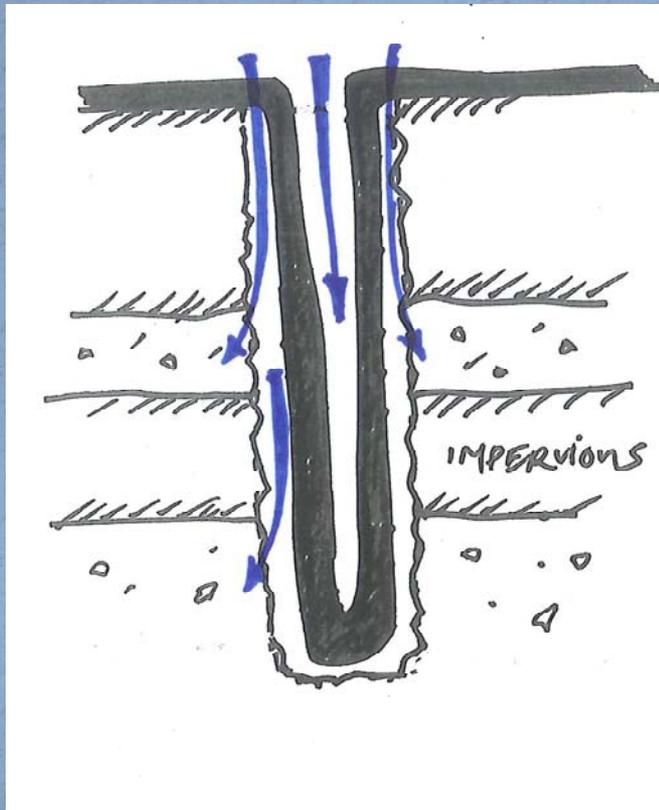
GHEW's

- Fluid circulated in a closed loop of pipe transfers heat from or to the ground, taking advantage of the earth's relatively constant temperature.
- Two basic types: Vertical and Horizontal
 - Vertical: Series, Parallel
 - Horizontal: Trench, Excavation, HDD

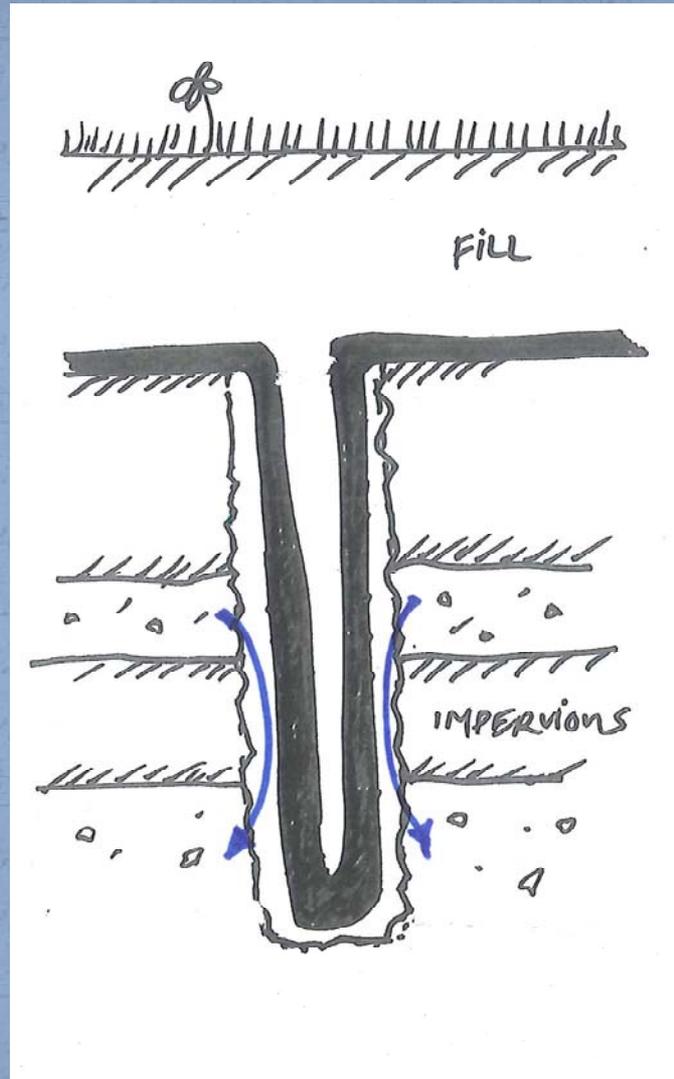
GHEW Standards Protect GW

1. Proper grouting/sealing between piping and borehole can prevent contaminated water to enter an aquifer – either from the surface or between aquifers.

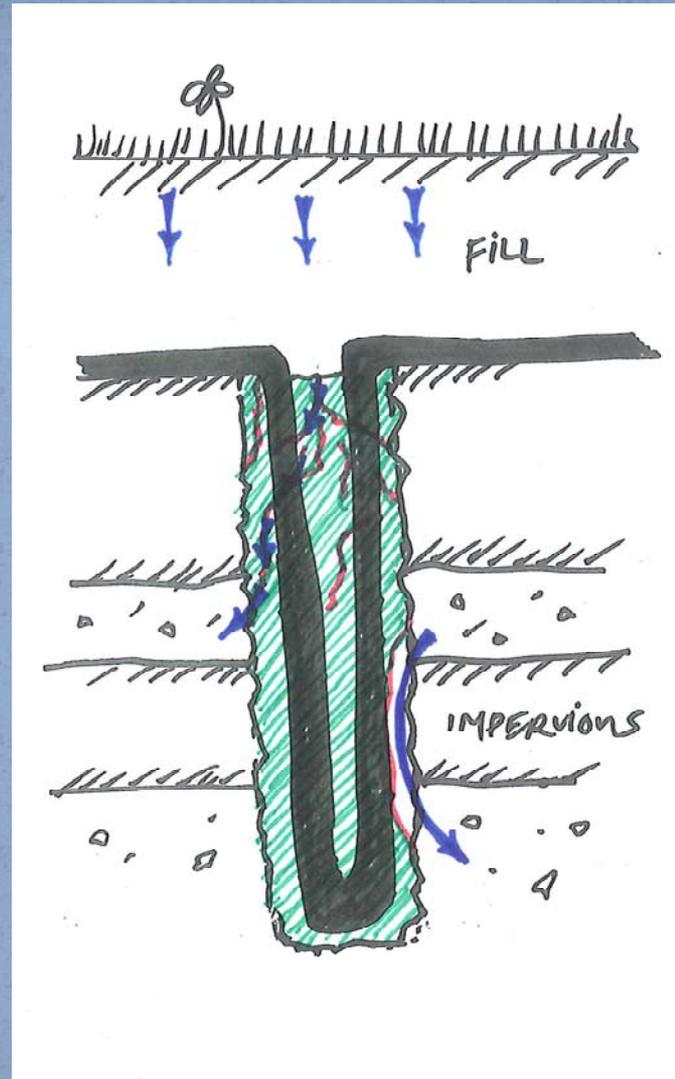
No seal – Surface contaminant



No seal – Adjacent aquifer



Ineffective seal



GHEW Standards Protect GW

1. Proper grouting/sealing between piping and borehole can prevent contaminated water to enter an aquifer – either from the surface or between aquifers.
2. Proper construction and destruction can prevent the release of heat transfer fluid into the aquifer.
3. Identification in the field can prevent damage to loops, fluid leaks.
4. Adequate setbacks can minimize impacts.

Content of GHEW Standards

- Location/Setbacks
- Driller Qualifications
- Reporting Requirements
- Definitions
- Borehole Diameter
- Installation
- Sealing Materials
- Circulating Pipe/Loop Material & Connections
- Loop Fluids
- Pressure Testing
- Field Identification/Marking
- Maintenance
- Destruction (Decommissioning)

Limitations of Standards

- DWR standards do not ensure proper function, sizing or efficiency of a GHEW system.
- DWR standards are not a manual for GHEW construction or destruction.

Progress

- State Survey (completed)
- County Survey (underway)
- Literature Review & Interviews
- Engineering Evaluation (underway)
- Composing Draft Standards (underway)

What's Next

- Internal Draft
- Internal Technical Review
- Release Public Draft
 - 30-day minimum comment period
 - Two public workshops
- Present to SWRCB – Summer 2013

Contact Information

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For more information or to subscribe to listserv:

<http://www.water.ca.gov/groundwater/wellstandards/>