

Water-quality trends for selected sites at and near the Idaho National Laboratory, Idaho

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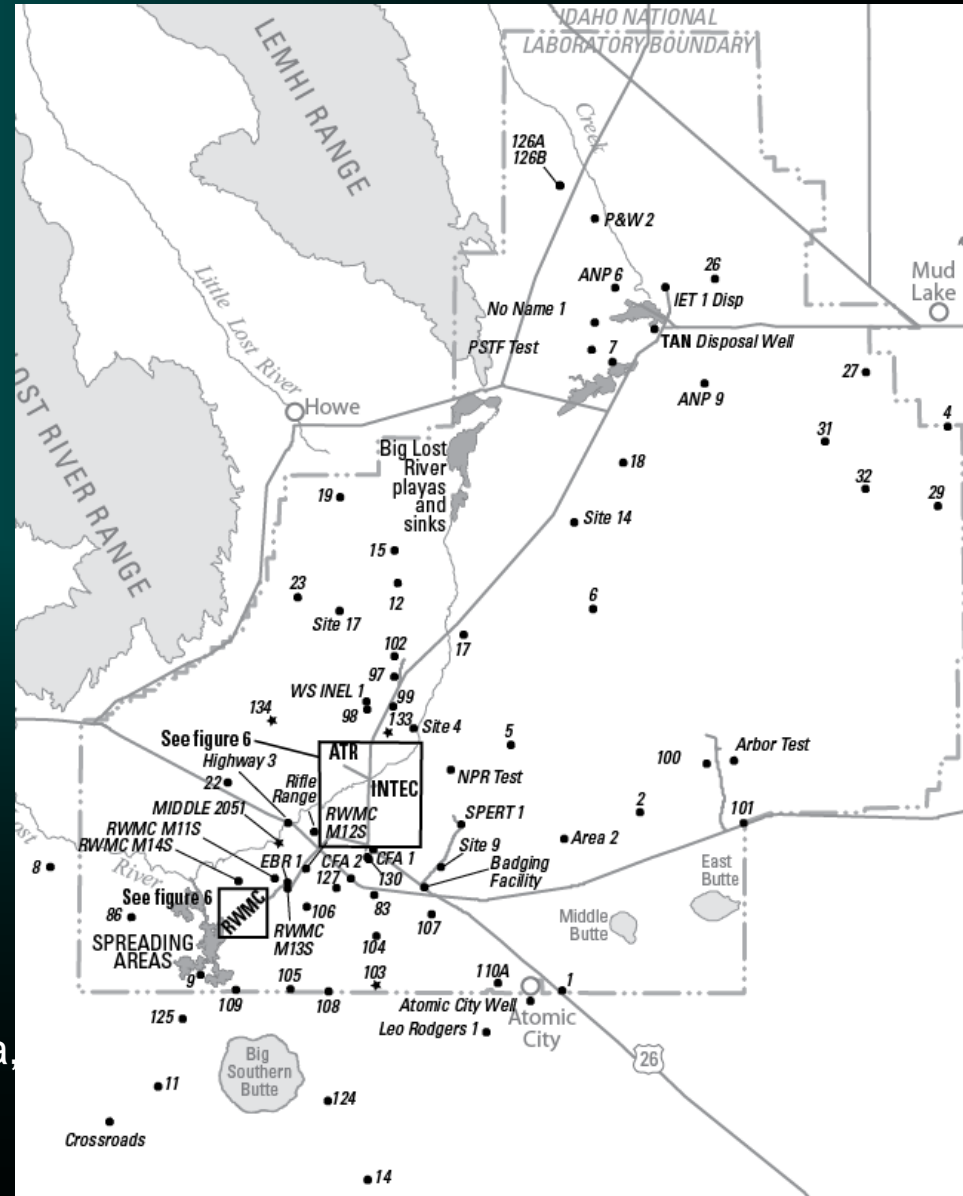
Study Objectives

- Analyze water-quality data collected at the INL from 1949 to present for a variety of radiochemical and chemical constituents from 131 aquifer wells, 35 perched aquifer wells and 7 surface water sites for trends in concentrations to determine if long term monitoring of all the sites needs to be continued and for all the constituents.
- Analyze data for selected radiochemical constituents, sodium, chloride, sulfate, nitrate, chromium and other trace elements, total organic carbon, and volatile organic compounds.

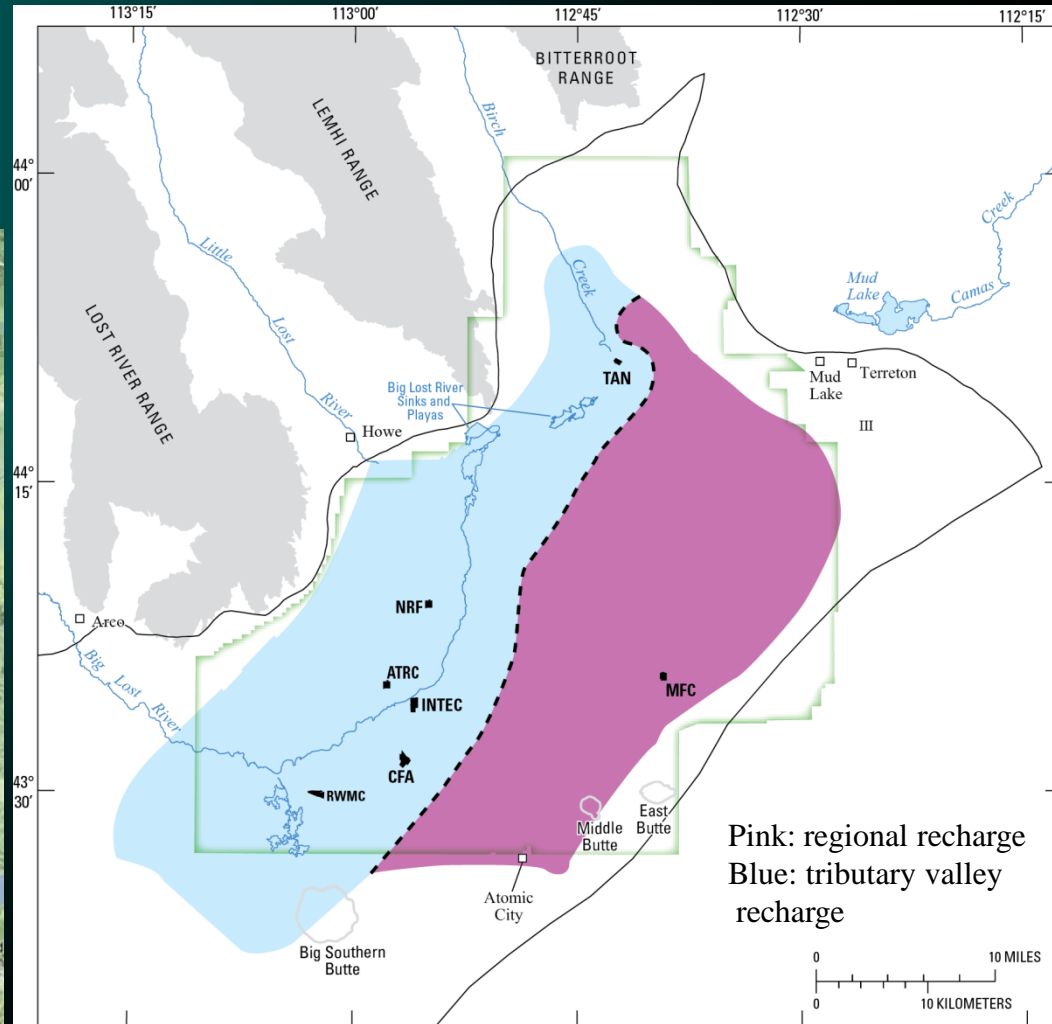
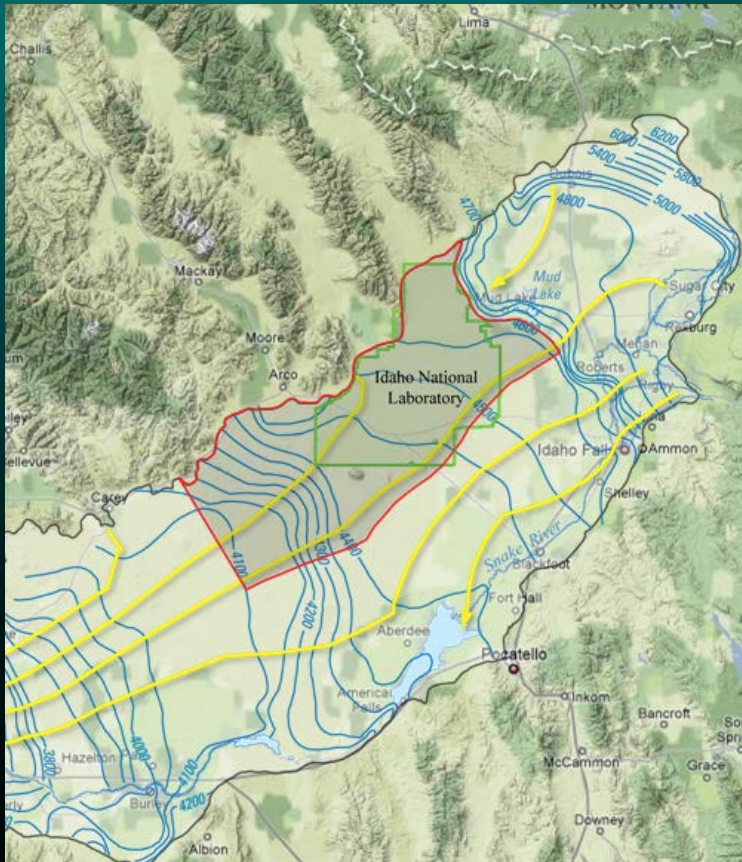


Sampled quarterly and semi-annually at many wells between early 1960's-2002; annual sampling since

Selected sites for sulfate, sodium, fluoride, chromium, Sr-90, Pu, Am, alpha, beta, gamma, VOC's, TOC, suite of trace elements



Olmsted (1962) and
Busenberg and others (2001)
defined major water types
at the INL



Approach

- Plotted entire datasets for sites with at least 10 consecutive years of data
- Removed outliers if value differed drastically from field specific conductance or used replicate value if more representative of data.
- Calculated trends on period of record when pump was in the well; for wells that had pumps in the entire period of record; calculated trends for data from 1981 to 2009 for non-wastewater wells and 1981 to 2012 for wastewater influenced wells which represented the time period quality assurance data was collected for the monitoring program.

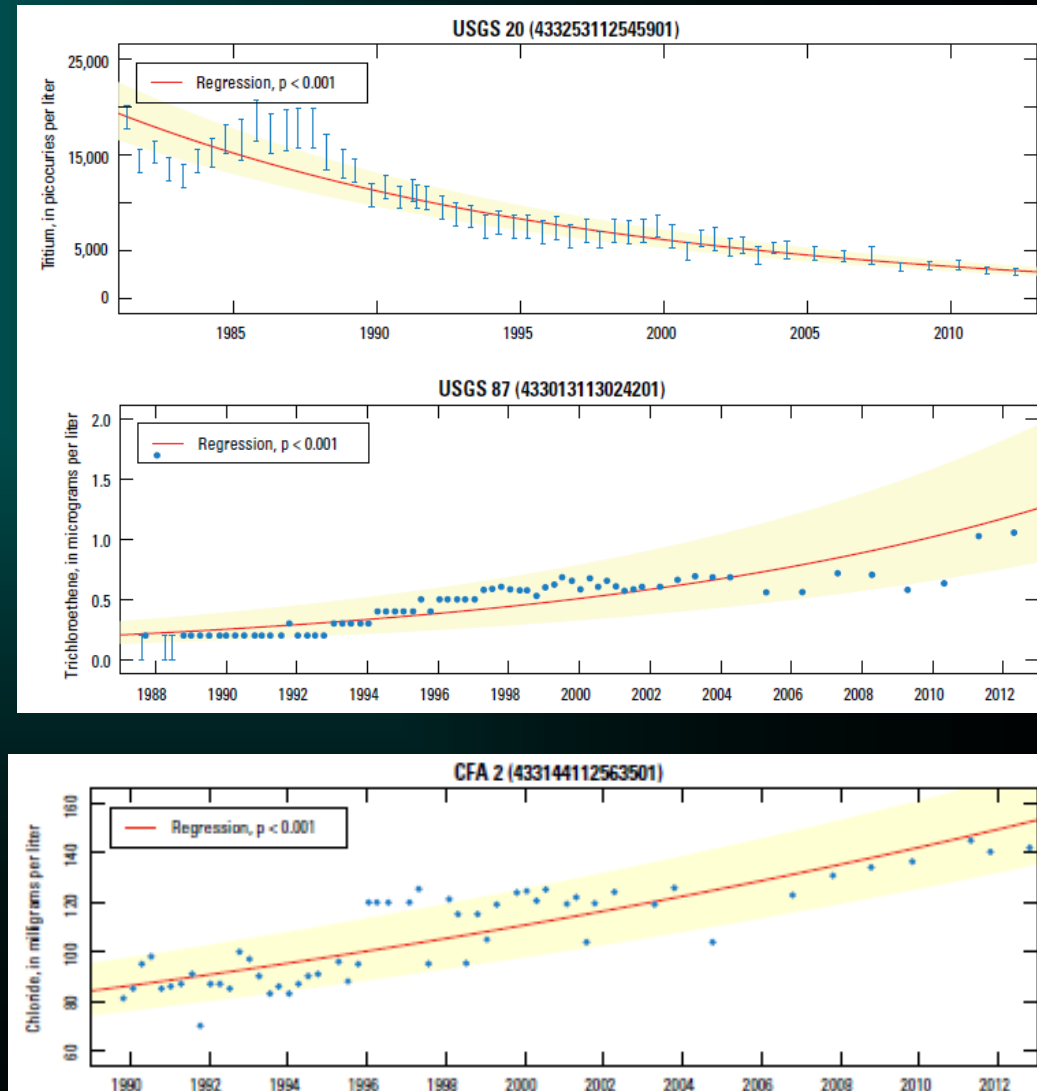


Statistical Data Analyses Methods for 2015 study

Water-quality trends were determined using a parametric survival regression model to fit the observed data, including left-censored, interval-censored, and uncensored data

The p -value of 0.05 represents a confidence level that the dataset is showing a trend or no trend 95 percent of the time.

A significance level of 0.05 was selected to determine if the trend was statistically significant; values greater than 0.05 indicate no trend

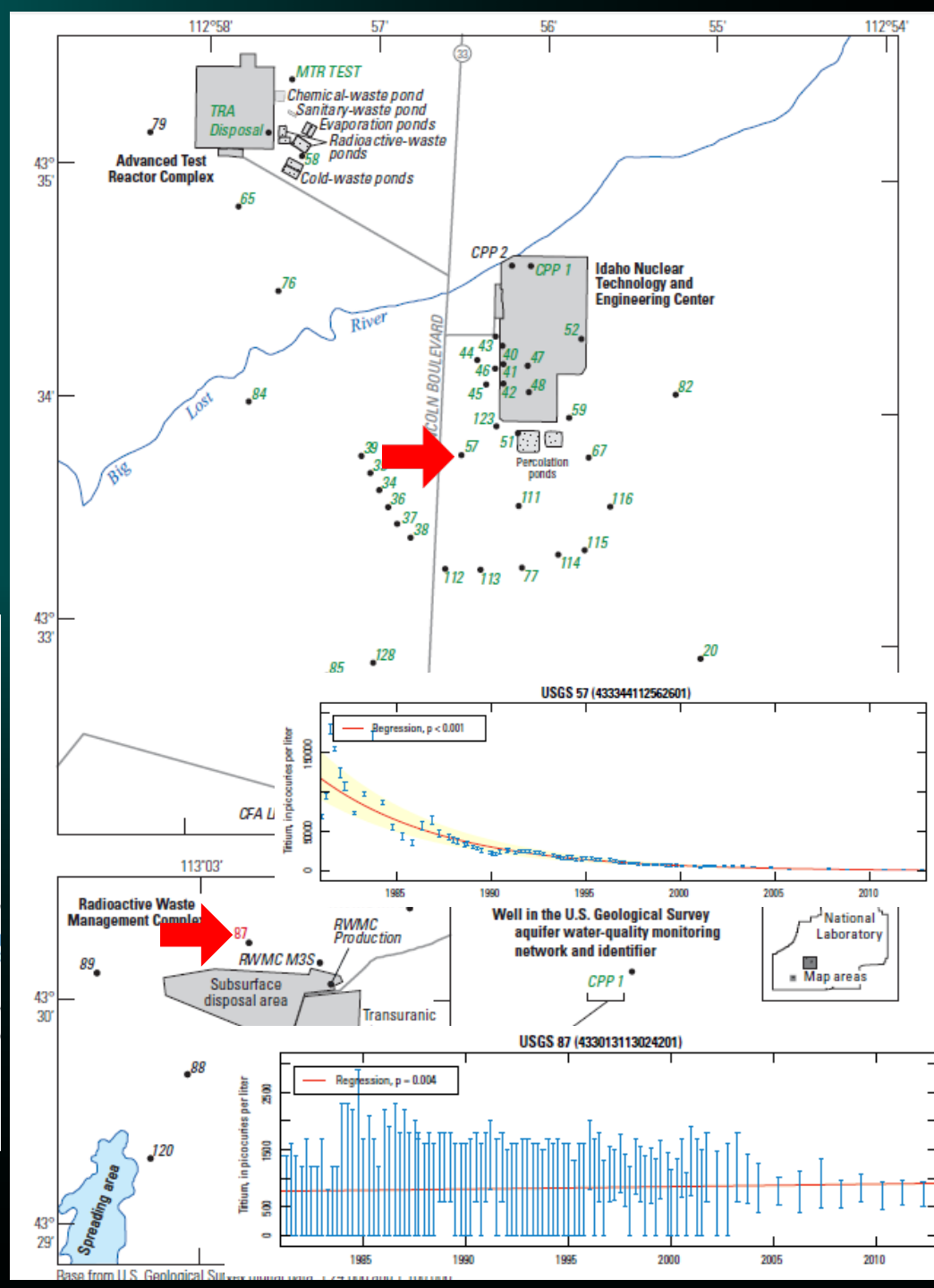
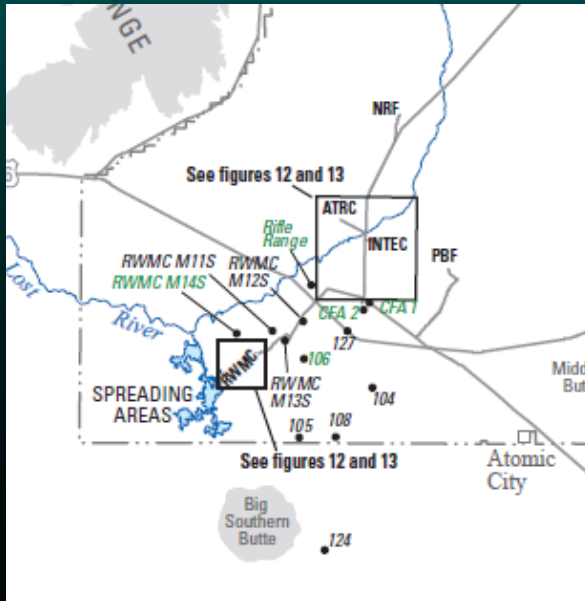


Tritium Trends

Decreasing in almost all wells near disposal due to discontinued disposal, radioactive decay and dilution and dispersion in the aquifer.

No trends mostly down gradient.

One well at RWMC shows increasing trend; concentrations about 1,000 pCi/L; much less than MCL of 20,000 pCi/L

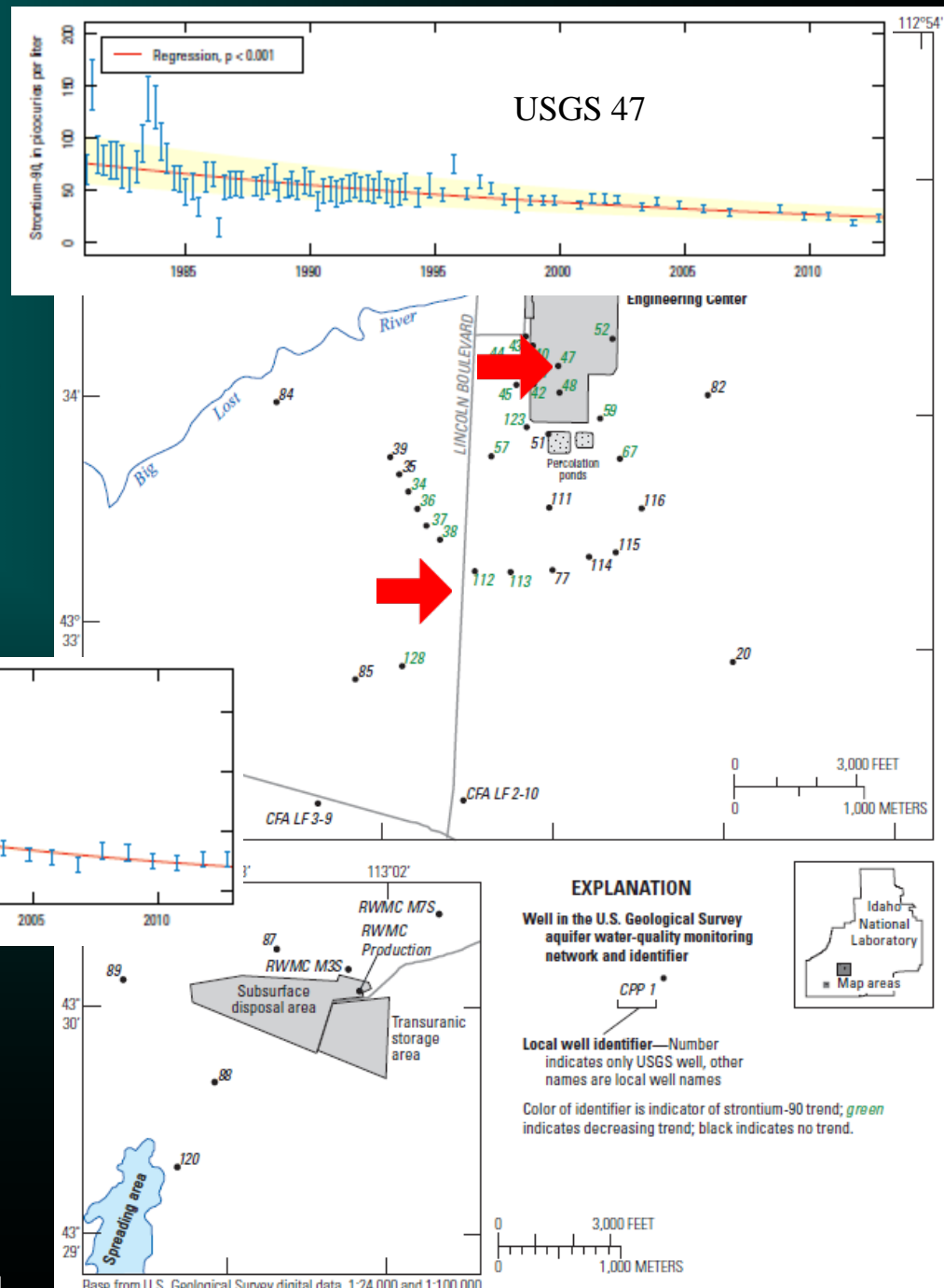


Strontium-90 trends

Wells with reportable concentrations show decreasing trends.

Attributed to discontinued disposal and radioactive decay.

Wells with no trends generally have concentrations below reporting levels.

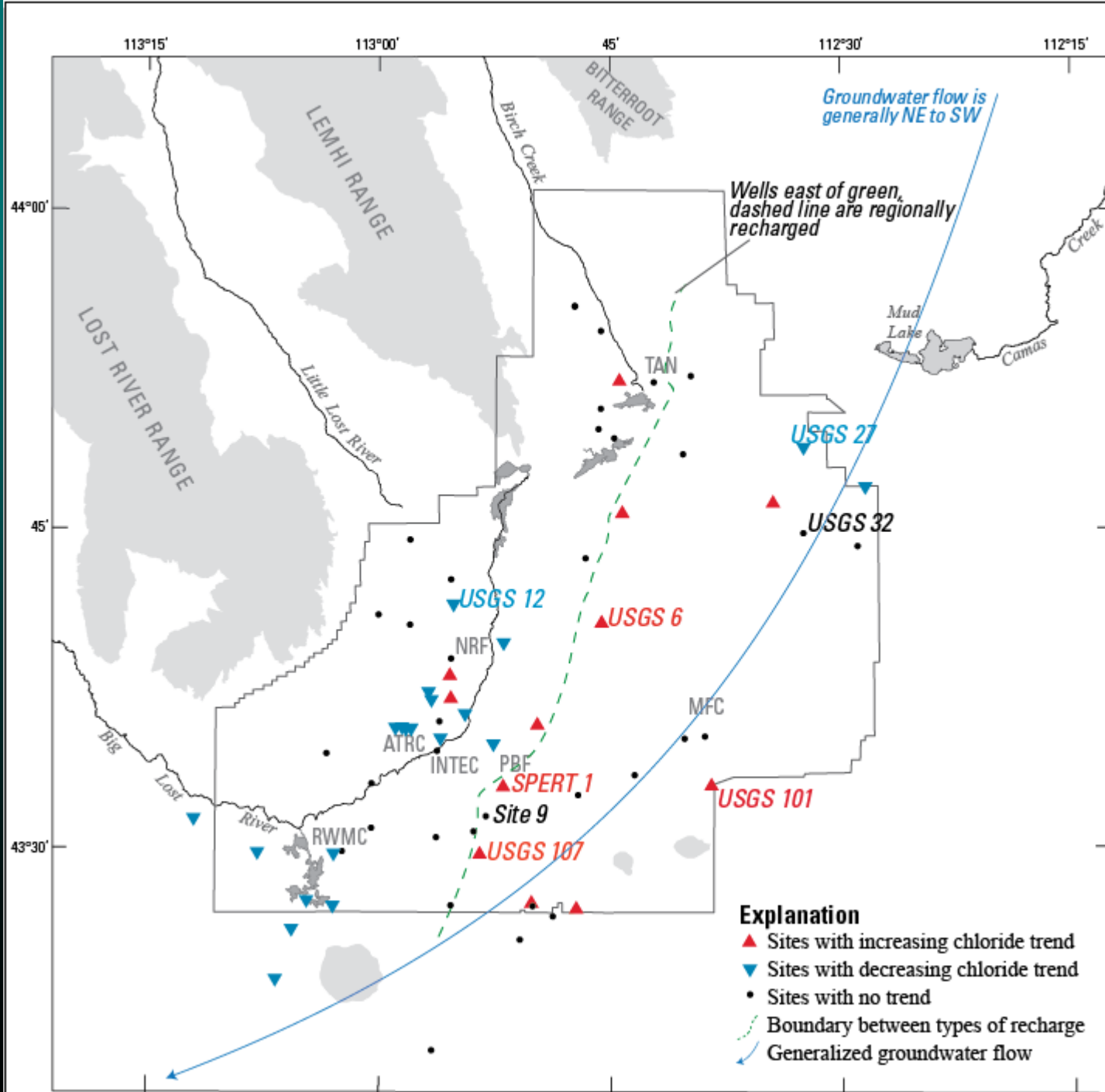


Chloride trends Regional wells

Black indicates
no trend

Red indicates
increasing trend

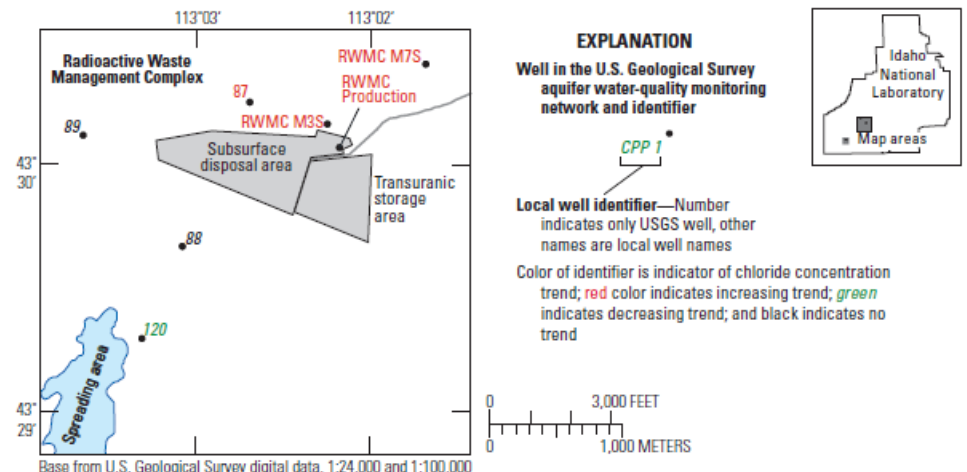
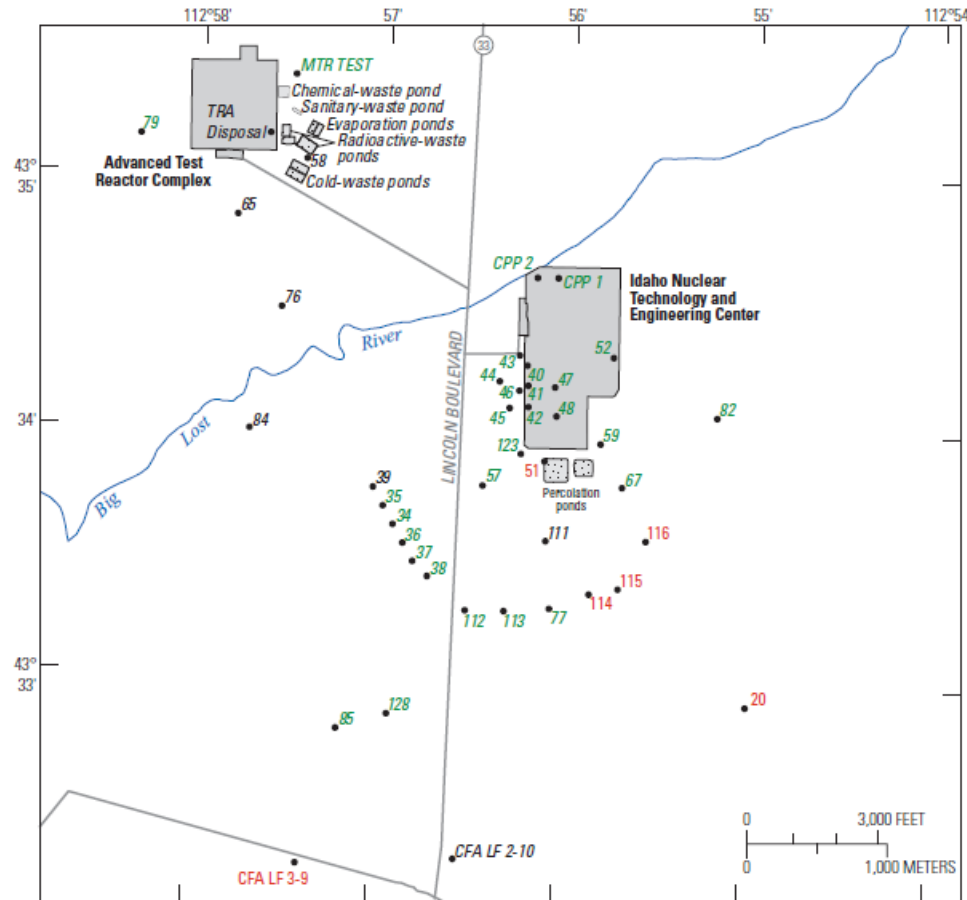
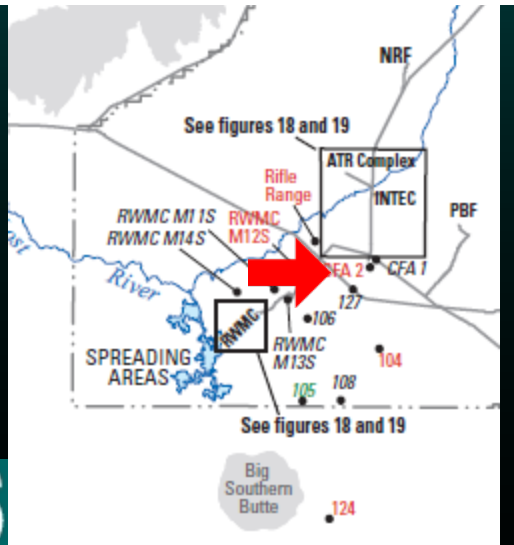
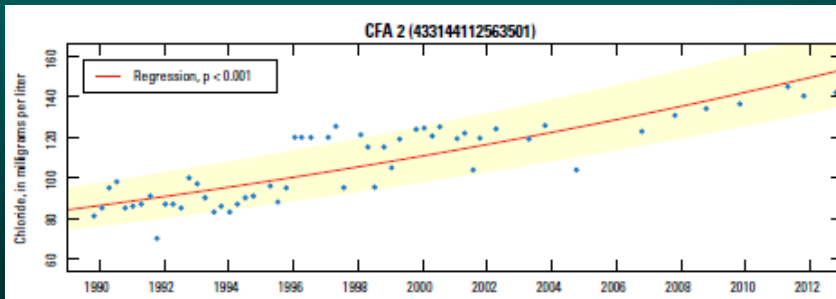
Blue indicates
decreasing trend



Chloride trends wastewater wells

See mostly decreasing trends around disposal areas.

See increasing trends downgradient.



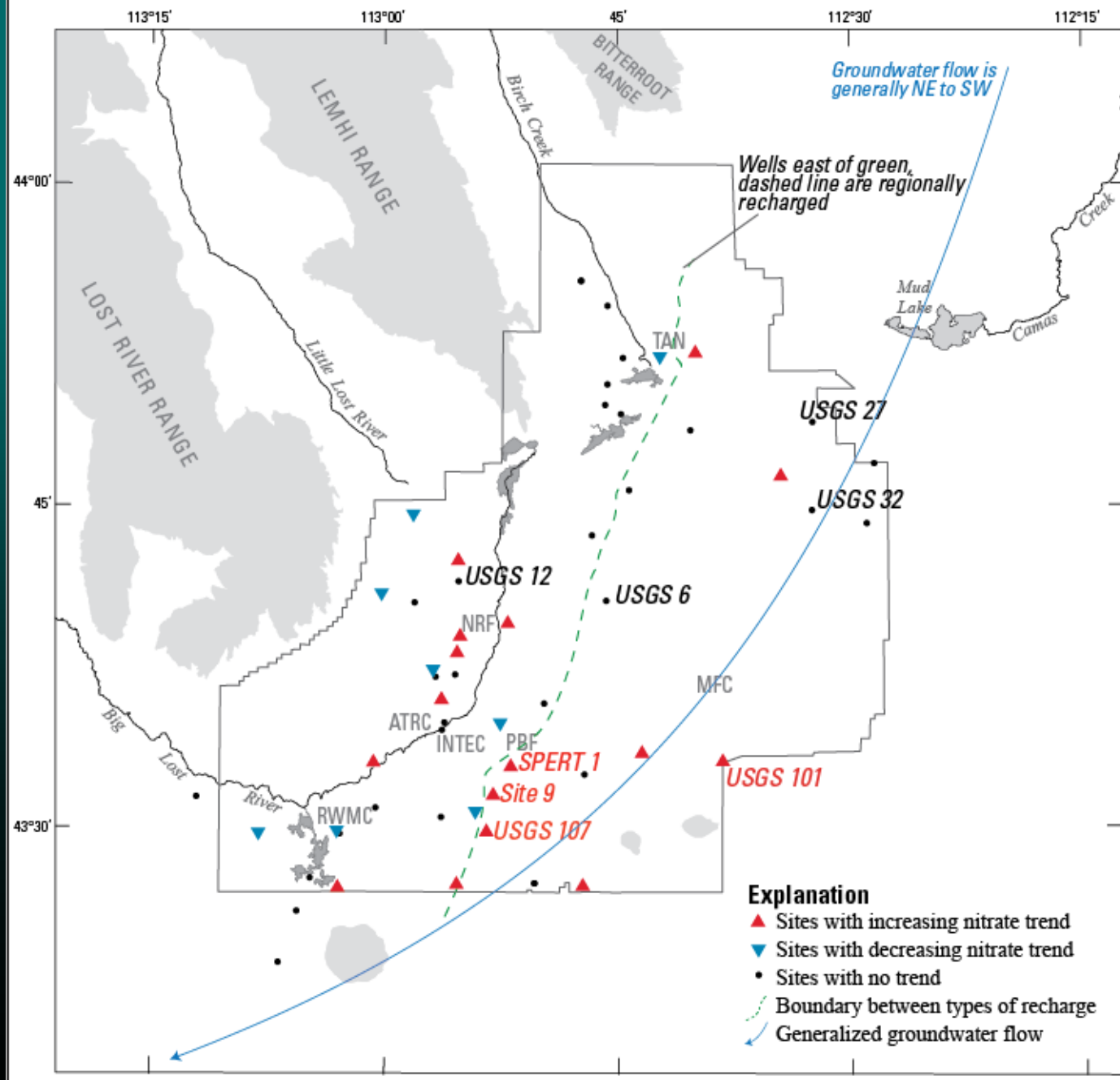
Base from U.S. Geological Survey digital data, 1:24,000 and 1:100,000

Nitrate trends Regional wells

Black indicates
no trend

Red indicates
increasing trend

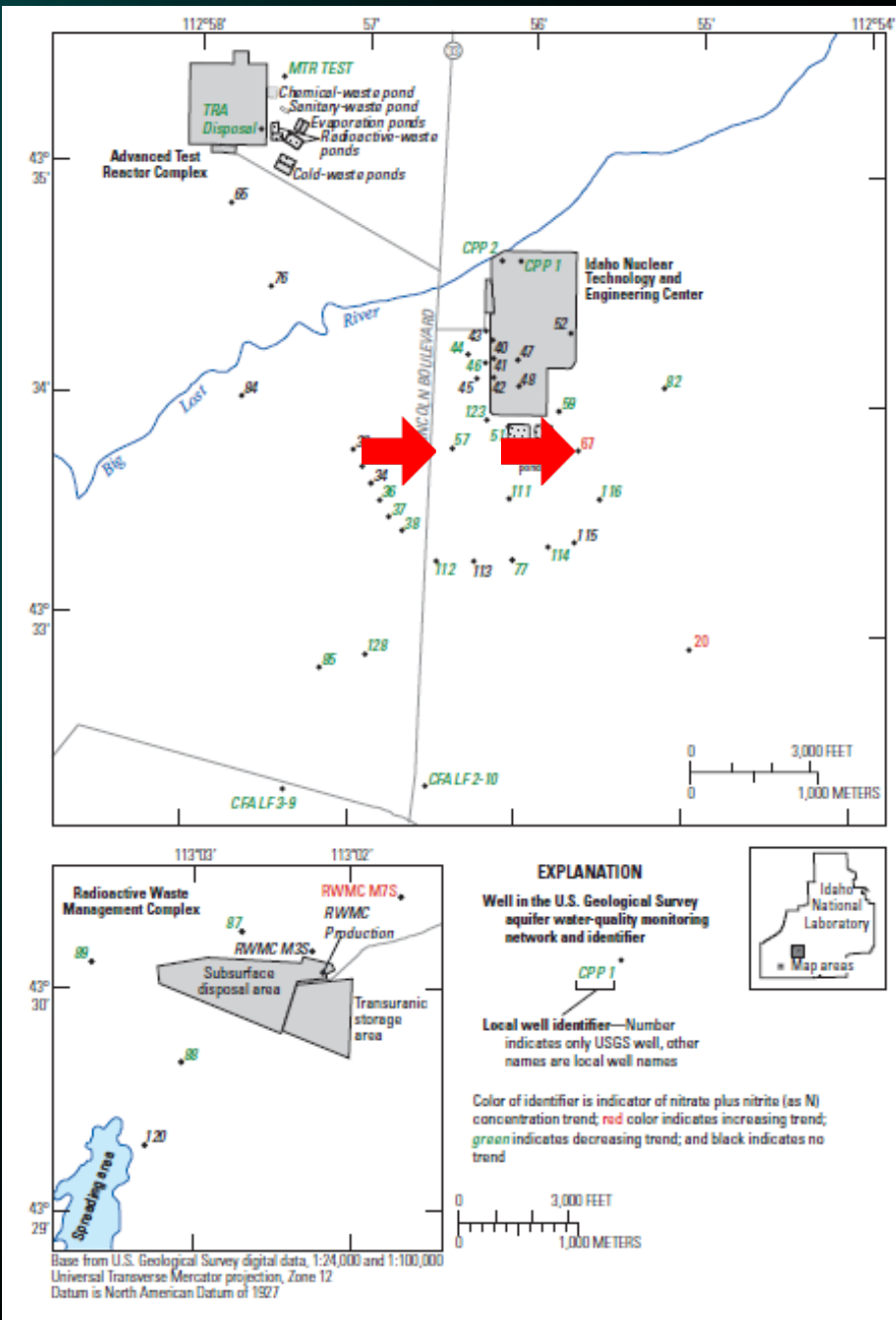
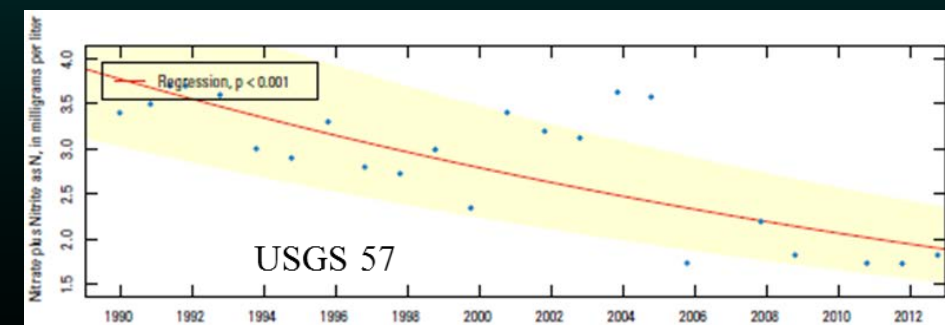
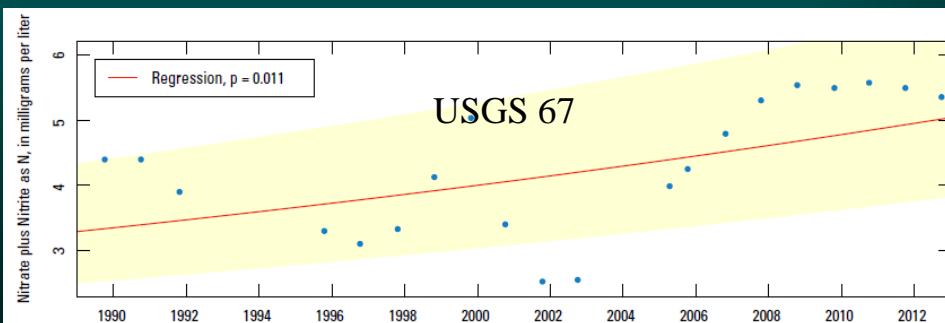
Blue indicates
decreasing trend



Nitrate trends wastewater wells

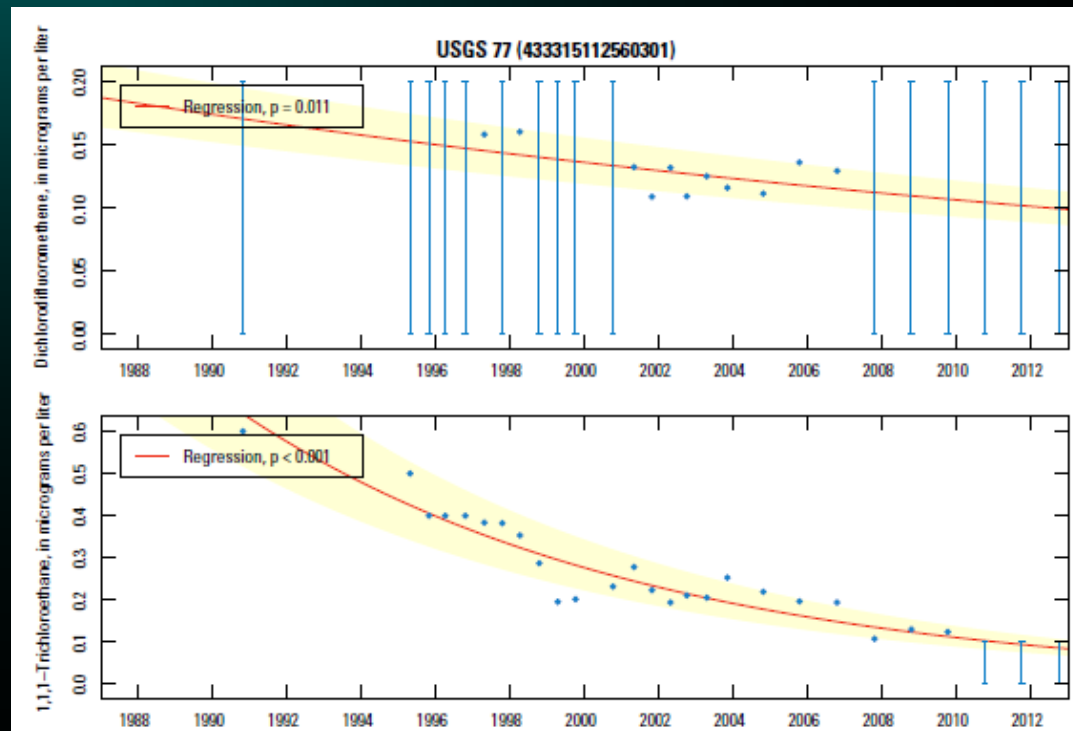
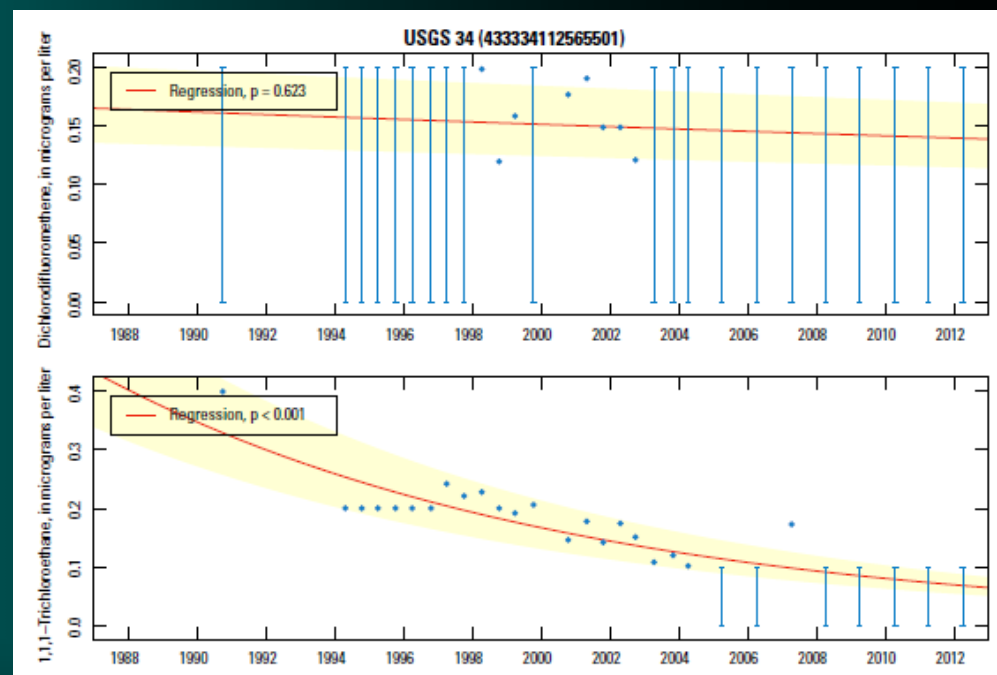
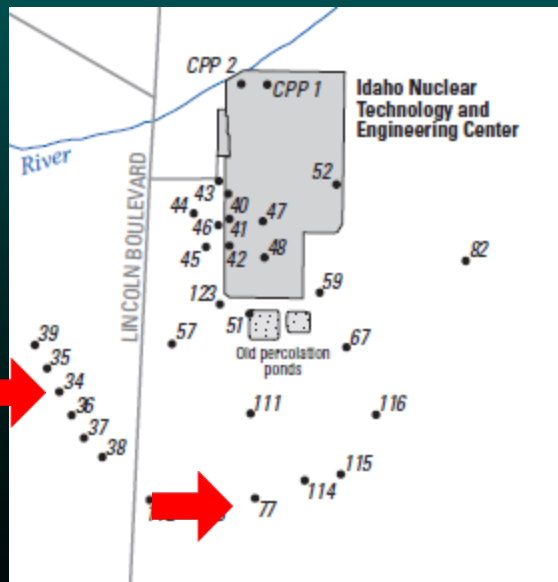
Most of the wells show decreasing trends.

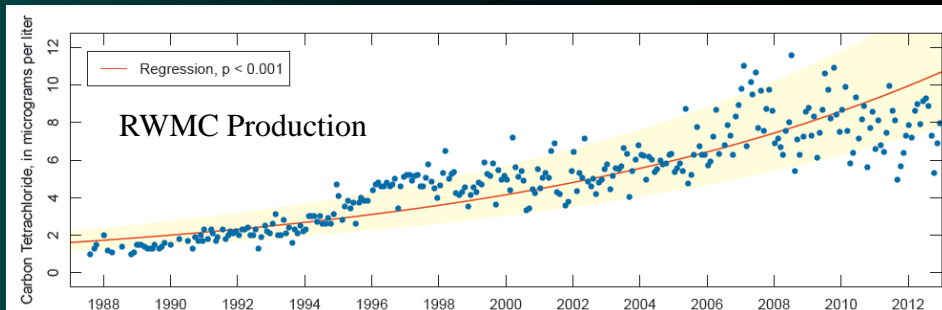
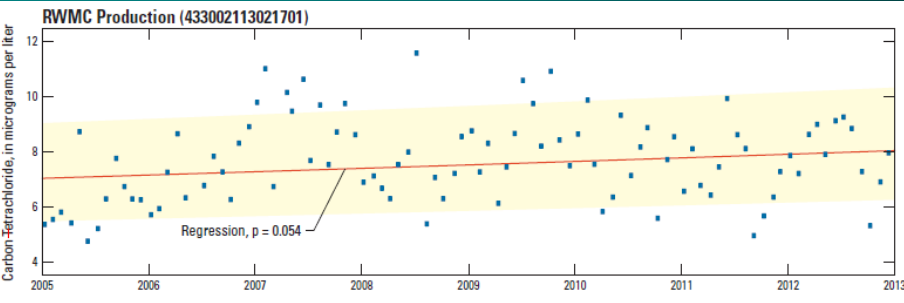
USGS 67 is an exception; but concentrations are well below the MCL of 10 mg/L



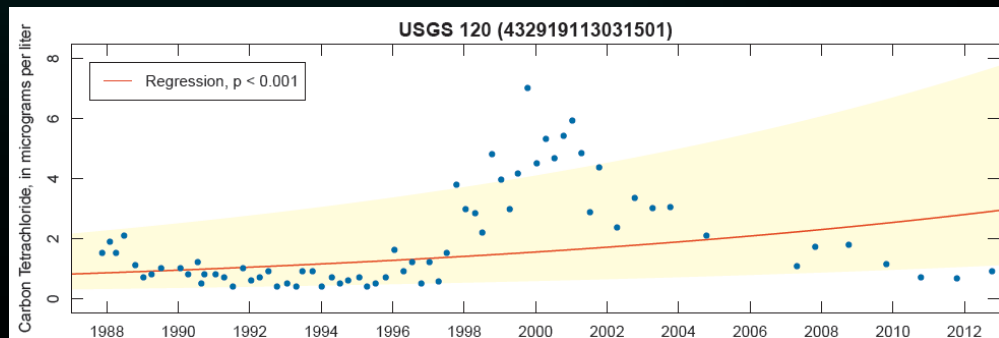
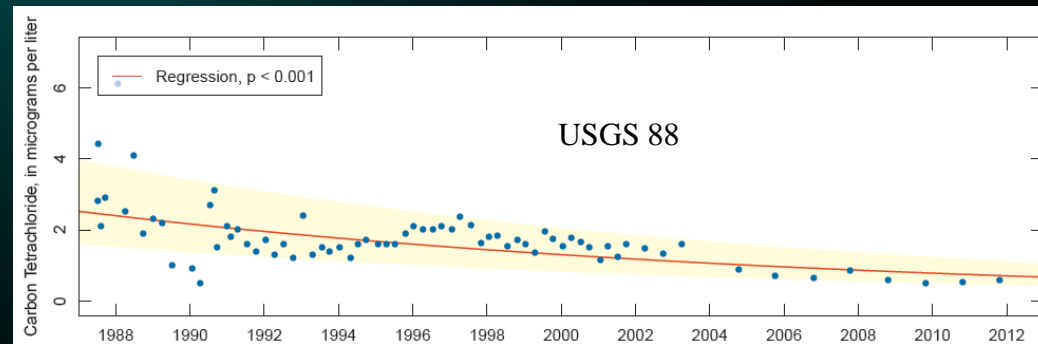
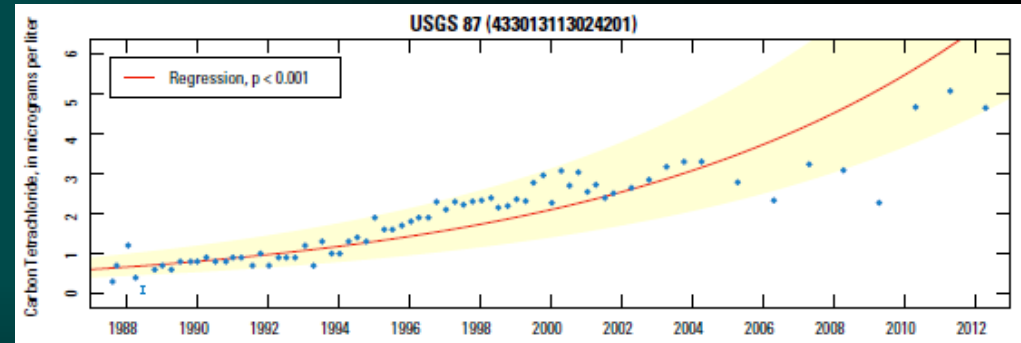
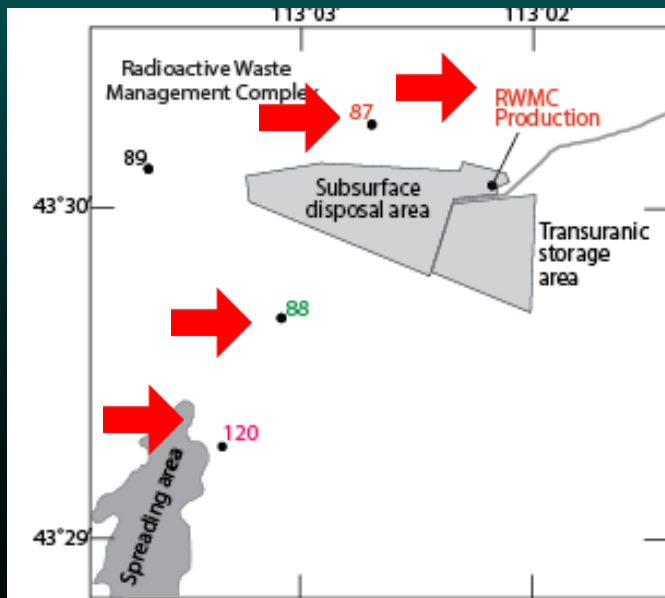
Volatile organics south of INTEC

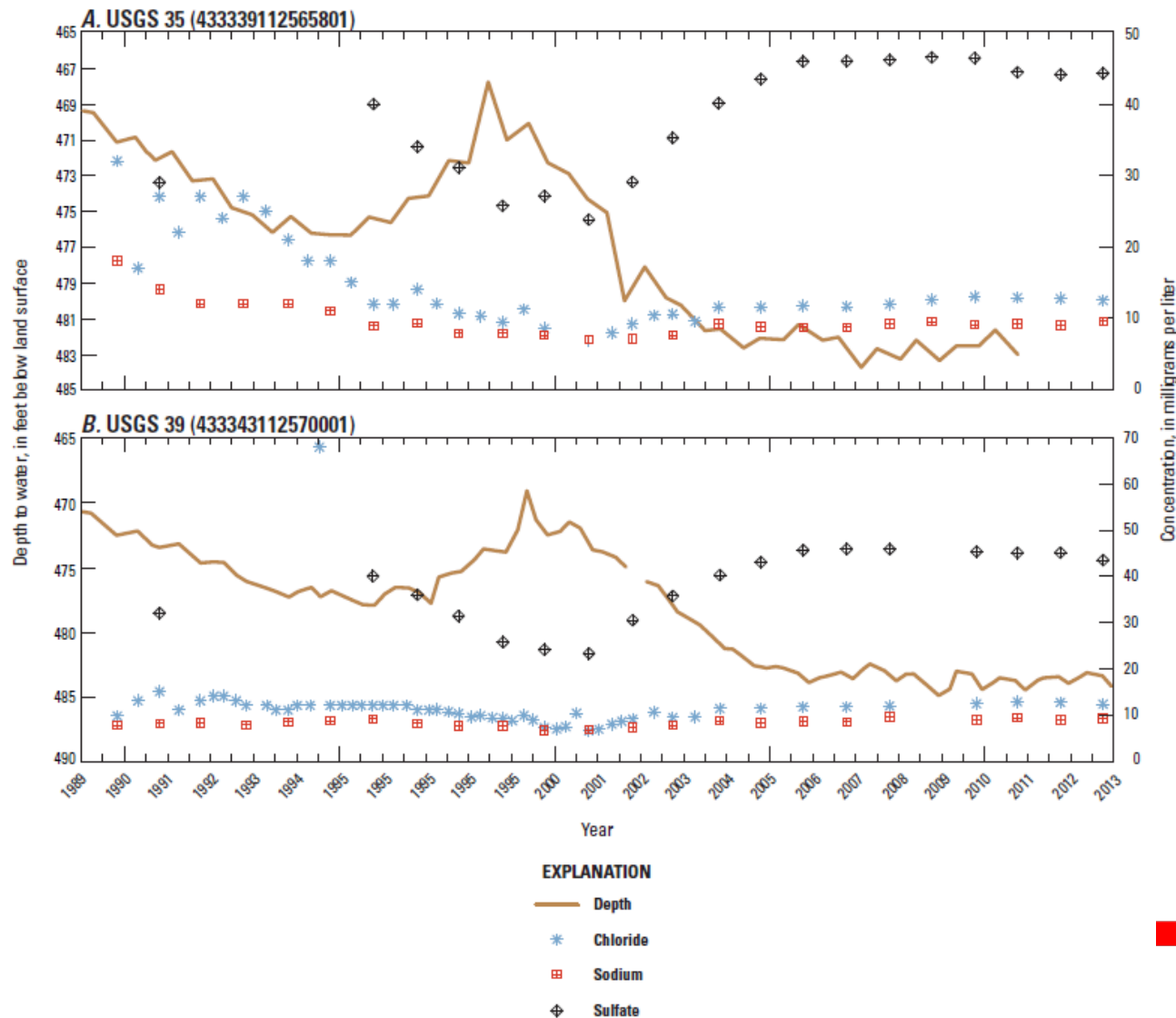
Concentrations of TCE have decreased to below the reporting levels recently; always have been below the MCL of 5 micrograms/liter



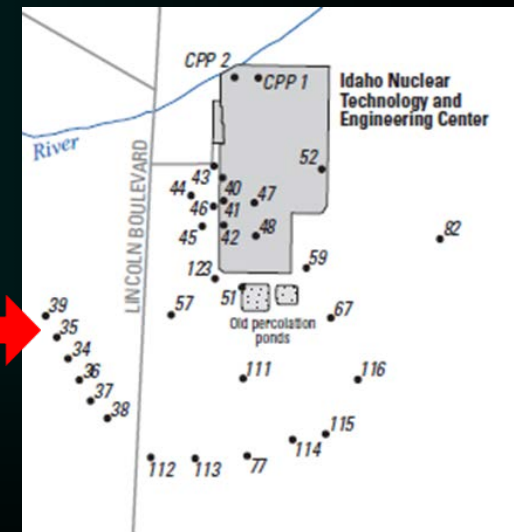


Carbon tetrachloride
Drinking water standard is 5 $\mu\text{g}/\text{L}$





Several of the wells had concentration changes that seemed to be consistent with wet and dry periods of recharge.



Summary

- Tritium and strontium-90 have been mostly decreasing in the aquifer due to discontinued disposal, dilution, dispersion and radioactive decay.
- Chloride, sodium, nitrate, and sulfate have been mostly decreasing in wells near INTEC and ATRC.
- Chloride and sodium are increasing in wells near CFA and RWMC
- Volatile organic compounds are decreasing at and downgradient of INTEC.
- Volatile organic compounds are increasing at 2 wells to the north of RWMC, one well to the south, decreasing in one well to the south



Summary

- Several of the regional wells in the west central part of the INL show mostly decreasing trends for chloride possibly due to dilution by lower concentration Big Lost River water.
- Several wells that sample regionally derived water in the eastern part of the INL show increasing trends or no trend for chloride, sodium, sulfate, and nitrate probably due to anthropogenic influences upgradient of the INL.
- Several wells have concentration changes that appear to correspond to wet and dry cycles of recharge.



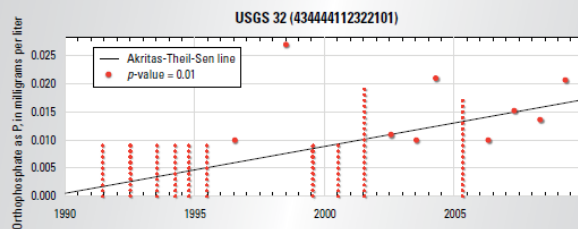
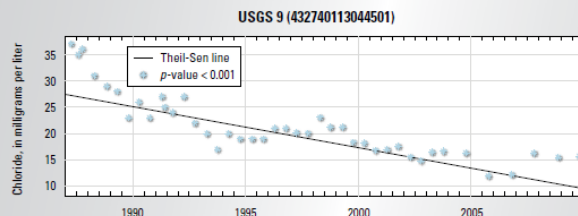
ANY QUESTIONS?



DOE/ID-22219

Prepared in cooperation with the U.S. Department of Energy

Water-Quality Characteristics and Trends for Selected Sites At and Near the Idaho National Laboratory, Idaho, 1949–2009



Scientific Investigations Report 2012–5169

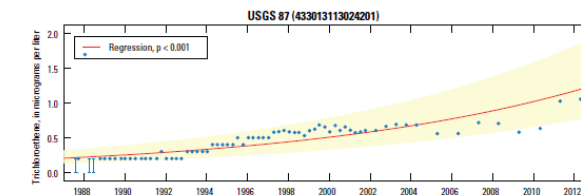
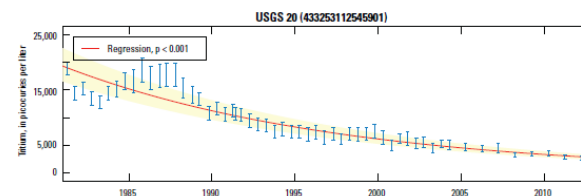
U.S. Department of the Interior
U.S. Geological Survey



DOE/ID-22233

Prepared in cooperation with the U.S. Department of Energy

Water-Quality Characteristics and Trends for Selected Wells Possibly Influenced by Wastewater Disposal at the Idaho National Laboratory, Idaho, 1981–2012



Scientific Investigations Report 2015–5003

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