

2011 NWRA CONFERENCE

NEVADA

UNDERGROUND INJECTION CONTROL & GEOTHERMAL ACTIVITIES

Russ Land

Nevada Division of Environmental Protection

Bureau of Water Pollution Control

Underground Injection Control Program

UIC Law and Regulations

- Nevada Revised Statute 445A.465:
 - Injection of fluids through a well or discharge of pollutant without permit prohibited
- 1. Except as authorized by a permit...it is unlawful for any person to:
 - (1b) Inject fluids through a well into any waters of the state
 - (1d) Discharge from a point source a pollutant or inject fluids through a well that could be carried into the waters of the state by any means
- UIC Regulations: NAC 445A.810 – 445A.925

Classes of Injection Wells

- I** - Industrial wells that inject hazardous/ non-hazardous wastes beneath lowermost USDW
- II** - Associated with oil and gas production
- III** - Associated with solution mining and mineral and recovery
- IV** - Wells injecting hazardous waste into USDWs (prohibited)
- V** - Injection wells not included in other classes
- VI** – CO₂ Sequestration – new type

Class V Injection Wells

- 22 types defined by US EPA
 - Commercial disposal via drain field/dry well
 - Large-capacity septics and cesspools
 - **Geothermal**, space heating and aquaculture
 - Stormwater drainage
 - Aquifer storage and recovery, recharge
 - Non-contact cooling water
 - Mine dewatering

UIC Regulatory Definitions

- **Underground Source of Drinking Water:** means all aquifers within the state regardless of the quality of the water
- **Injection well:** a well used for the subsurface emplacement of fluids, except fluids associated with active drilling.
- **Well:** 1. A bored, drilled or driven shaft with a depth greater than the largest surface dimension;
- 2. A hole which is dug, with a depth greater than the largest surface dimension;
- 3. An improved sinkhole; or
- 4. A subsurface fluid distribution system, not including subsurface fluid distribution systems associated with septic systems that have a capacity of 5,000 gallons or less per day.

Injection and Anti-Degradation

- NAC 445A.850
- Injection of fluid that degrades quality of aquifer prohibited...
- No person may inject a fluid which degrades that *physical, chemical or biological* quality of the aquifer into which the fluid is injected
- Cannot exceed drinking water standard or aquifer background values, whichever is higher
- Maintain quality - beneficial use as well as drinking water

Aquifer Protection at Geothermal Projects

- Application process and on-going monitoring
- UIC permits – wells and surface discharges
- Chemical Usage – wells and cooling towers
- Water quality sampling
- Mechanical Integrity (MI) Testing
 - Internal MI
 - External MI
- Monitoring Program

Geothermal Injection Wells

- Also regulated by NV Division of Minerals & BLM
- Depths: <500 – 10,000 feet
- Temperatures range from 200 – 475 degF
- Geothermal water quality
 - 500 – 10,000 ppm, common 2000 – 5000 ppm
- Types of Geothermal Plants – Flash and Binary
- Geothermal areas vary
 - Geo water to surface
 - Alluvial vs Fault production
- UIC permit – Geo-heat pump “open-loop systems only”

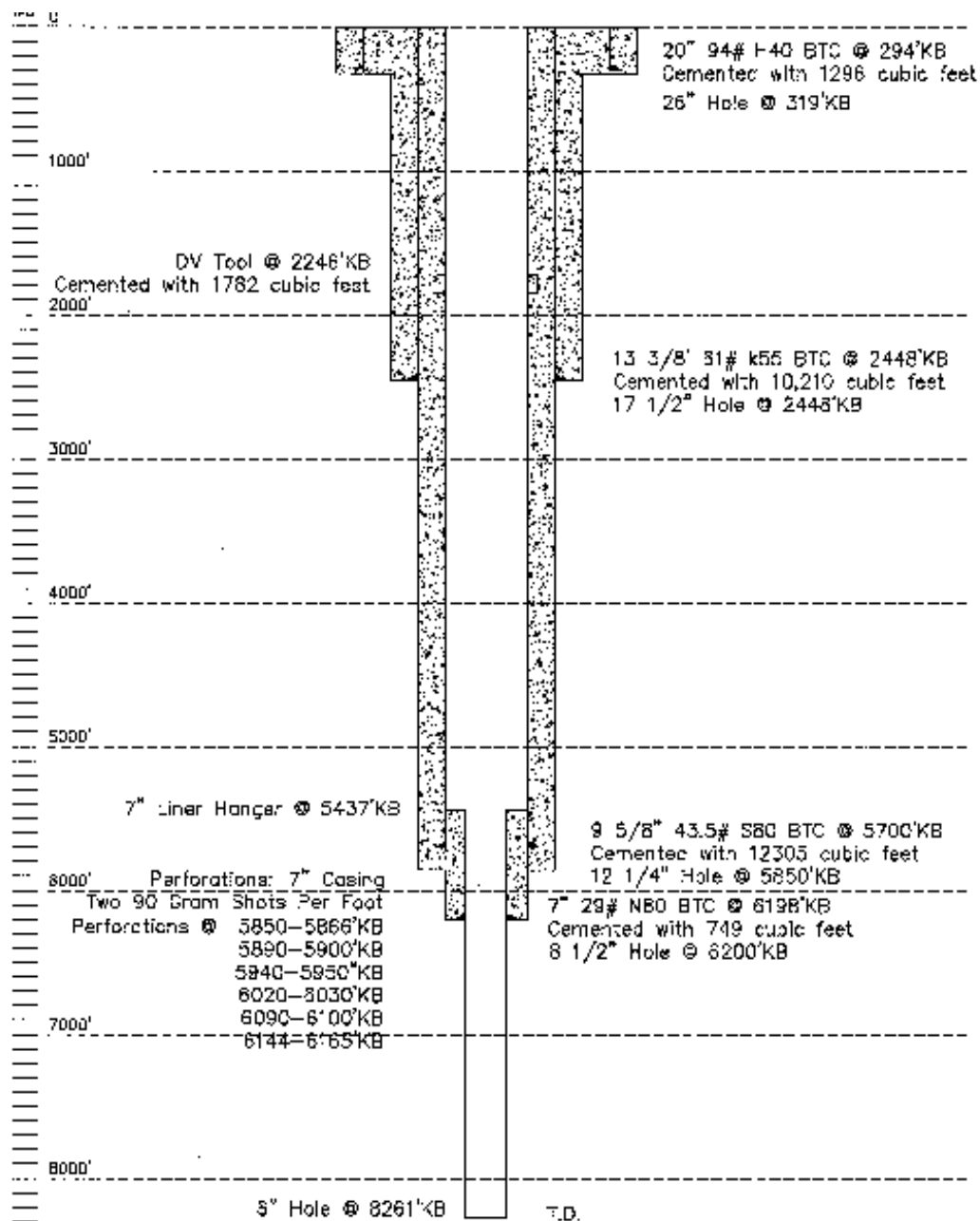
Multiple strings of casing

Complex configurations & variable environments

Corrosion can take place at different locations

Loss Circulation Zones behind pipe

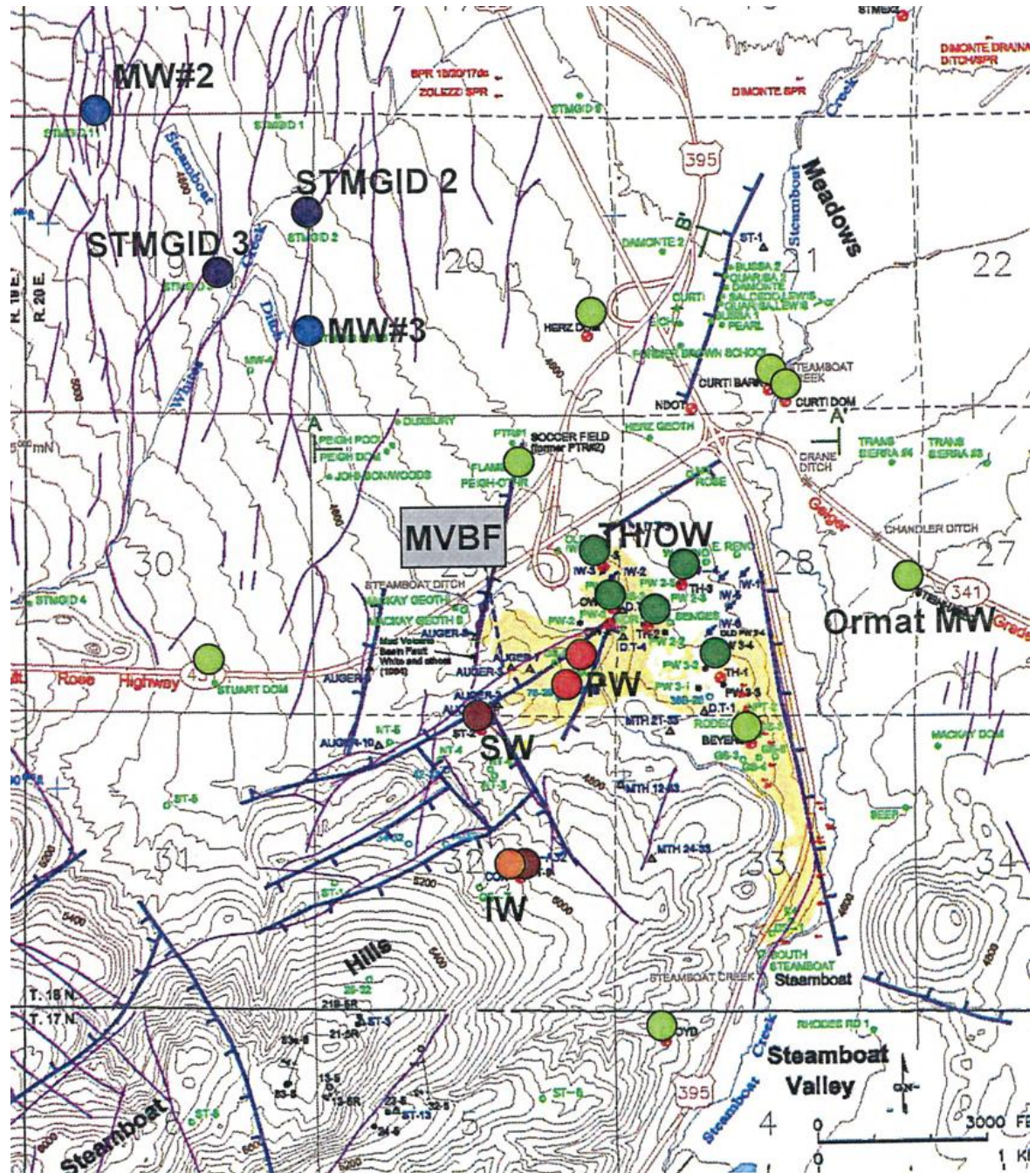
Confining zone breakdown



Example

Various sources of water
Various demands
Geology and Faulting
Corrosive conditions
Multiple horizons & “screen intervals”

Water samples
Water levels
Temperature profiles
Soil gas



Thank you

- Resources
 - UIC Geothermal Info
ndep.nv.gov/bwpc/uic_geo_hp.htm
 - US EPA - epa.gov
- Russ Land
 - 901 S. Stewart St, Carson City 89701
 - 775-687-9428
 - rland@ndep.nv.gov