

# Stormwater Management in the Spokane Coeur d'Alene Corridor and Implications for Groundwater Quality

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**Hydrogeology Symposium**  
**Tacoma, WA**  
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# Overview

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- Hydrogeology 101
- History of Local Issues
- Current Examples of Stormwater Management in Washington and Idaho
- Results of Various Treatment Efficiency Studies
- Indications from Spokane County's Groundwater Monitoring Program



# Spokane Coeur d'Alene Corridor



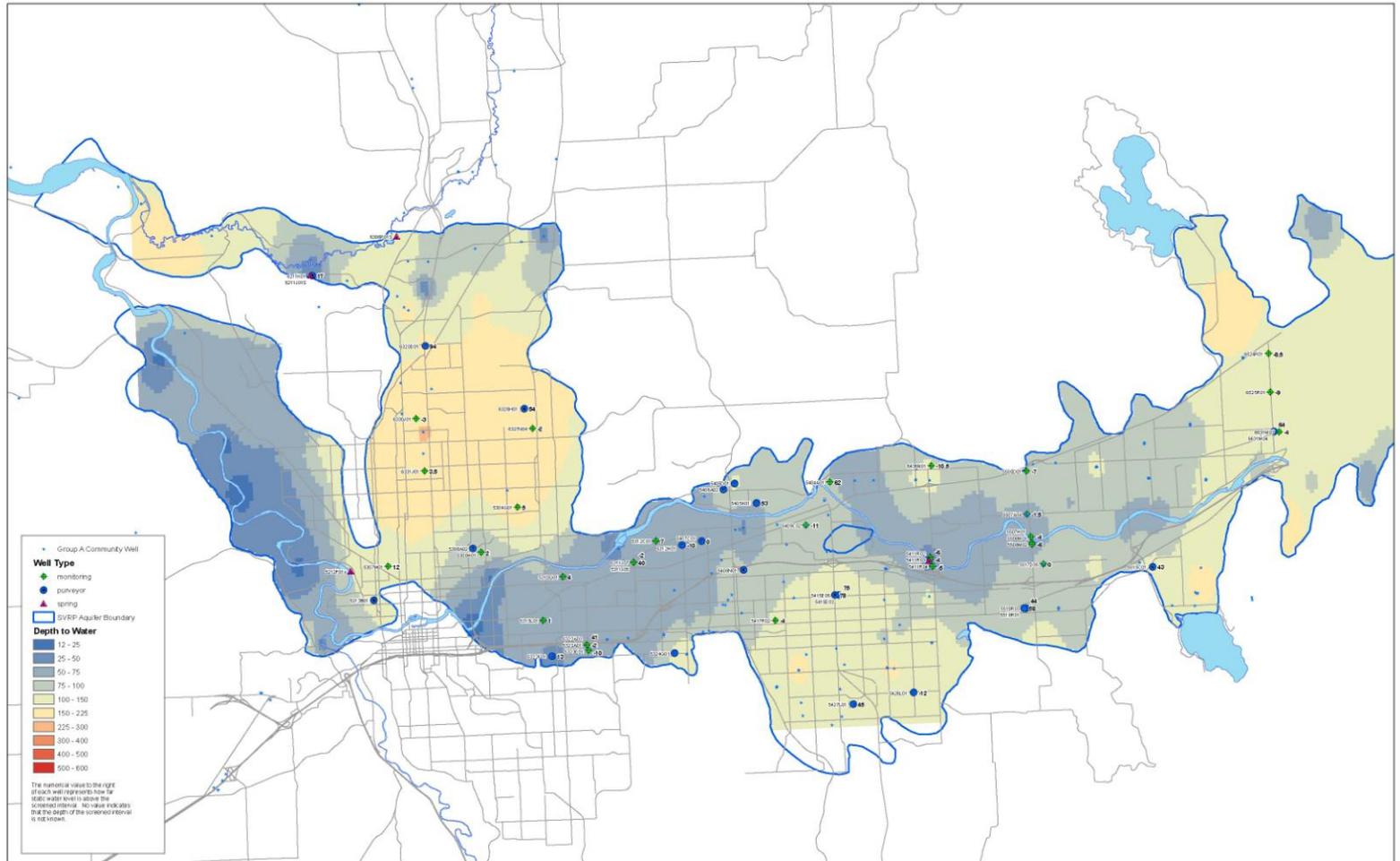
# Spokane Valley / Rathdrum Prairie Aquifer Characteristics





SPOKANE COUNTY

# Groundwater Monitoring Program



# Spokane Valley / Rathdrum Prairie Aquifer Geology



# Spokane Valley / Rathdrum Prairie Aquifer Characteristics

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- Ice Age Glacial Flood Deposits
- Highly Transmissive / Permeable Sand/Gravel
- Sole Source Drinking Water for 500,000 Residents



# A Brief History...

- Storm sewers in City of Spokane initially connected to sanitary sewer system
  - Combined Sewer Overflows to Hangman Creek and Spokane River
  - Active retrofits underway, moving to storage/regional infiltration
  - Legal challenges; recent settlement with River Keeper re: PCB discharges
- Spokane North/Valley historically relied on infiltration...still does



# Guiding Regulations / Documents

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- Federal Sole Source Designation
- Aquifer Sensitive Areas / CARAs
- Spokane Regional Stormwater Manual
  - BMPs Emphahsize Utilization of Existing Drainages and Infiltration
  - 6-month NRCS (Natural Resources Conservation Service) Type II 24-hour storm event is the water quality design criteria
  - Presumptive approach



# Local Examples



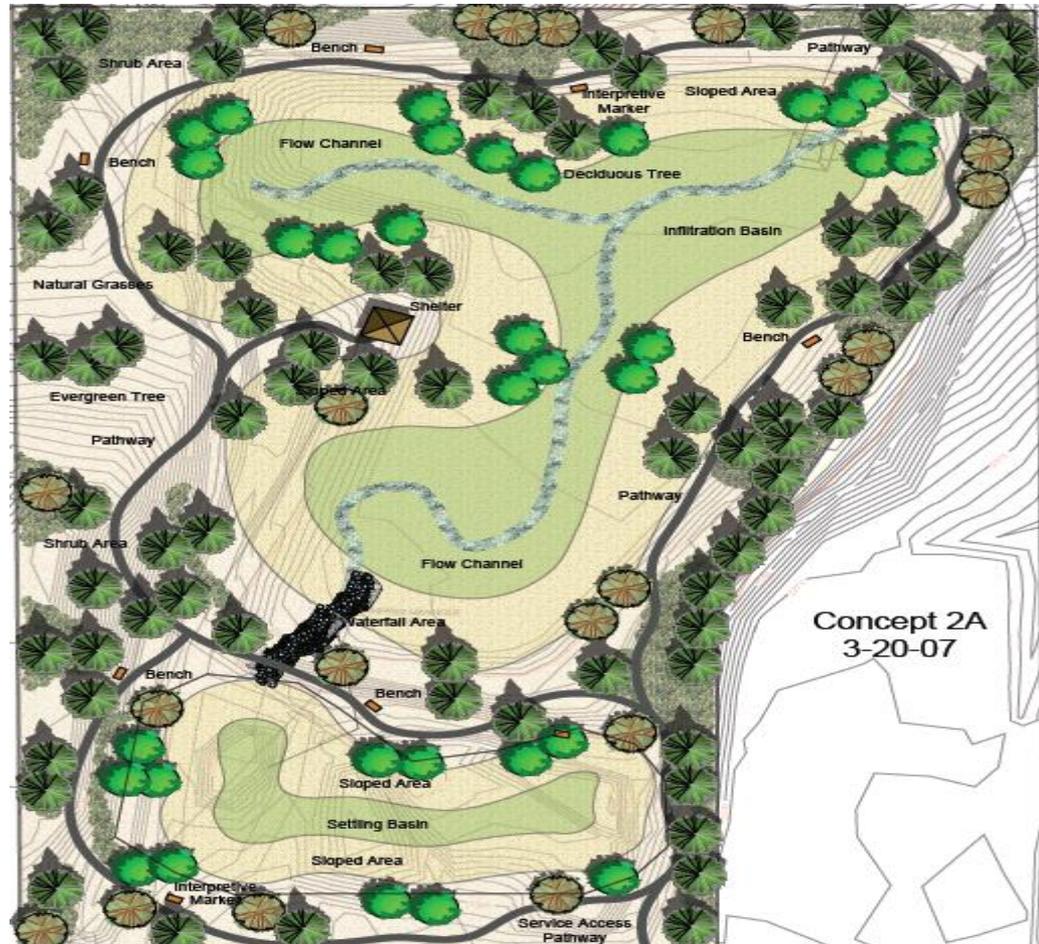
# Local Examples



# Local Examples



# Local Examples



# Local Examples

- Spokane County Moran Prairie Regional Facility



# Local Examples

- Panhandle Health District / Hayden, ID



# Local Examples



# Local Examples



# Treatment Efficiency Studies

- Panhandle Health District (May 2007)
  - Raingarden (bioretention swale) VS. StormTreat (secondary treatment - skimmer followed with wetland plant polish)
    - Bacterial – StormTreat far superior (4-5x), could be indicator of organic mulch in Raingarden
    - TSS – Raingarden marginally superior (both +/- 90%)
    - Metals – Close to equal (+/- 70-90%), except that Raingarden was inferior in Total Cu removal (+/-40%)
    - Nutrients – (N, P) Close to equal (+/- 50%-80%)
    - Heavy hydrocarbons – Close to equal, both more effective with diesel



# Treatment Efficiency Studies

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- Spokane County (February 2003)
  - Spokane area Stormwater Quality and BMP Practices (EPA, WDOE)
    - Evaluation of biofiltration swales, oil/water separators, and drywells
      - Focus on residential, commercial, industrial sources
      - 8 sampling sites in Spokane Valley, variously fit with flow recording and sampling devices
      - Extensive analytical testing during storm events in 2002 and 2003



# Treatment Efficiency Studies

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- Spokane County (February 2003)
  - Findings – Mixed/Variable results
    - storm event size, age of facilities
      - Oil / Water Separators – BTEX / Oils evaluated
      - Drywells – mixed results/ up and down
      - Biofiltration Swale – inconclusive, thought to be a function of imported soil and lack of mature vegetation
  - Facilities are still in place, under control of City of Spokane Valley, and provide opportunity for additional testing.



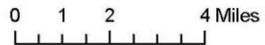
# Groundwater Monitoring Program

**Figure 1**  
**Monitoring Locations**

**Well Type**

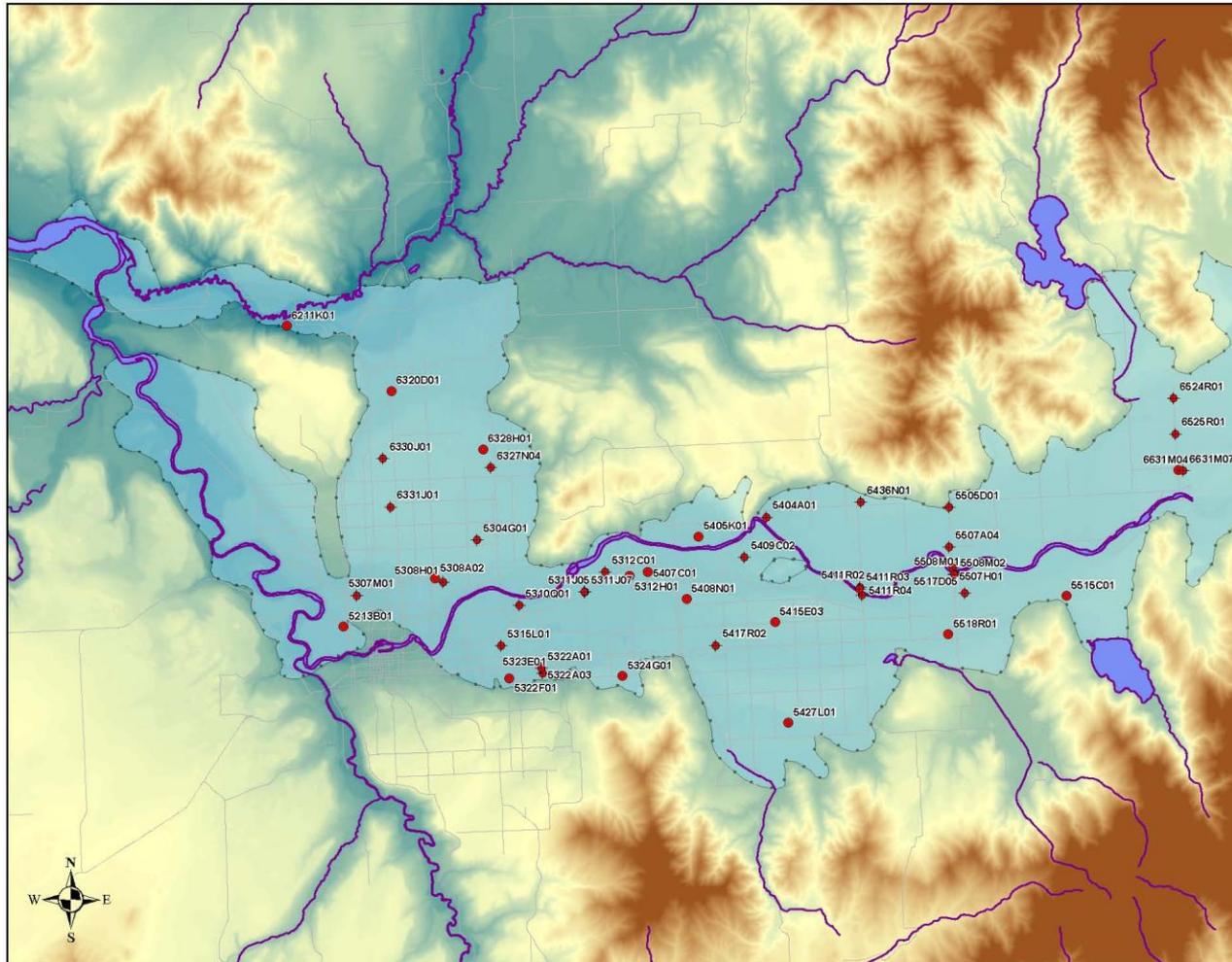
- ◆ monitoring
- purveyor

SVRP Aquifer Boundary

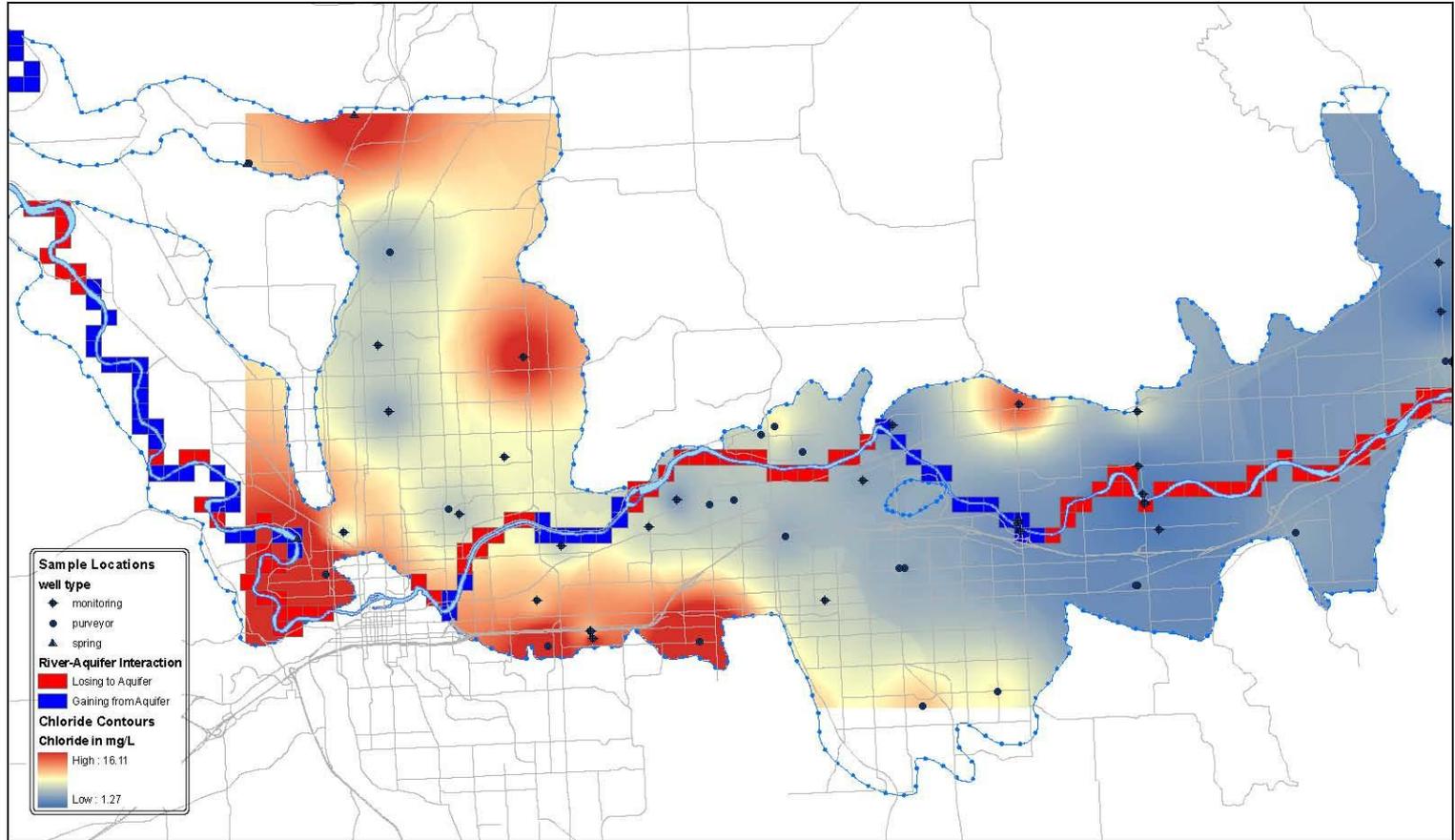


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WATER RESOURCES

**2008 Annual Water Quality  
Monitoring Report**



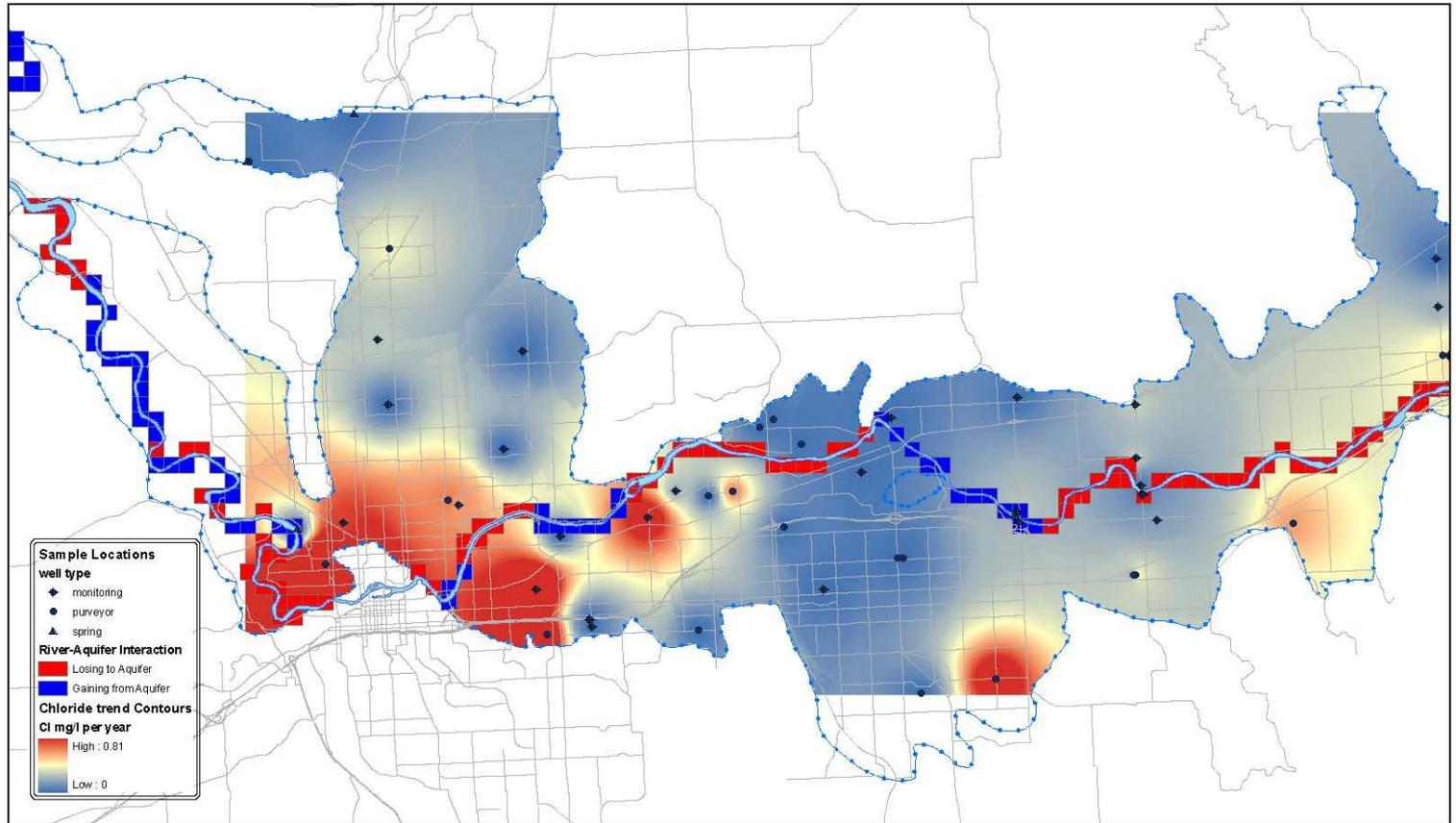
# Groundwater Monitoring Program



Chloride Contours Spokane Valley-Rathdrum Prairie Aquifer

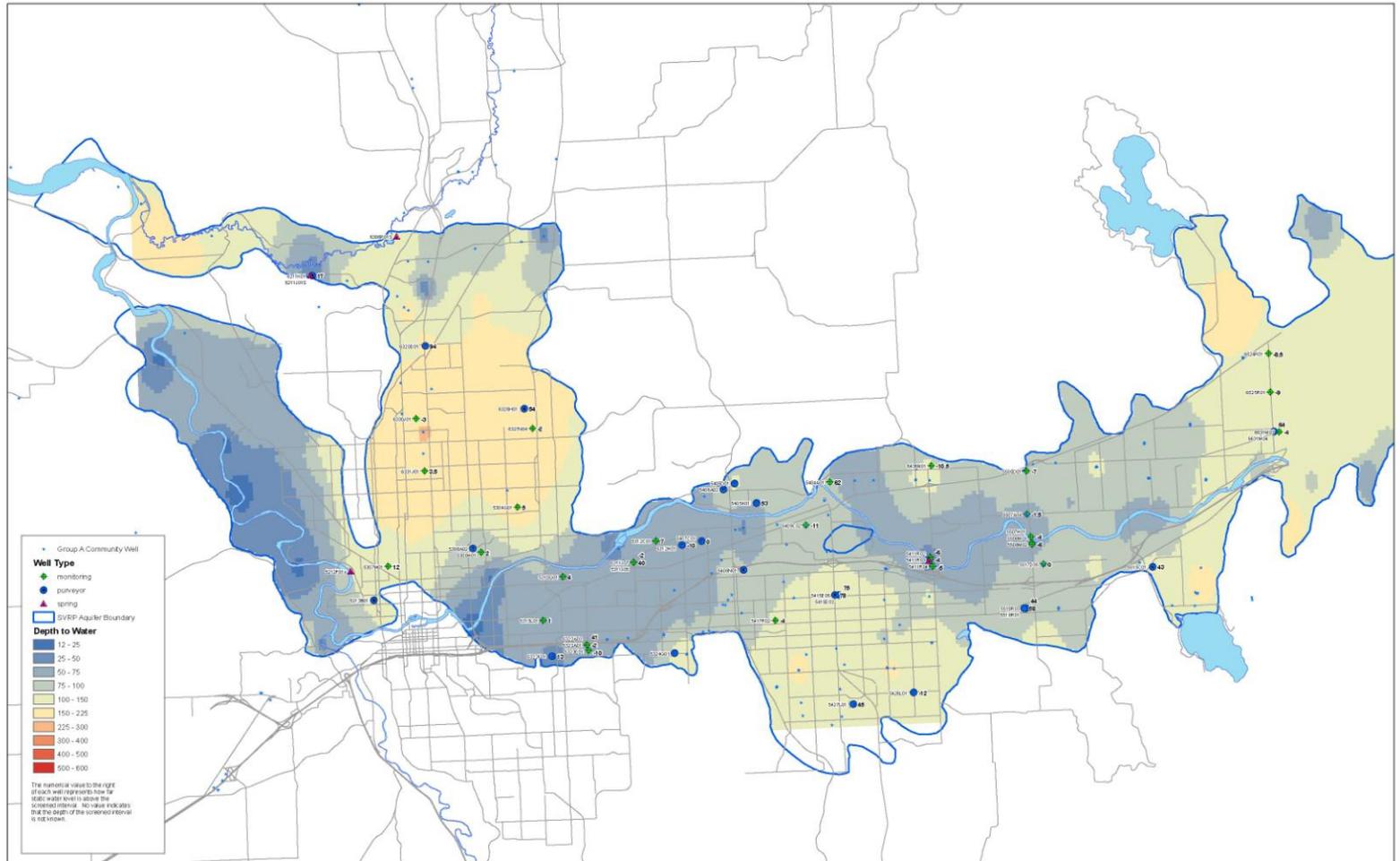


# Groundwater Monitoring Program



Chloride Trend Contours Spokane Valley-Rathdrum Prairie Aquifer

# Groundwater Monitoring Program



# Summary

- Local hydrogeology very favorable to infiltration / dilution
- Efforts underway to remove municipal stormwater from sanitary systems and to get out of the river...a regional aquifer protection issue in City of Spokane
- Little to no information on treatment efficiencies of local BMPs; regional manual is presumptive. Some testing, lots of opportunity.
- Local GW monitoring efforts clearly show upward trends in chlorides, esp. where dtw is shallow.



# References

- Idaho
  - Panhandle Health District
    - [www.phd1.idaho.gov](http://www.phd1.idaho.gov)
    - *PHD Emerald Gardens LID Demonstration Project*, Duerock, September 2007
    - *StormTreat / Bioretention Stormwater Treatment Evaluation*, 319 NPS Grant # S081, IDEQ, Duerock, June 2007



# References

- Washington / Spokane County
  - *Swale Evaluation Project*, TetraTech, 2004
  - *Spokane Area Stormwater Quality and BMP Practices*, TetraTech, 2003
  - Stormwater Utility Information
    - [www.spokanecounty.org/stormwater](http://www.spokanecounty.org/stormwater)
  - Water Quality Monitoring Information
    - [www.spokanecounty.org/wqmp](http://www.spokanecounty.org/wqmp)



# Questions

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