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USGS Ground-Water Investigation Related to the Leukemia Cluster in the Fallon Area of Churchill County, Nevada

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U.S. Department of the Interior
U.S. Geological Survey

Objectives of USGS Investigation

1. **Characterize current quality of all drinking water sources in the Fallon area.**
2. **Determine if there have been changes in water quality over the last decade.**
3. **Evaluate if water consumed by case families differs from water consumed by the community as a whole.**

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Investigation Design

- Collect samples from 100 domestic and public-supply wells in the Fallon area.
- Resample wells sampled in 1989.
- Collect samples from case-family houses.
- Collect additional data near JP-8 pipeline.

What did we sample for?

Each analysis required

35 bottles

- **Major Anions and Cations**
- **Trace Elements**
  - **Filtered and Unfiltered**
- **Nutrients and DOC**
- **Volatile Organics**
- **Pesticides**
- **Alpha, Beta, Gamma Radioactivity**
- **Uranium isotopes**
- **Stable isotopes of water**
- **Radon**

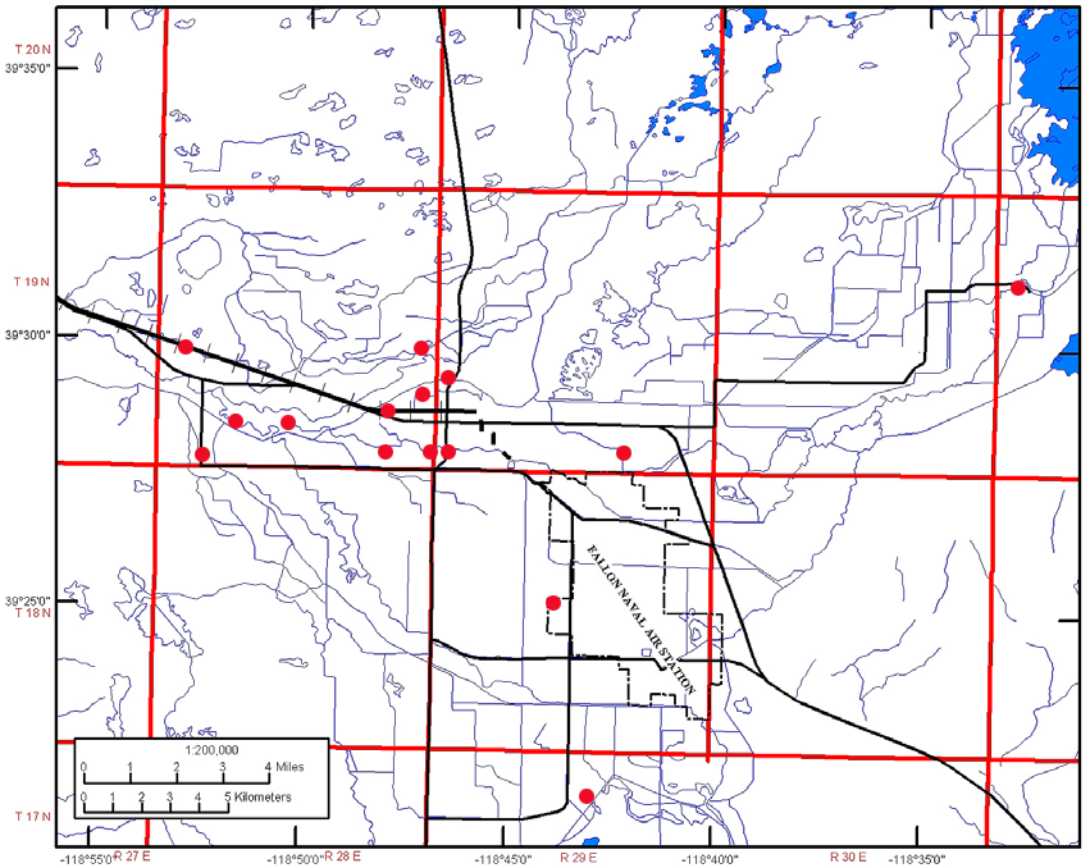
Sampling

Sampling usually took 3½ to 5 hours per site.

How did we locate sites?

- We wanted wells:
  a. Used as public supply.
  b. Near the pipeline.
  c. Throughout the valley.
  d. In all the aquifers.
  e. Where case families live or had lived.

Case-Family Locations



Nevada State Health Division provided a map showing approximate locations of case-family residences.

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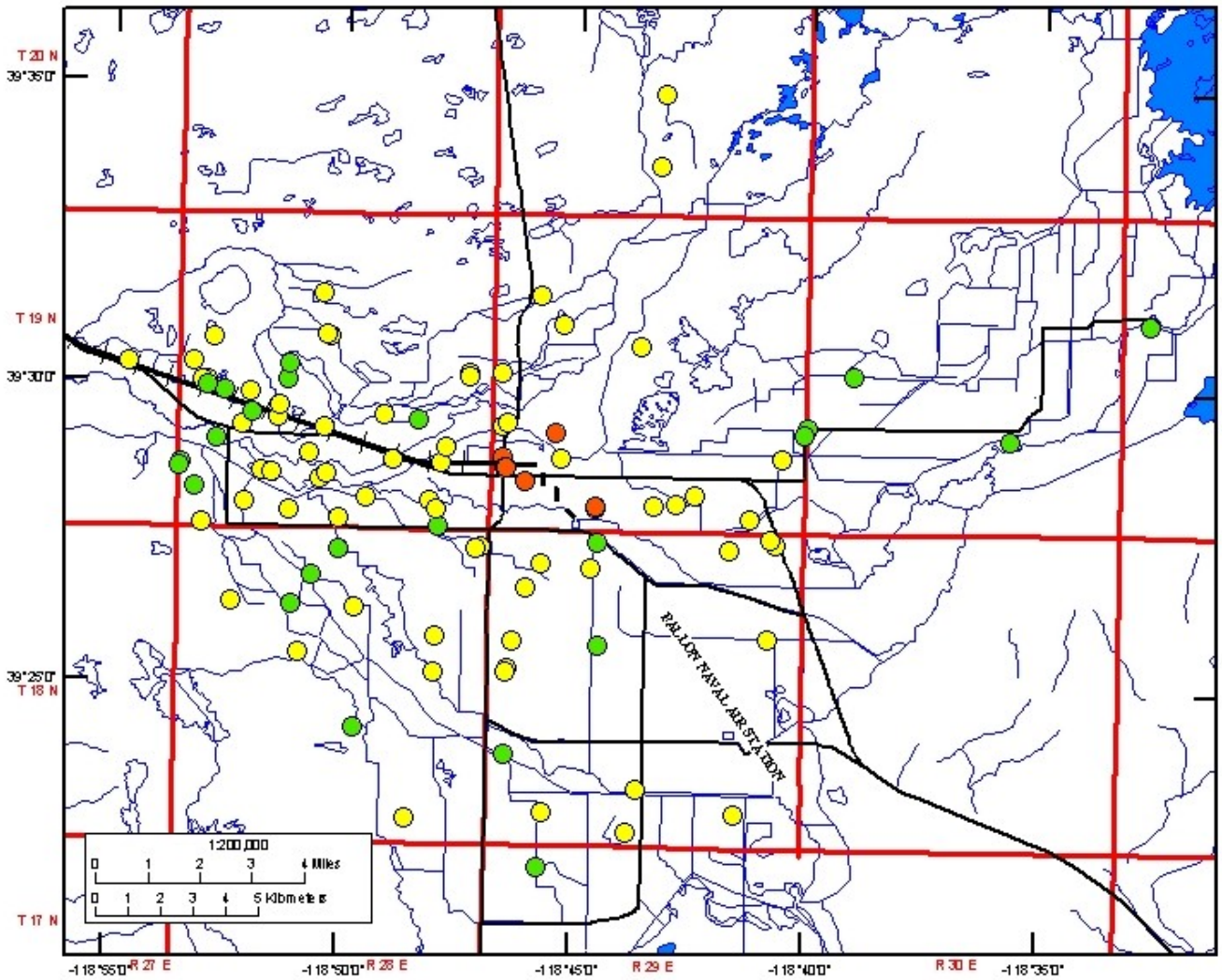
Location of Sampling Sites



- Shallow aquifer
- Intermediate aquifer
- Basalt aquifer

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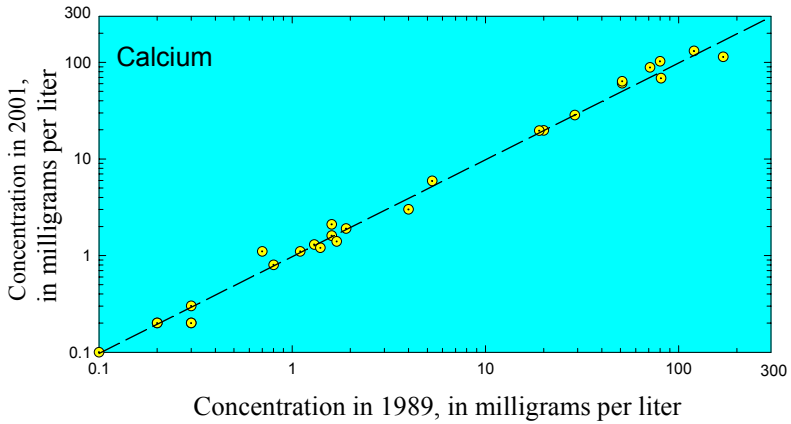
Results

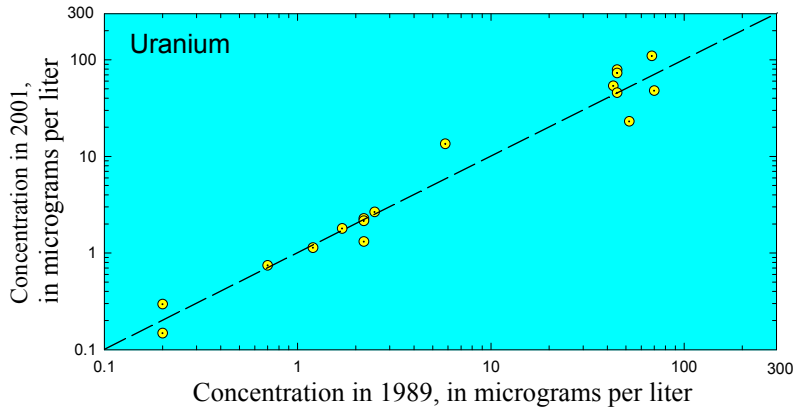
- 29 wells sampled in 1989 were resampled in 2001.
- 30 wells sampled from Shallow Aquifer.
- 62 wells sampled from Intermediate Aquifer.
- 8 wells sampled from Basalt Aquifer.
- 14 wells sampled from current and past residences of case families.
- 11 wells within about 1,000 ft of pipeline.

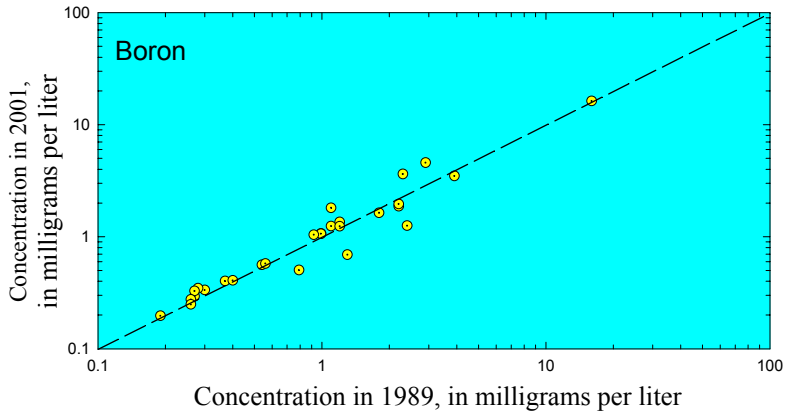
Changes between 1989 and 2001

29 domestic and public-supply wells sampled in both 1989 and 2001.

Samples in close proximity to the dashed line indicate that samples were similar for both time periods.







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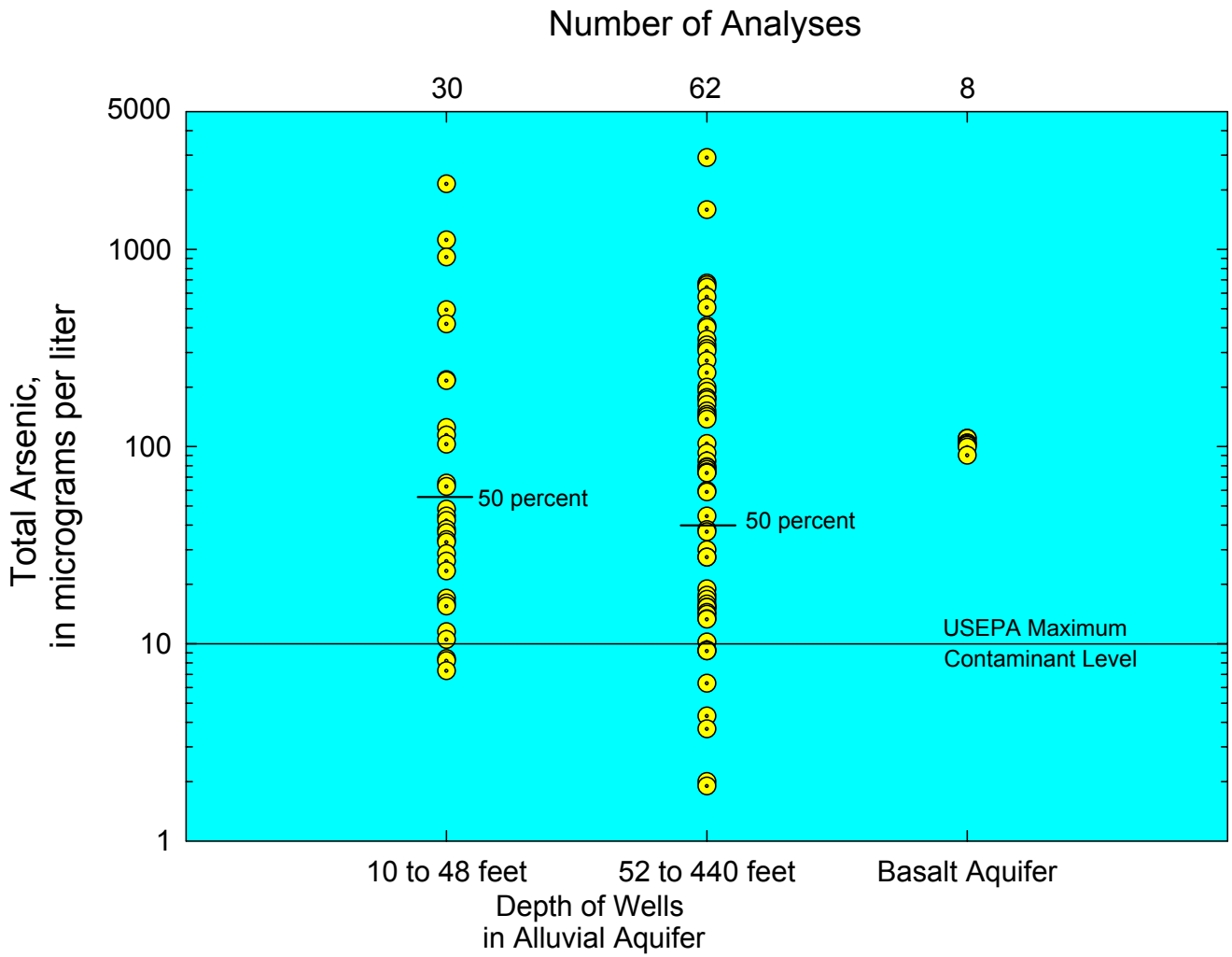
Arsenic



89 percent of samples exceed current MCL

Plot showing that most wells in all aquifers commonly exceed the US EPA Maximum Contaminant Level (MCL) for Arsenic.

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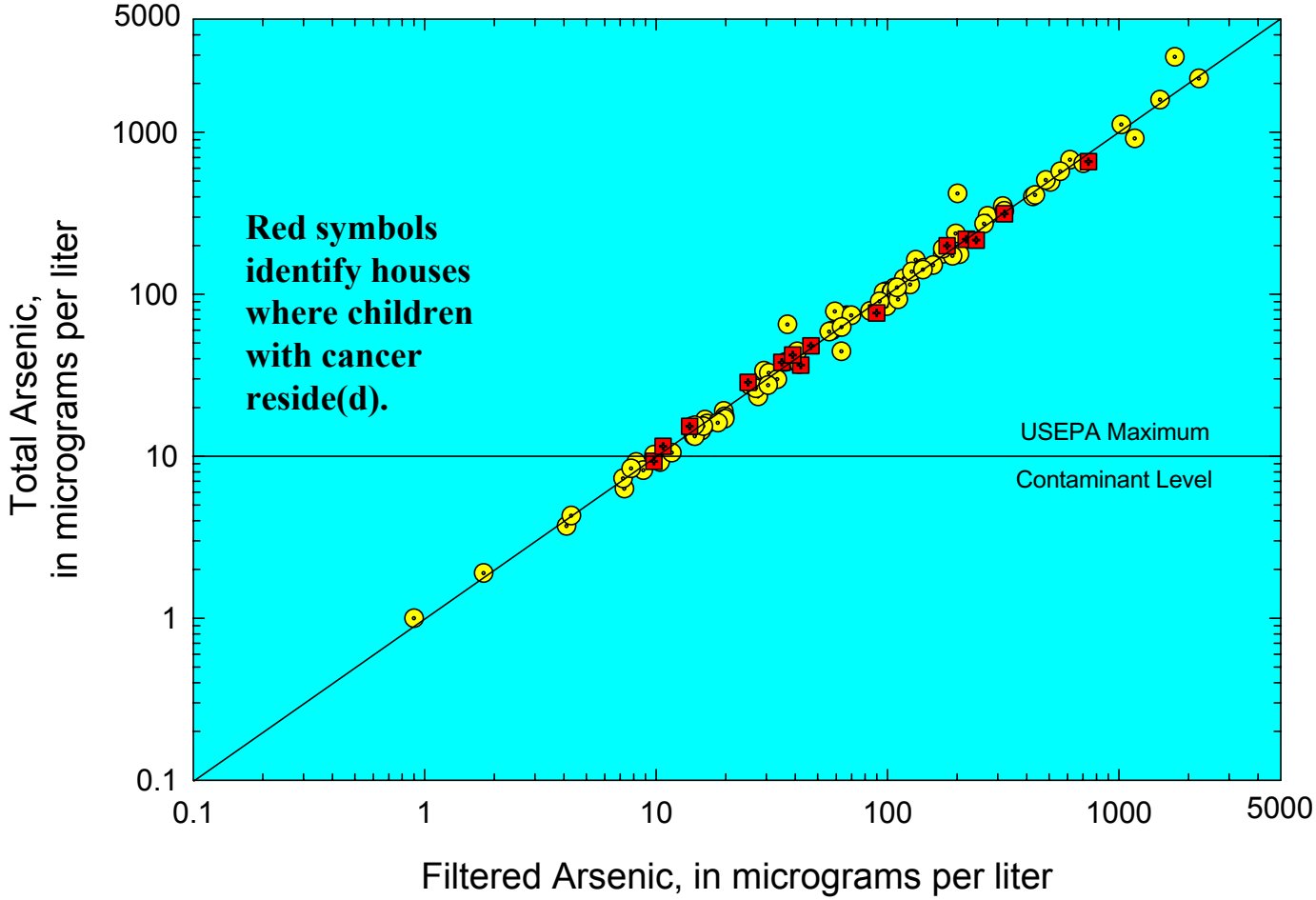
Total vs Filtered Arsenic



Scatter plot showing filtered Arsenic concentrations are the same as total Arsenic concentrations. It also shows that the case families are exposed to Arsenic at the same levels as the community.

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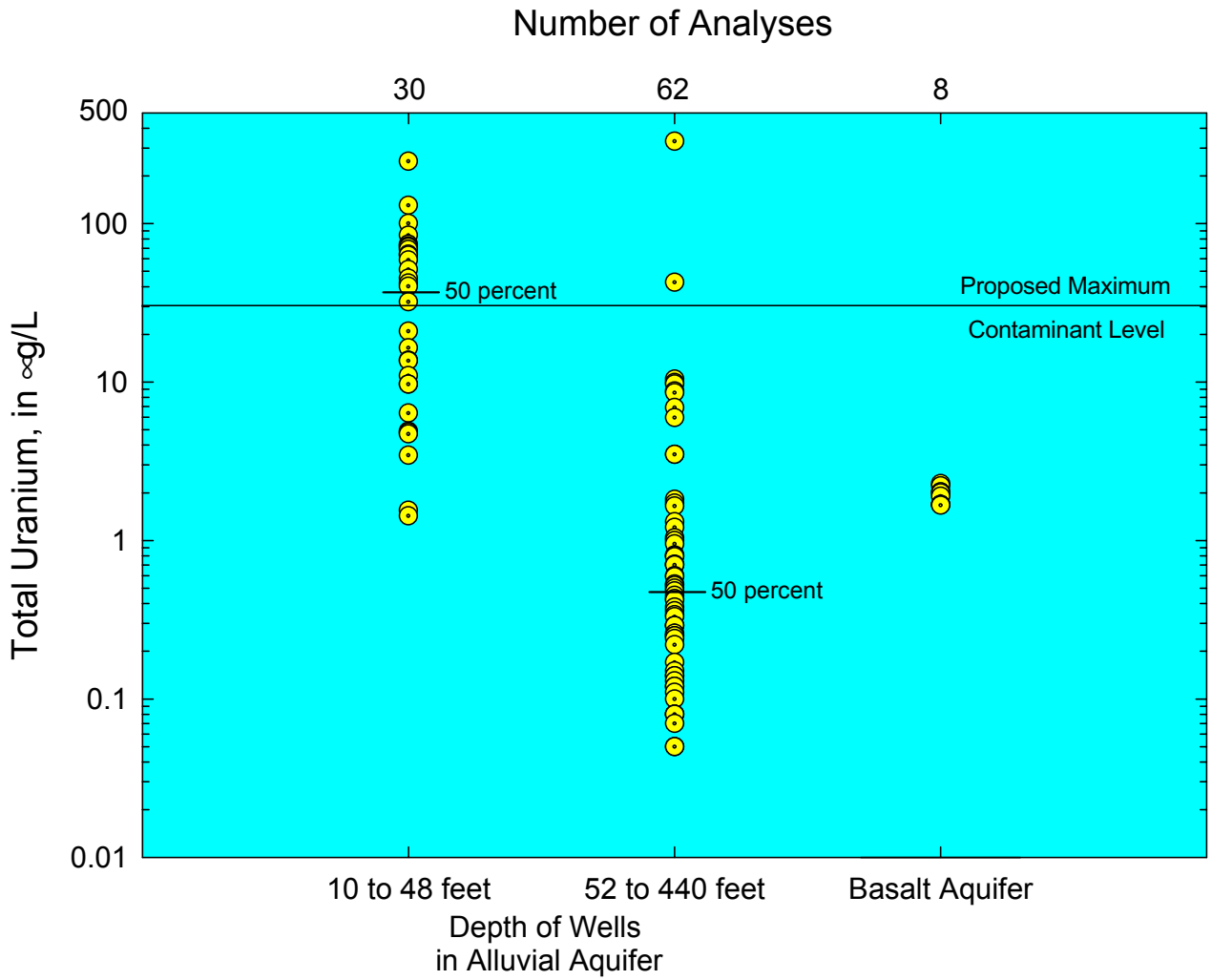
Uranium



18 percent of samples exceed proposed MCL.

Almost all are in the shallow alluvial aquifer.

Plot showing concentrations of Uranium that demonstrates wells greater than 50 feet deep seldom exceed the proposed EPA Maximum Contaminant Level for Uranium.

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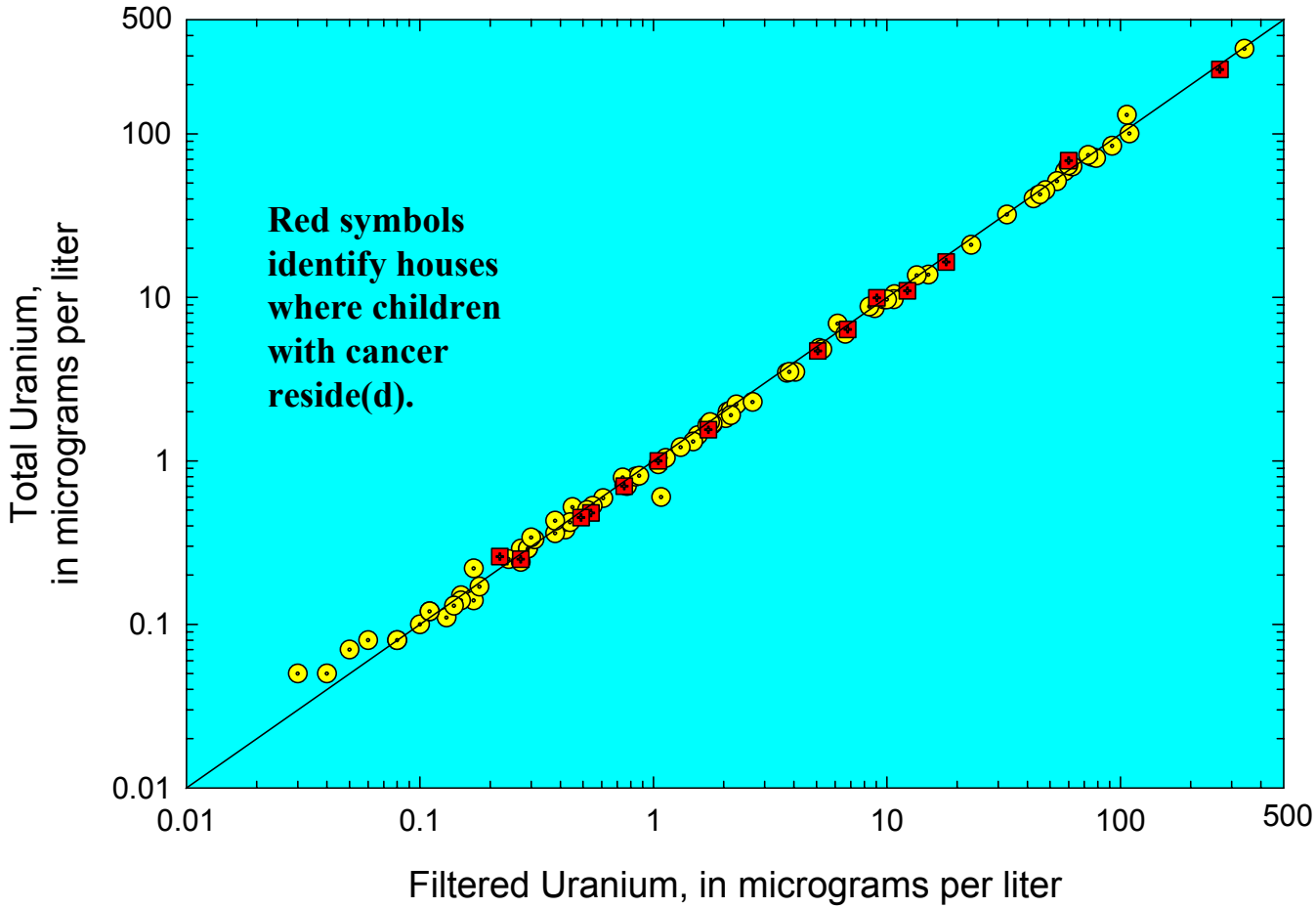
Total vs Filtered Uranium



Scatter plot showing filtered Uranium concentrations are the same as total Uranium concentrations. It also shows that the case families are exposed to Uranium at the same levels as the community.

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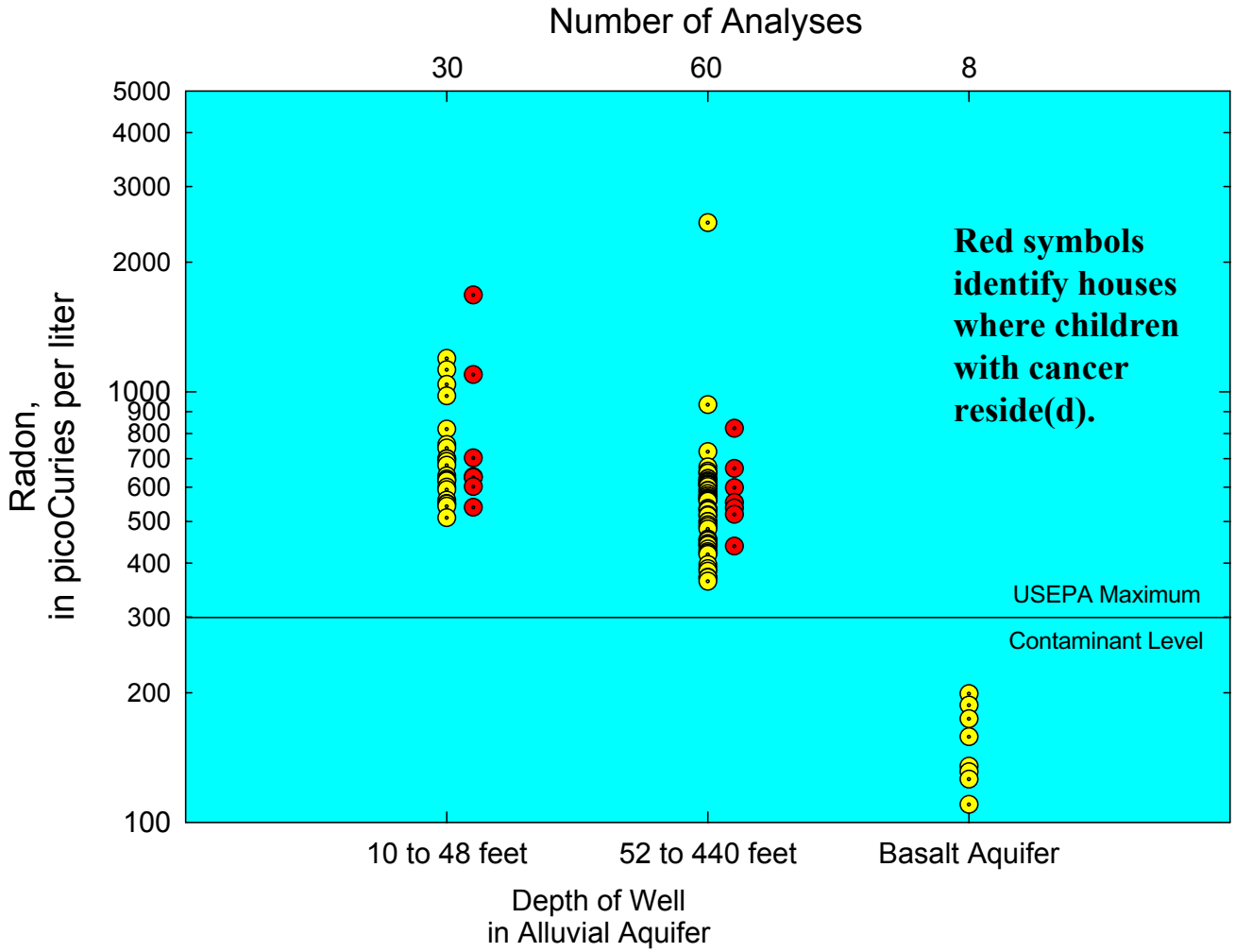
Radon



Plot showing radon concentrations in all of the alluvial aquifer water wells exceed the drinking water standards. It also shows the case families are exposed to Radon at the same levels as the community.

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VOCs and Pesticides

- Few samples showed the presence of volatile organic compounds and pesticides.
- Benzene was never detected.
- TCE was detected once (0.05 ppb)
- Traces of chloroform (0.01 to 0.18 ppb) were found in seven domestic wells (1 case family).
- Traces of atrazine (0.01 ppb or less) were found in five wells (1 case family).
- Traces of simazine (0.05 ppb or less) were found in nine wells (1 case family).

Fuels

Batch plant on Trento Lane
where fuels were found in well water.

- Eleven wells are within ~1,000 feet of the pipeline.
  - Range 108 to 1,070 feet.
- Depth of the wells ranged from ~35 to 180 feet.
- Four of the wells are at former residences of case families.
- Fuel indicators (xylene, ethyl-benzene, PAH's) were found only at an industrial site.

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Conclusions

- Quality of water in aquifers hasn't changed since 1989.
- Arsenic, uranium, and radon in ground water commonly exceed drinking water standards.
- There is no 'Aha, we found it!'. Nothing we have now points to a cause for the cluster:
  - Case-family wells near the pipeline do not contain fuels or solvents.
  - Case families are exposed to the same concentrations of arsenic, uranium and radon as the rest of the community.