The SVRP Aquifer: How Does it Work?

Prepared by
John J. Porcello, LHG (Washington), RG (Oregon)
GSI Water Solutions, Inc.

Prepared for the
Water Law in Eastern Washington Conference

May 28, 2026

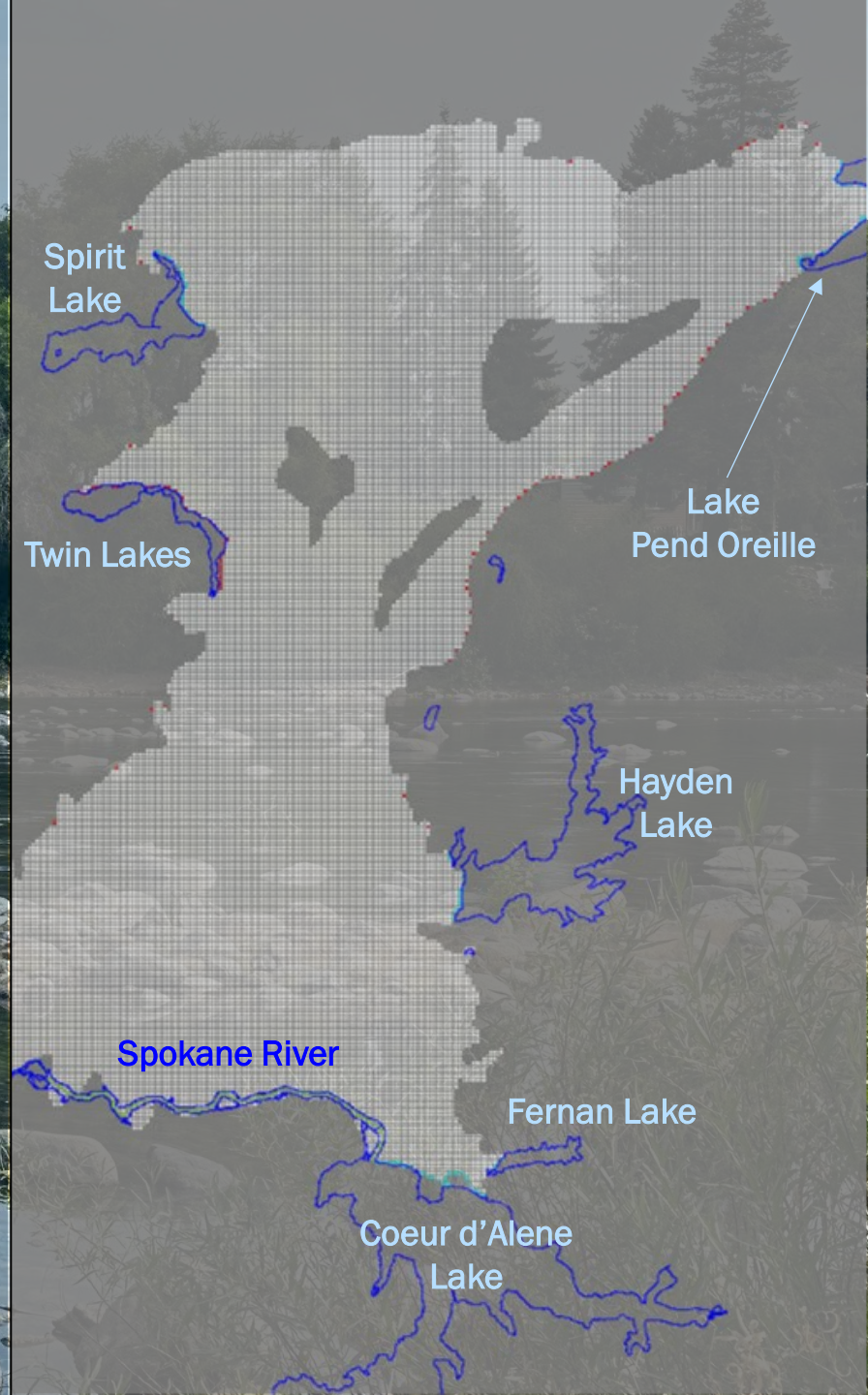

Photo by John Porcello
Sept. 11, 2025

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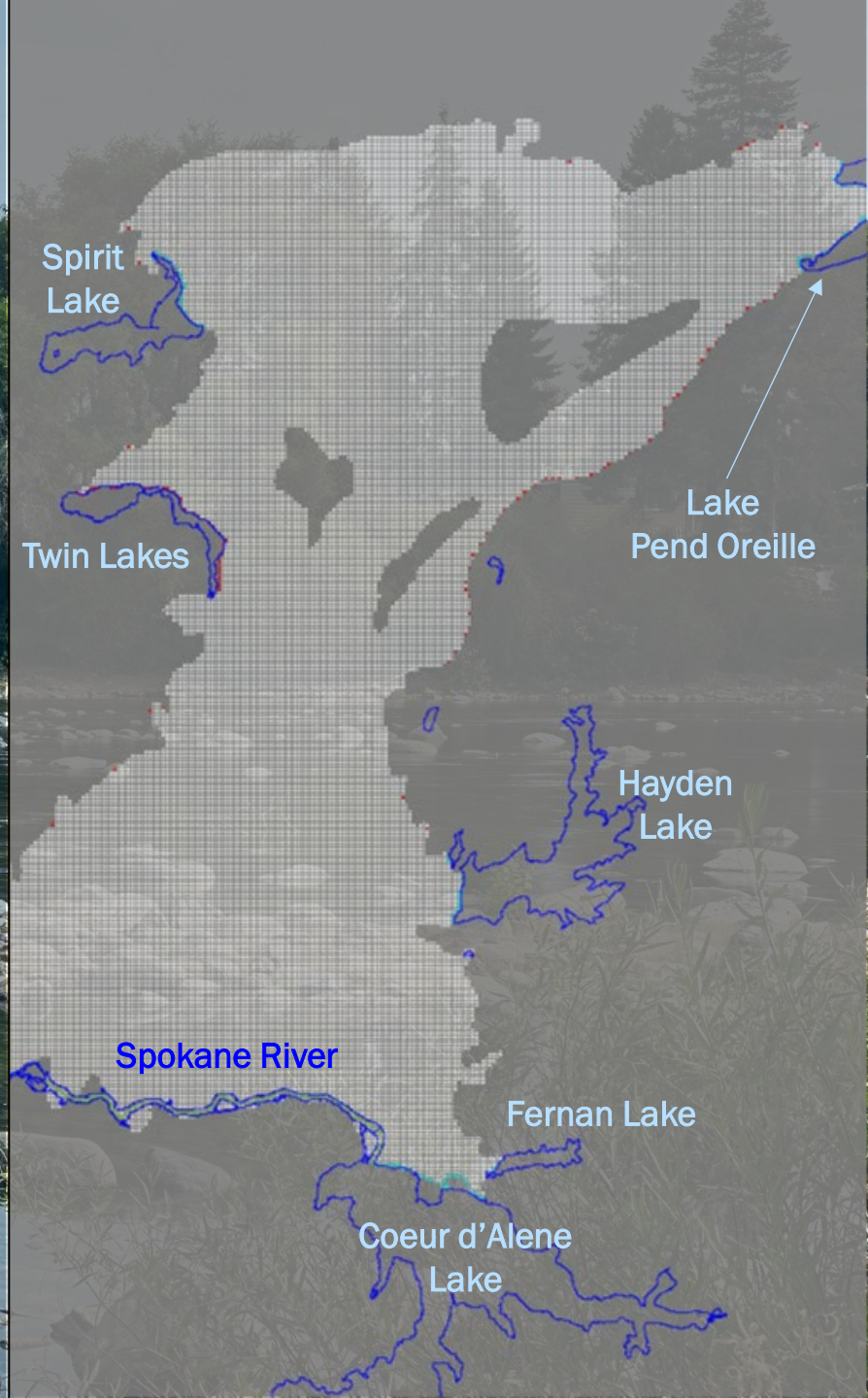

The Aquifer And The Spokane River: Partners In Water!

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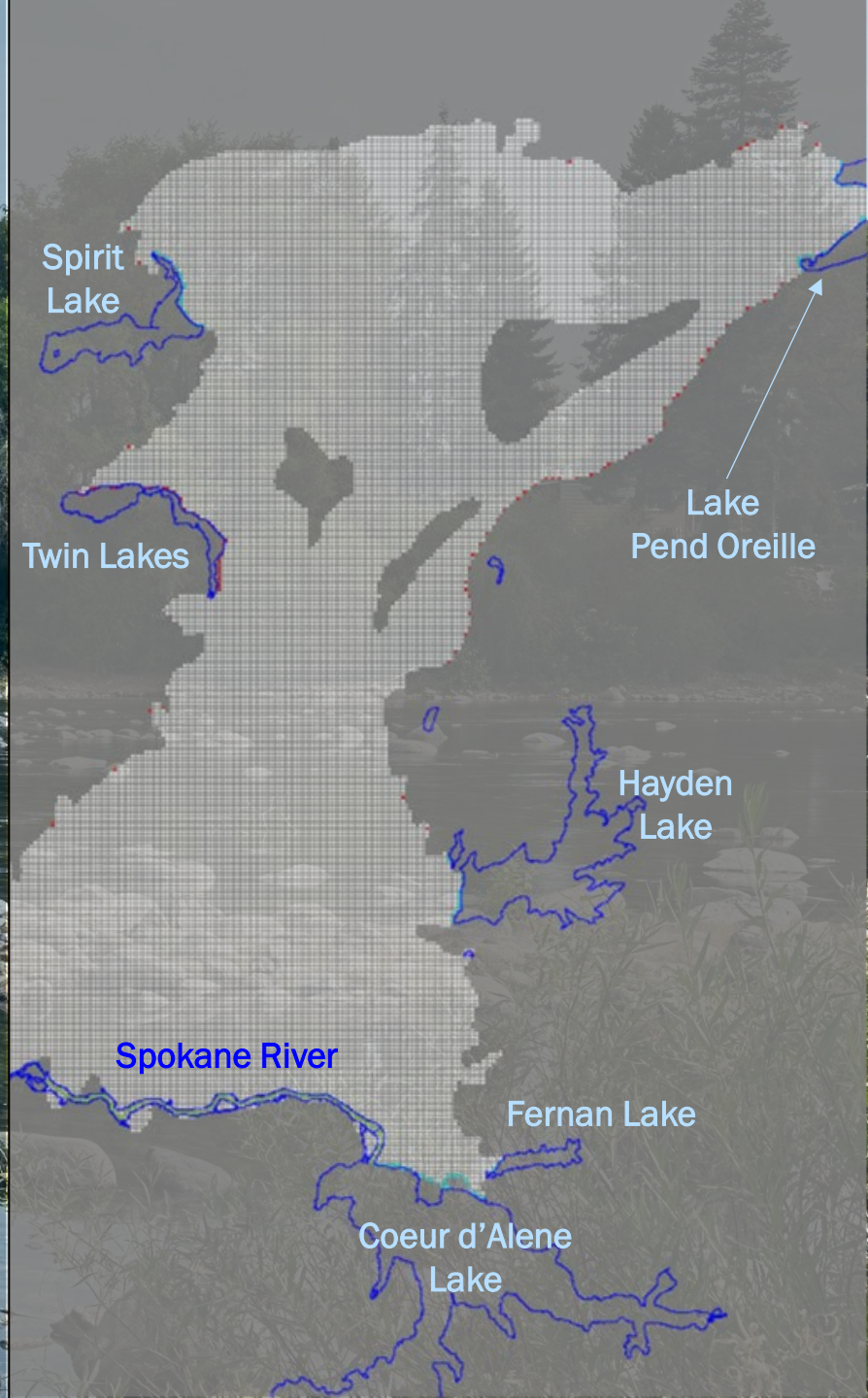


Water Agency Collaboration

Entities Conducting Groundwater Supply Management and Planning in the SVRP Aquifer

Too Many Cities and Other Municipal Water Providers to List Here!

Local Water Purveyor Groups Leading Modeling Efforts in Idaho and Washington

IWAC – Idaho Washington Aquifer Collaborative

SAJB – Spokane Aquifer Joint Board

City of Spokane

Local Agencies

Spokane County, Washington

Kootenai County, Idaho – Kootenai County Aquifer Protection Board

Public Health – Panhandle Health District

Panhandle Health District I

Serving Benewah, Bonner, Boundary, Kootenai, and Shoshone counties of Idaho

Other Entities

State Agencies

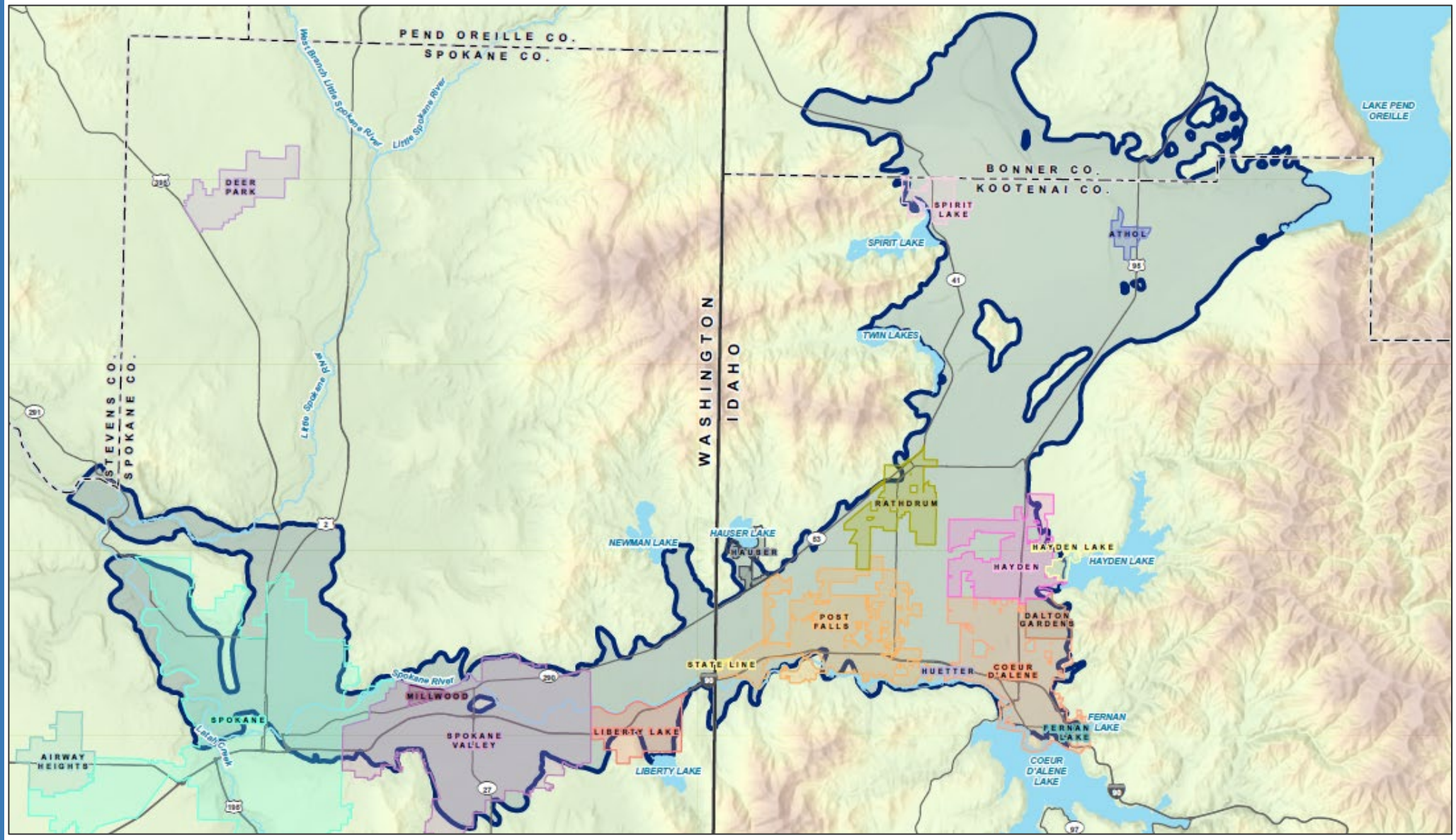
Idaho Department of Environmental Quality
Idaho Department of Water Resources
Washington State Department of Health
Washington State Department of Ecology

Research Community

U.S. Geological Survey
USDA Natural Resources Conservation Service
Idaho Water Resources Research Institute
University of California, Merced

The Spokane Valley – Rathdrum Prairie Aquifer System

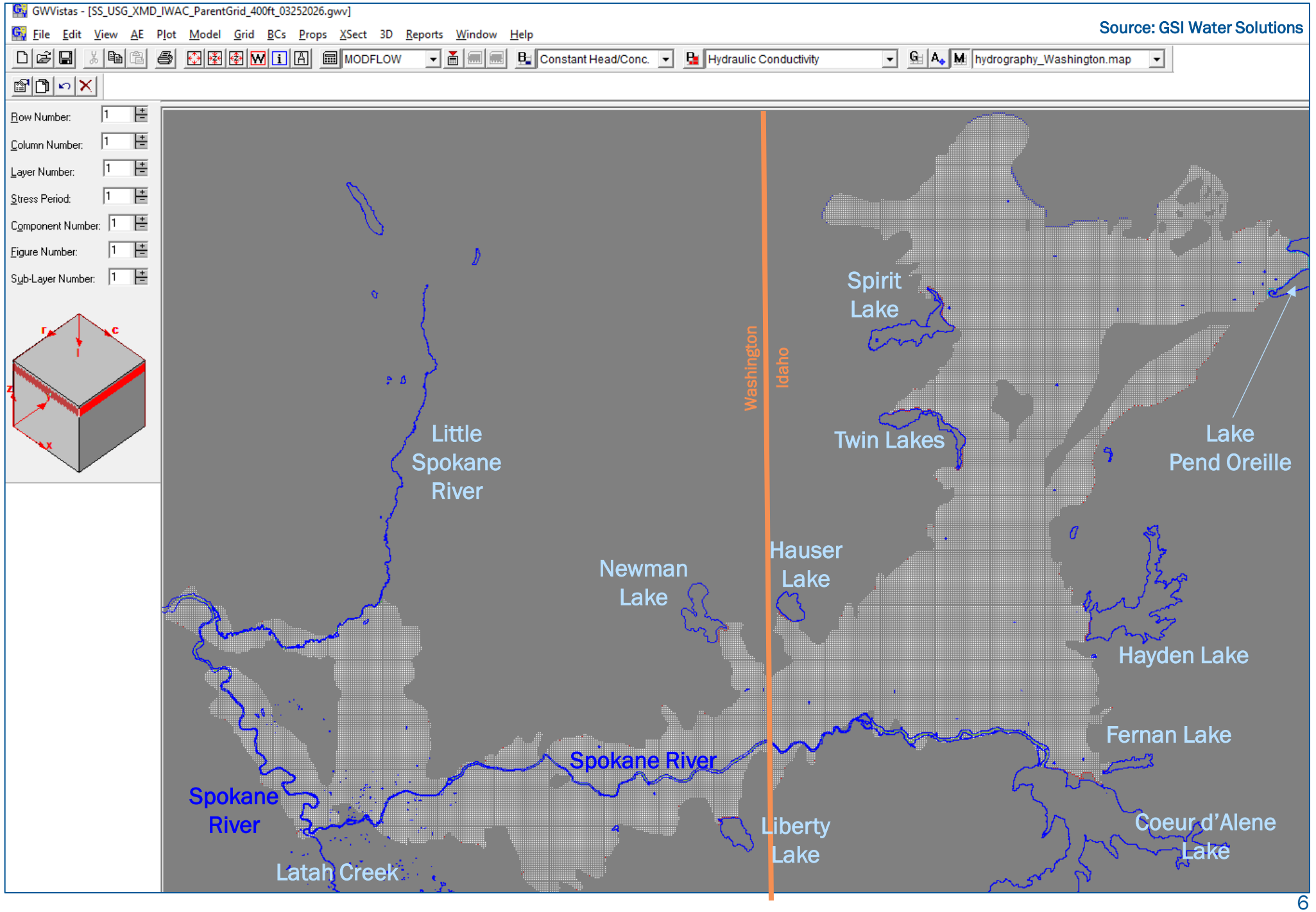
An EPA-Designated Sole-Source Aquifer



Source: GSI Water Solutions

The Local Water Purveyors' Groundwater Flow Model

Parent Grid



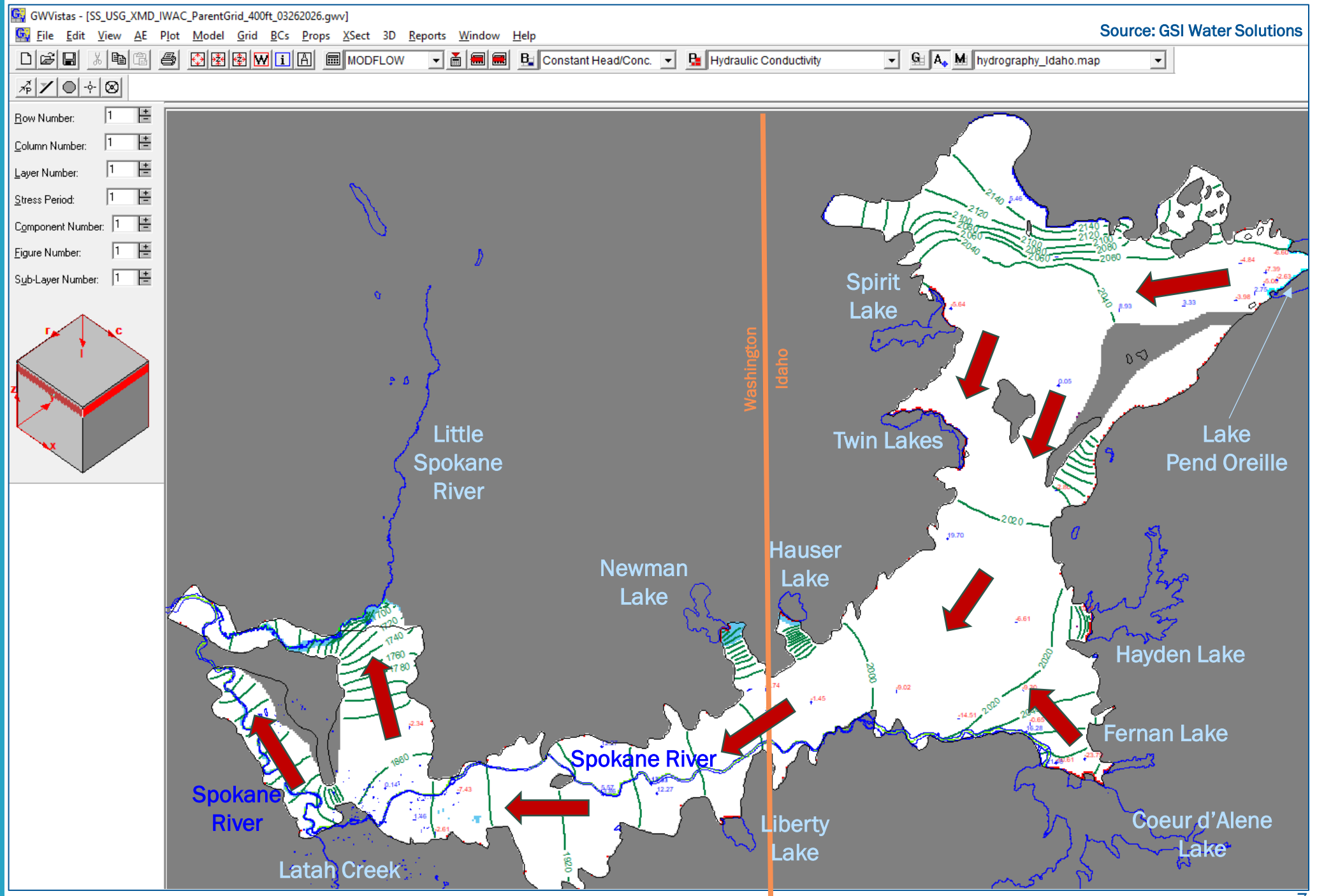
IWAC IDAHO WASHINGTON AQUIFER COLLABORATIVE

SAJB

CITY OF SPOKANE

The Local Water Purveyors' Groundwater Flow Model

Groundwater Levels and Flow Directions

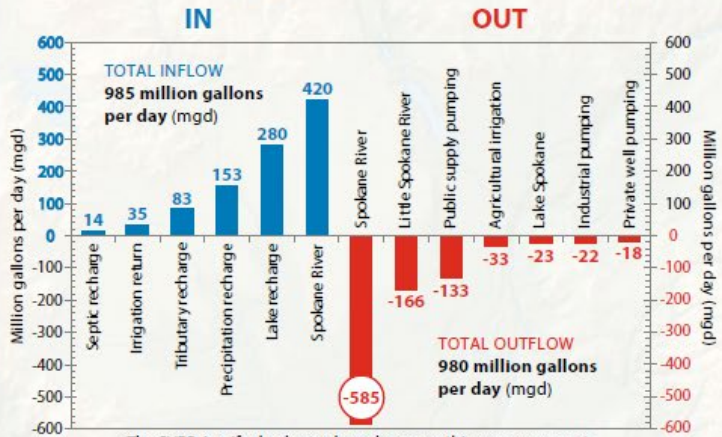


GSI Water Solutions

Aquifer Water Budget

Aquifer Atlas, 2023

Balancing the water budget.



The SVRP Aquifer budget values shown on this page represent average conditions of all days in the years 1995 to 2005.

Water entering the SVRP Aquifer

Water leaving the SVRP Aquifer

The Spokane Valley-Rathdrum Prairie (SVRP) Aquifer is dynamic with water flowing into and out of the system. Like a household budget, a water budget is an accounting of the amount and source of water recharging the SVRP Aquifer, and the amount and destination of water discharging from the SVRP Aquifer. This water budget is organized into two categories: inflow (water that recharges or flows IN to the SVRP Aquifer) and outflow (water that discharges or flows OUT of the SVRP Aquifer). In any successful budget, the IN and OUT numbers should match. More data could narrow the small gap in this budget.

The Spokane River plays a key role in the aquifer water budget: the river provides about 43% of the SVRP Aquifer inflow, and it receives almost 60% of the SVRP Aquifer outflow. The lakes near the SVRP Aquifer contribute about 28% of the inflow.

Human uses are only about 21% of the SVRP Aquifer outflow. Look on page 14 to find out how much SVRP Aquifer water people in Idaho and Washington use.

153 mgd enter the aquifer from precipitation that lands on the ground above the aquifer.

Spirit Lake adds 36 mgd

Lake Pend Oreille adds 43 mgd

Twin Lakes add 26 mgd

Agricultural and golf course irrigation returns 35 mgd

Tributary basins add 83 mgd

Irrigation only wells pump 33 mgd

Hayden Lake adds 45 mgd

Hayden Lake recharge

Newman Lake adds 15 mgd

Hauser Lake adds 13 mgd

Subsurface flow to Lake Spokane takes 23 mgd

This is Waikiki Spring discharging to the Little Spokane River.

166 mgd discharge to the Little Spokane River

Public supply wells pump 133 mgd

Public water systems pump, store, and deliver SVRP Aquifer water.

585 mgd discharge to the Spokane River

The Spokane River adds 420 mgd

Domestic wells pump 18 mgd

Fernan Lake adds 10 mgd

Industrial wells pump 22 mgd

Liberty Lake adds 4 mgd

Septic systems add 14 mgd

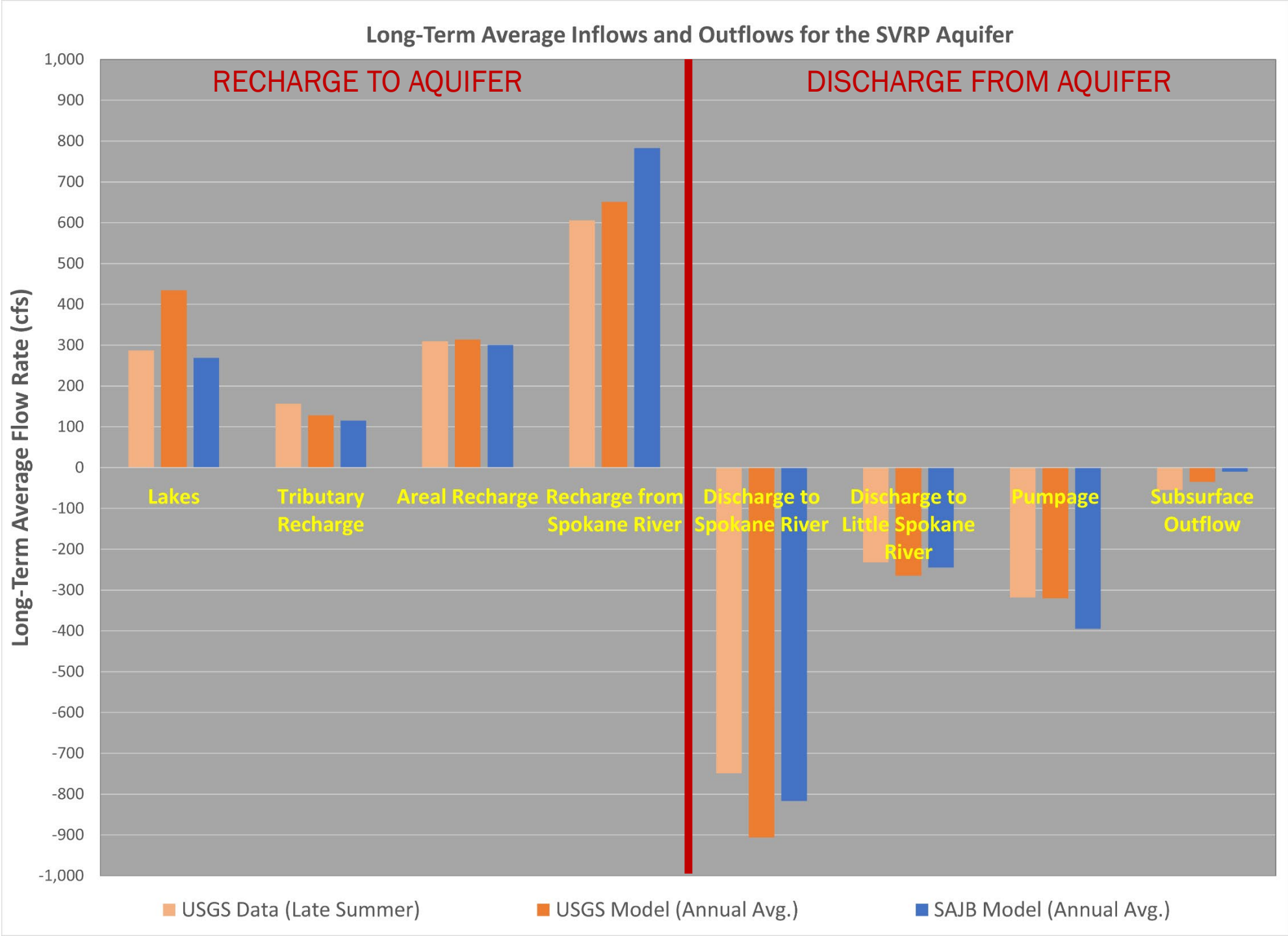
Coeur d'Alene Lake adds 89 mgd

Water that goes down a storm drain is included with the precipitation that lands on the ground.

The information on this page is adapted from USGS Scientific Investigations Report 2007-5044.

Aquifer Water Budget

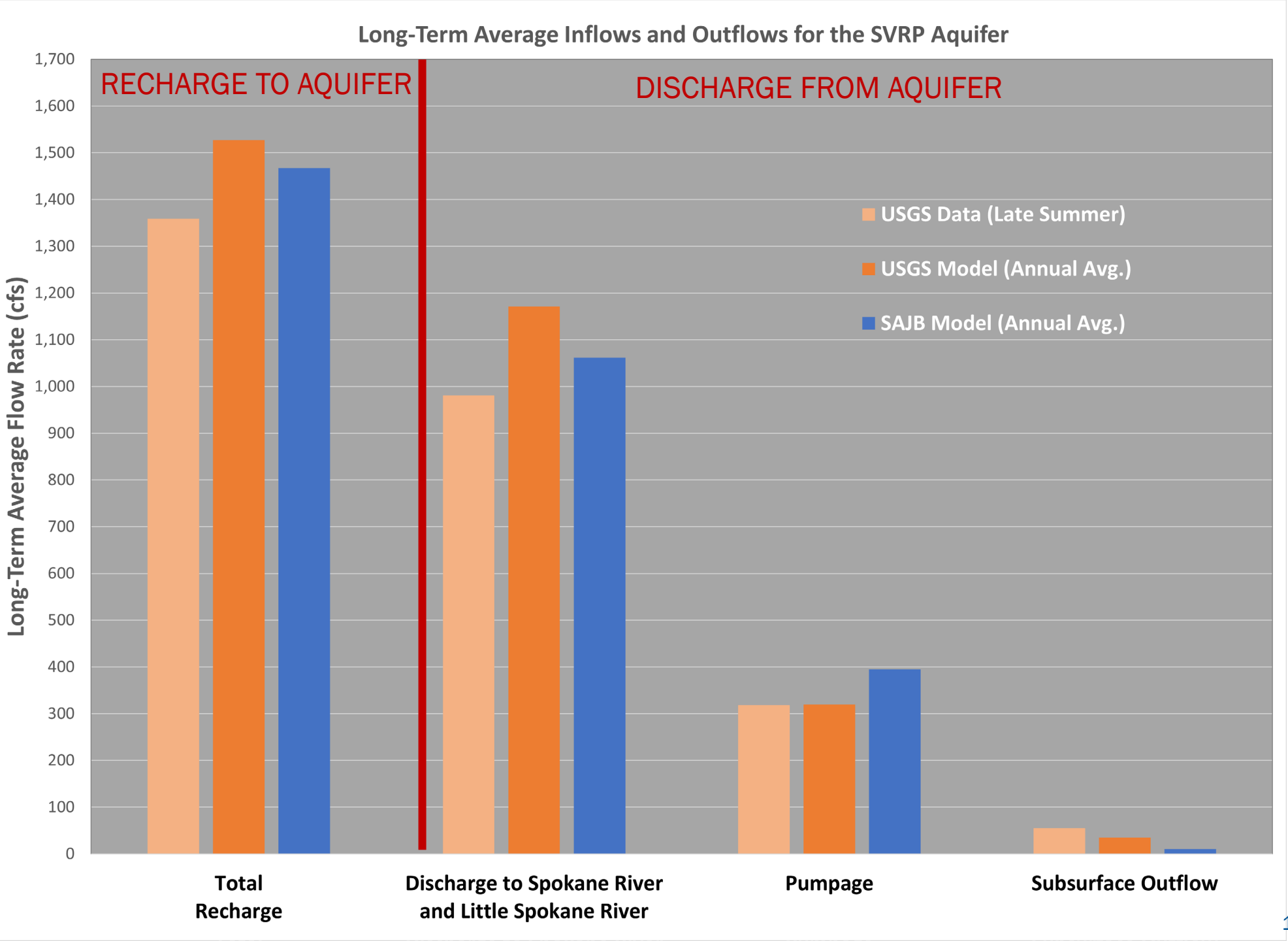
Estimates by USGS (2007) and SAJB (2025)



GSI Water Solutions

Aquifer Water Budget

Estimates by USGS (2007) and SAJB (2025)

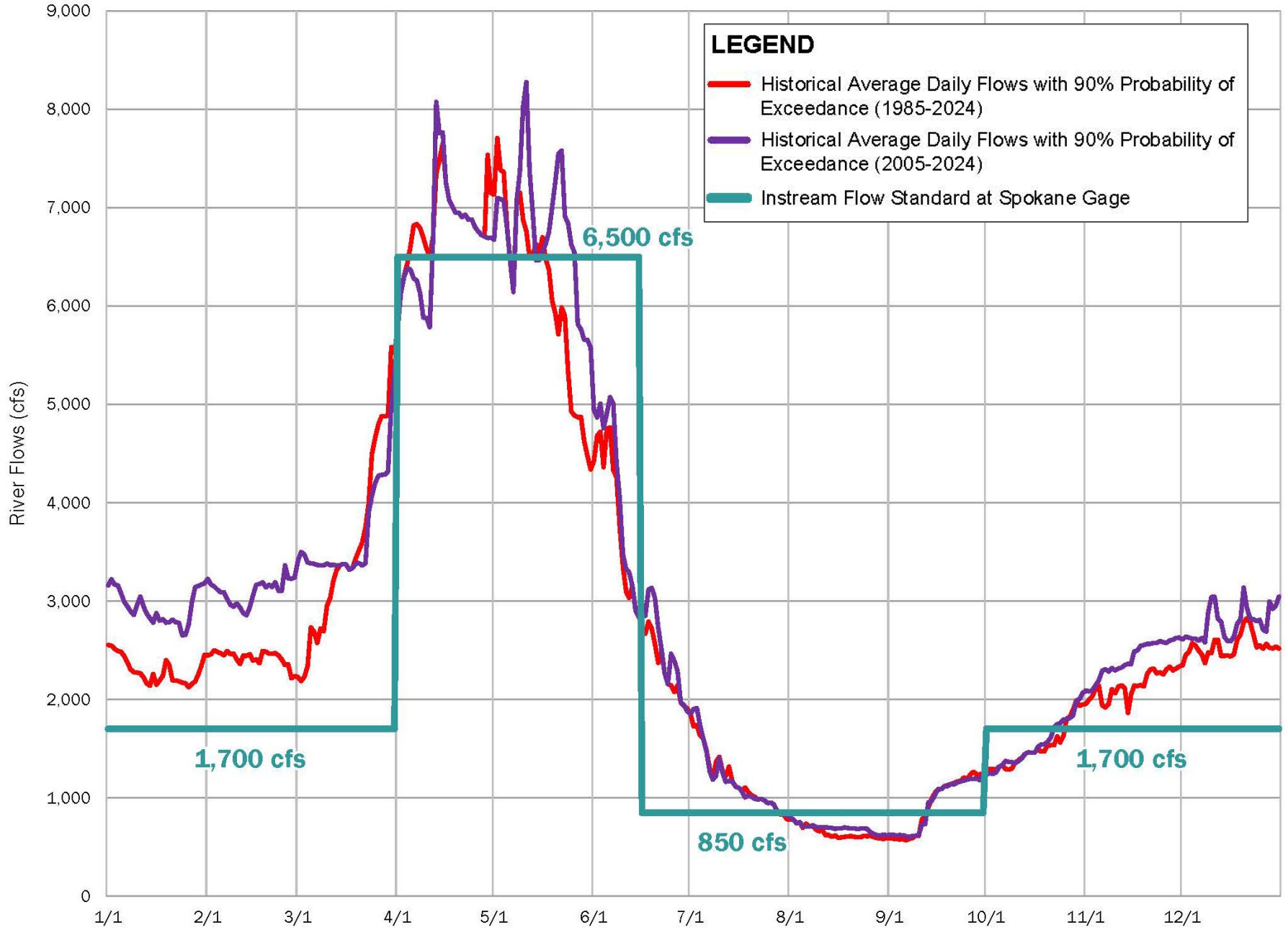


GSI Water Solutions

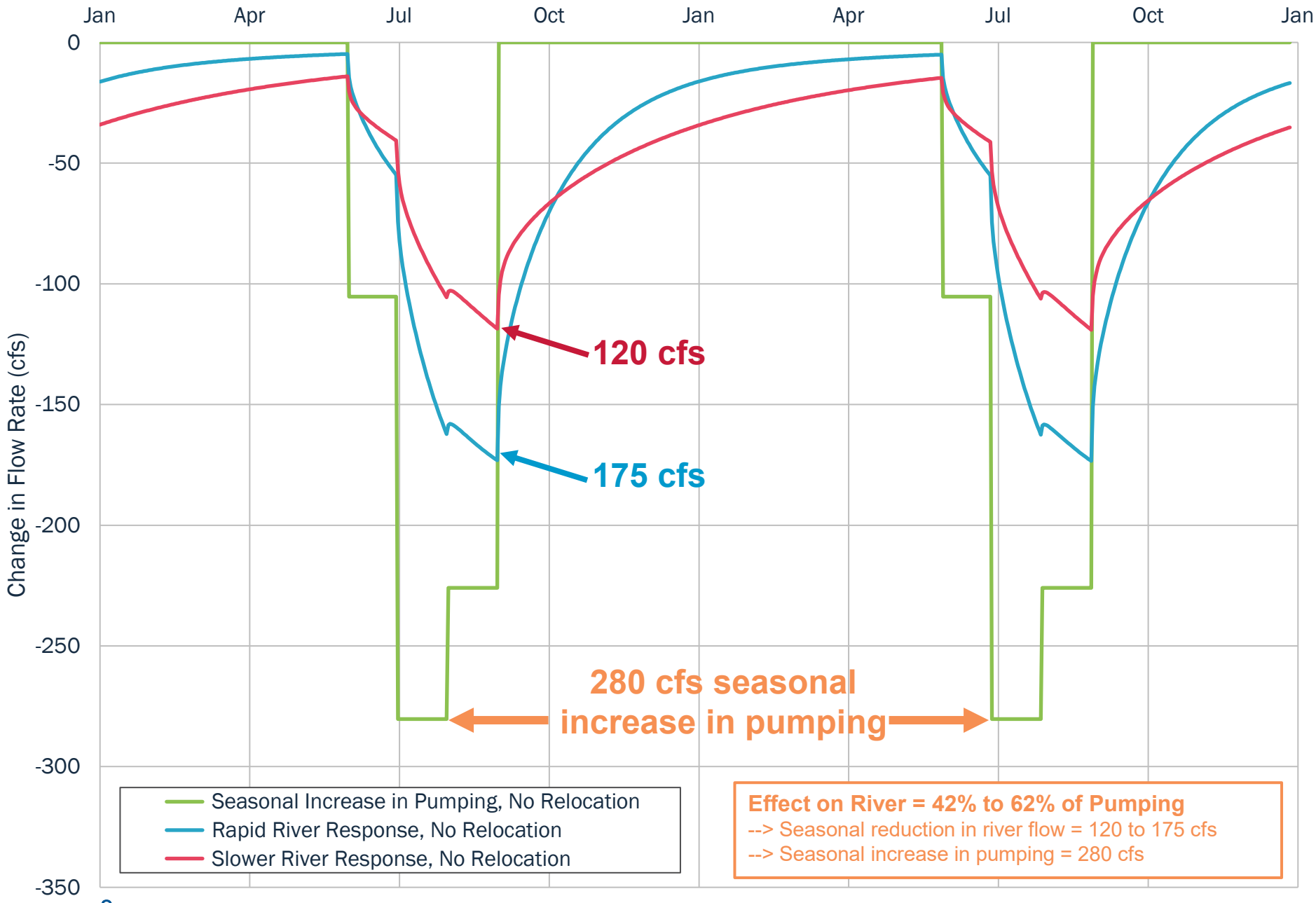
Historical Streamflow vs. Instream Flow Standard at Spokane Falls

(1985-2024)
(2005-2024)

Source: GSI Water Solutions



Modeling the Effect of Mid-2010s Peak-Season Collective Pumping by Washington Purveyors on Streamflows at Spokane Falls

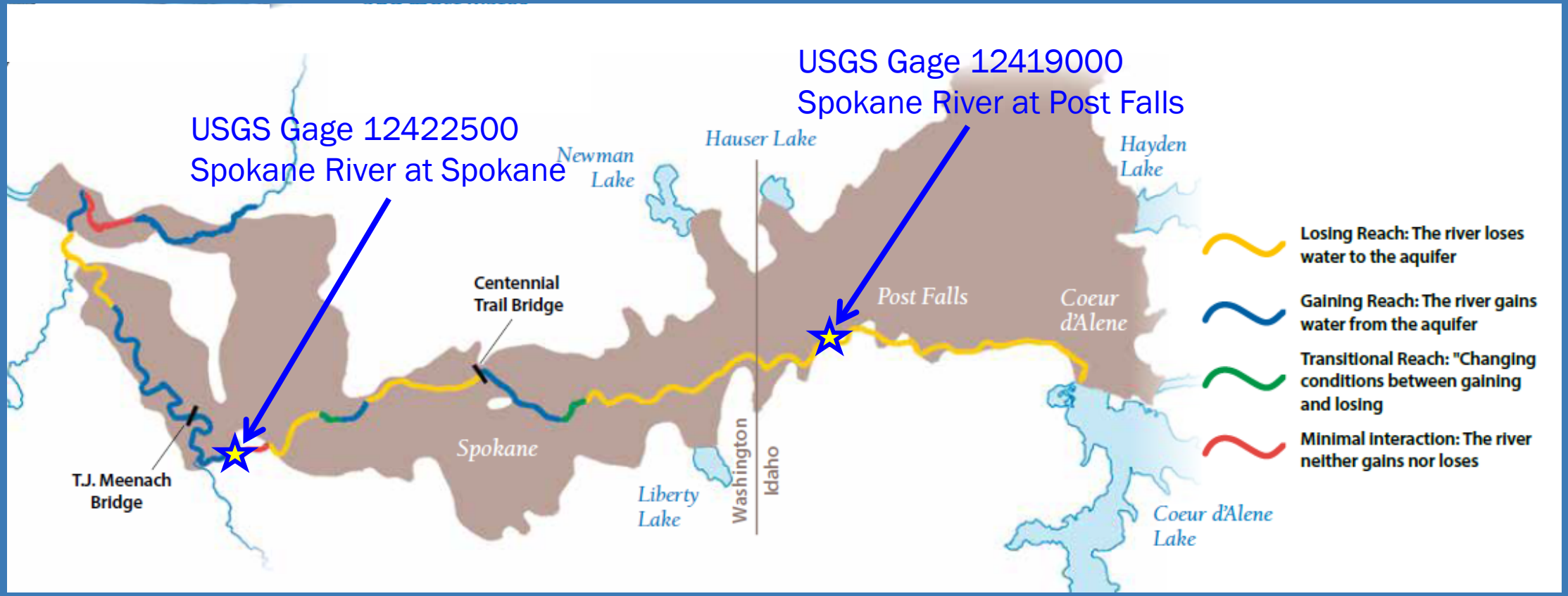


Source

Porcello, J., Burt, W., Gorski, J. and T. Wick. *Climate Change and Summer Streamflows: Climate Change Influence on Summer Streamflows, Unanticipated Discovery While Studying Other Influences*. In *The Water Report*, Issue #166, pp 1-12. December 2017.

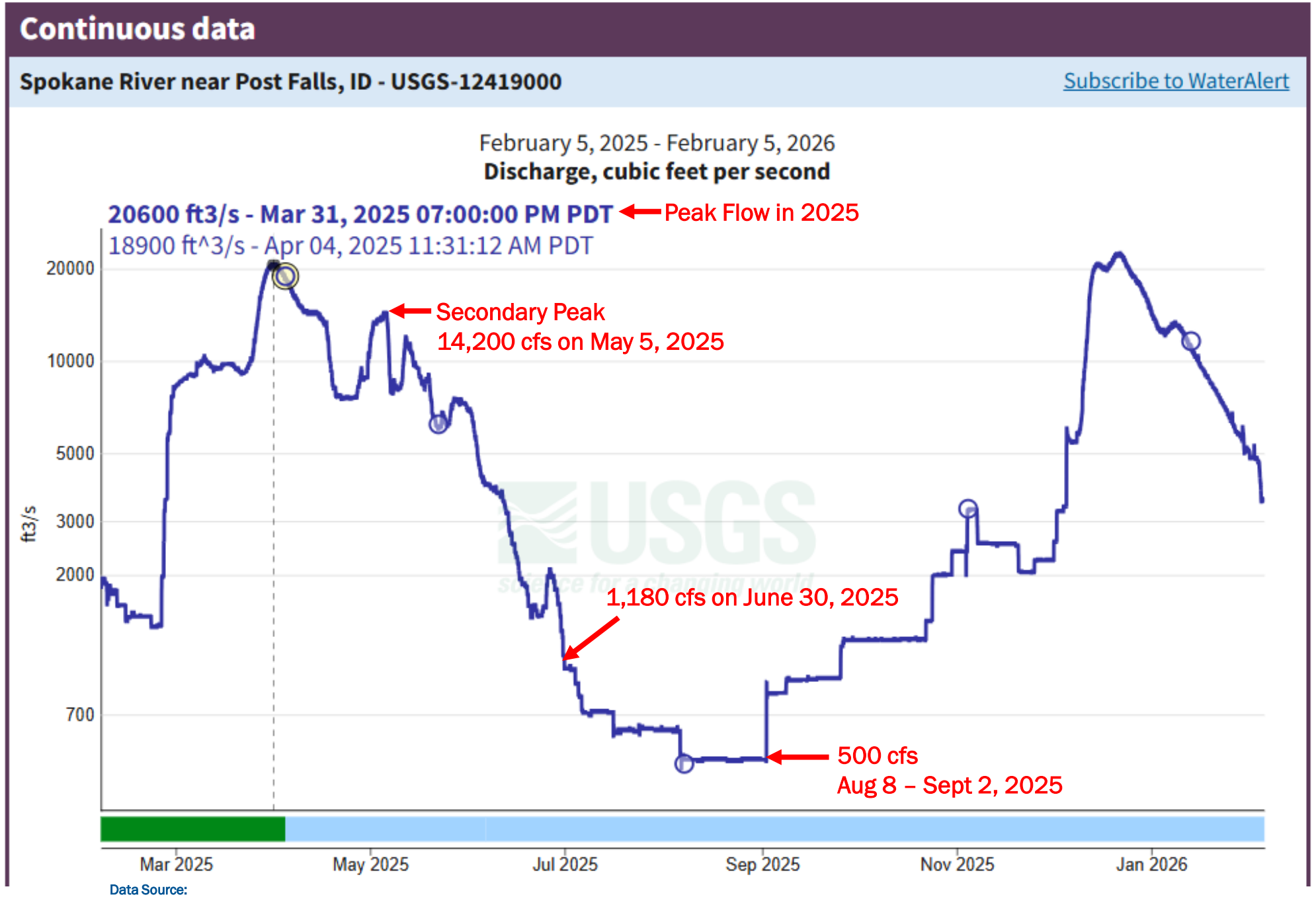
GSI Water Solutions

Spokane River Primary Gaging Stations and Gaining/Losing Reaches

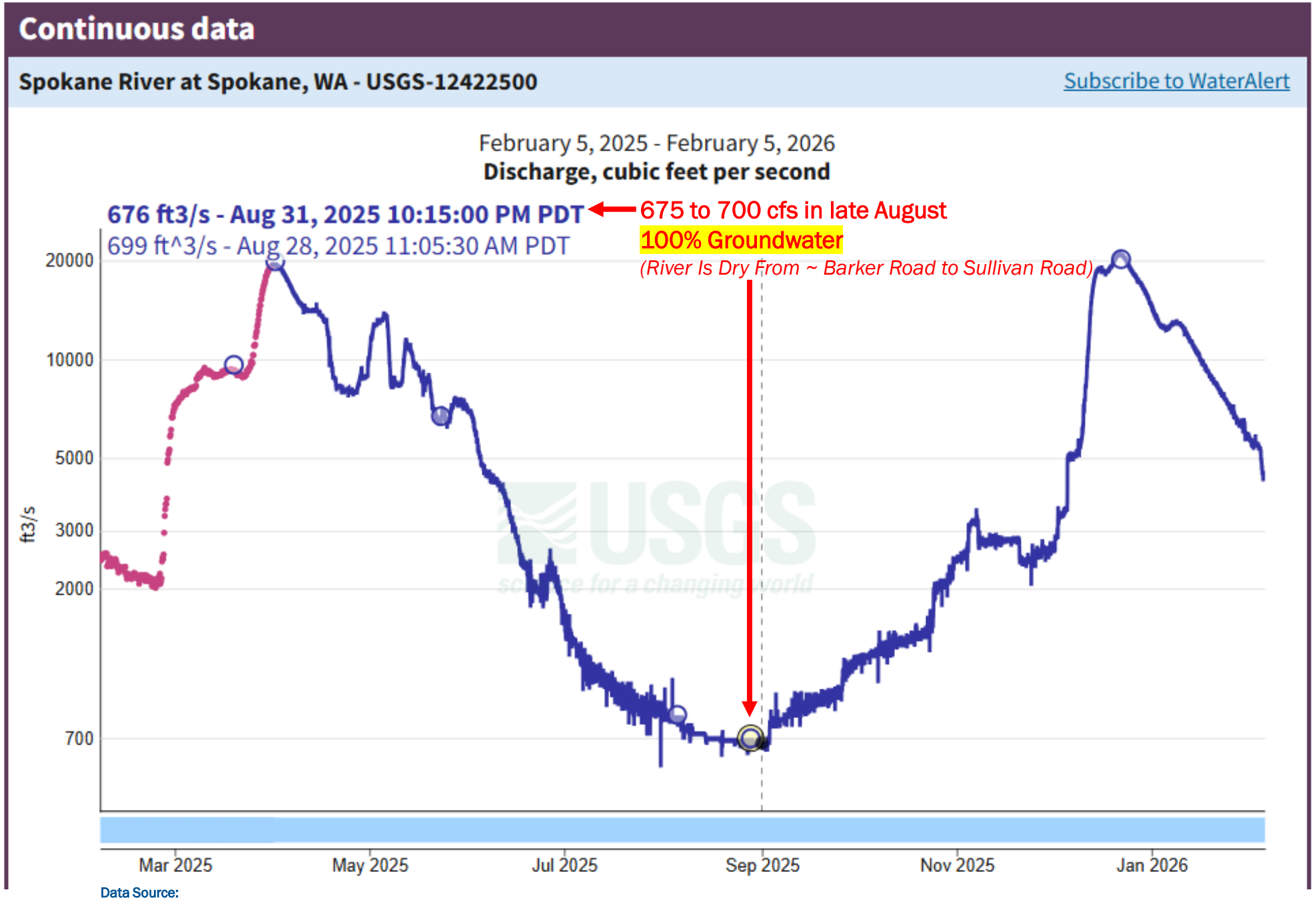


Source: The Spokane Valley-Rathdrum Prairie Aquifer Atlas, Fifth Edition (2023)

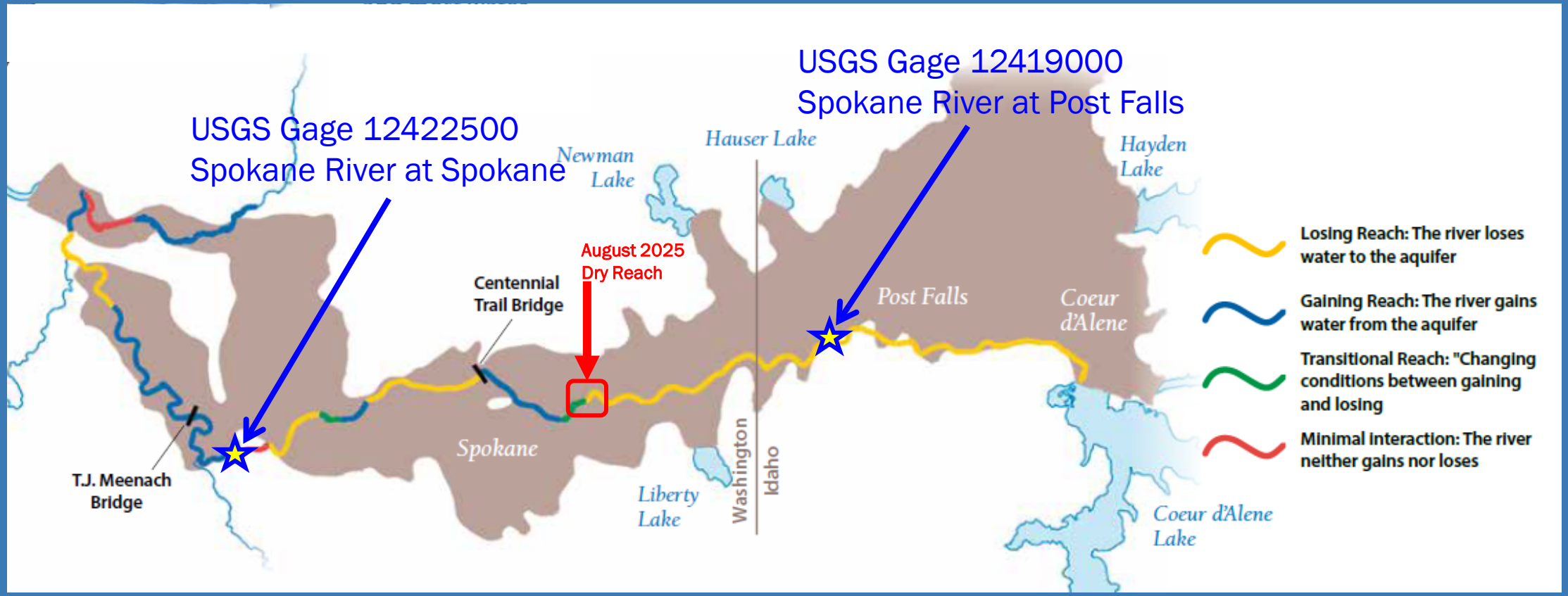
Streamflow at Post Falls *(Since Early Feb 2025)*



Streamflow at Spokane Falls *(Since Early Feb 2025)*



Spokane River Primary Gaging Stations and Gaining/Losing Reaches



Source: The Spokane Valley-Rathdrum Prairie Aquifer Atlas, Fifth Edition (2023)

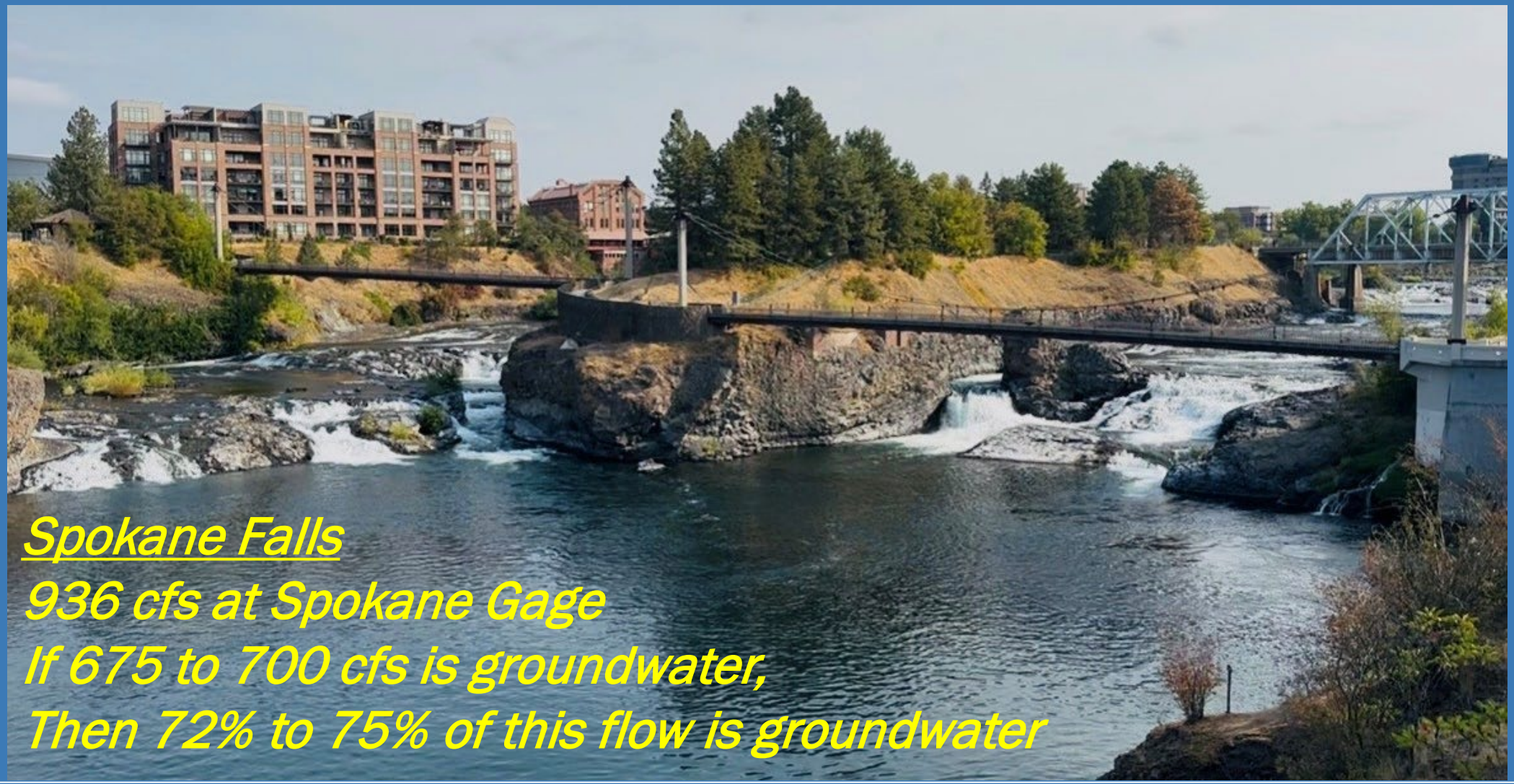
Flora Rd (August 2025): Not Your Typical Riverbed!

"I'm Standing Near Flora Road"

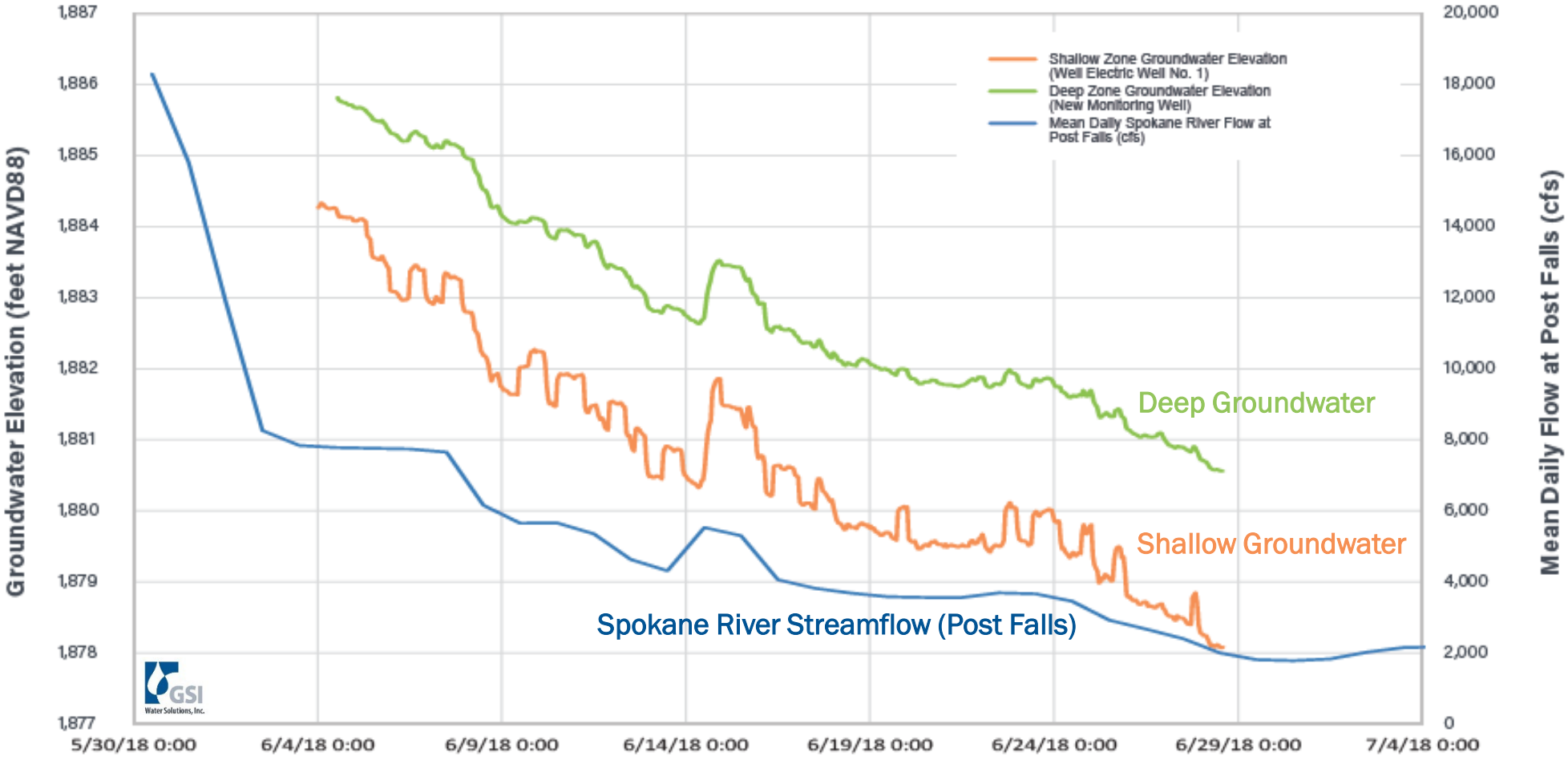
"Water is Normally Up To My Waist"

"Resembles a Desert"

Spokane Falls (Sept. 12, 2025 at 10 AM)



Groundwater Levels and Streamflows Between Dry Reach at Flora Road and Spokane Falls *(June 2018)*



1. Groundwater levels track the river's flow and stage
2. Groundwater levels higher in deep than shallow groundwater
   - Recharge upstream to the east (downward gradient)
   - Discharge in this area (upward gradient)

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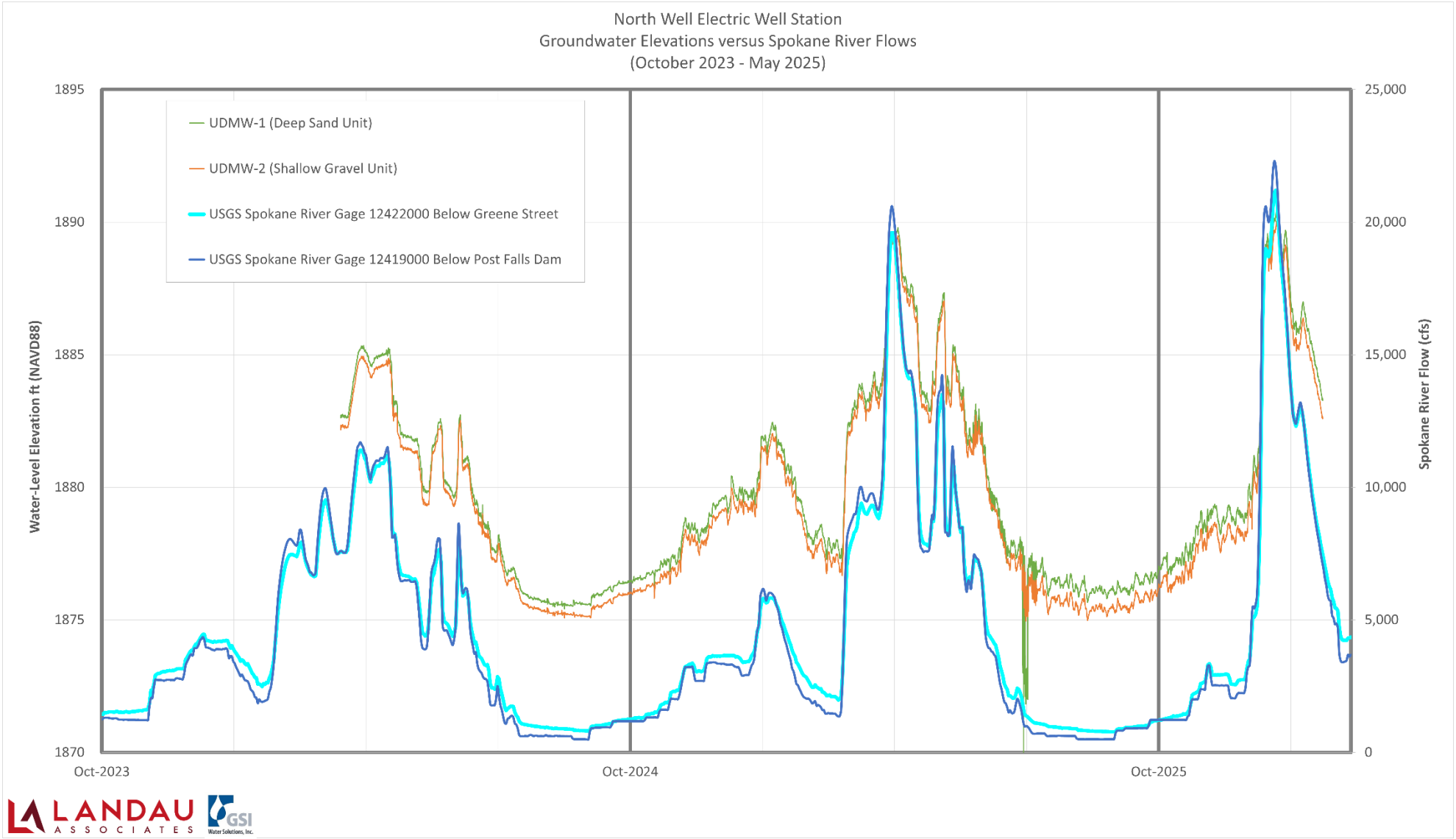
Groundwater Levels and Streamflows Between Dry Reach at Flora Road and Spokane Falls

(Water Year 2024 to Present)

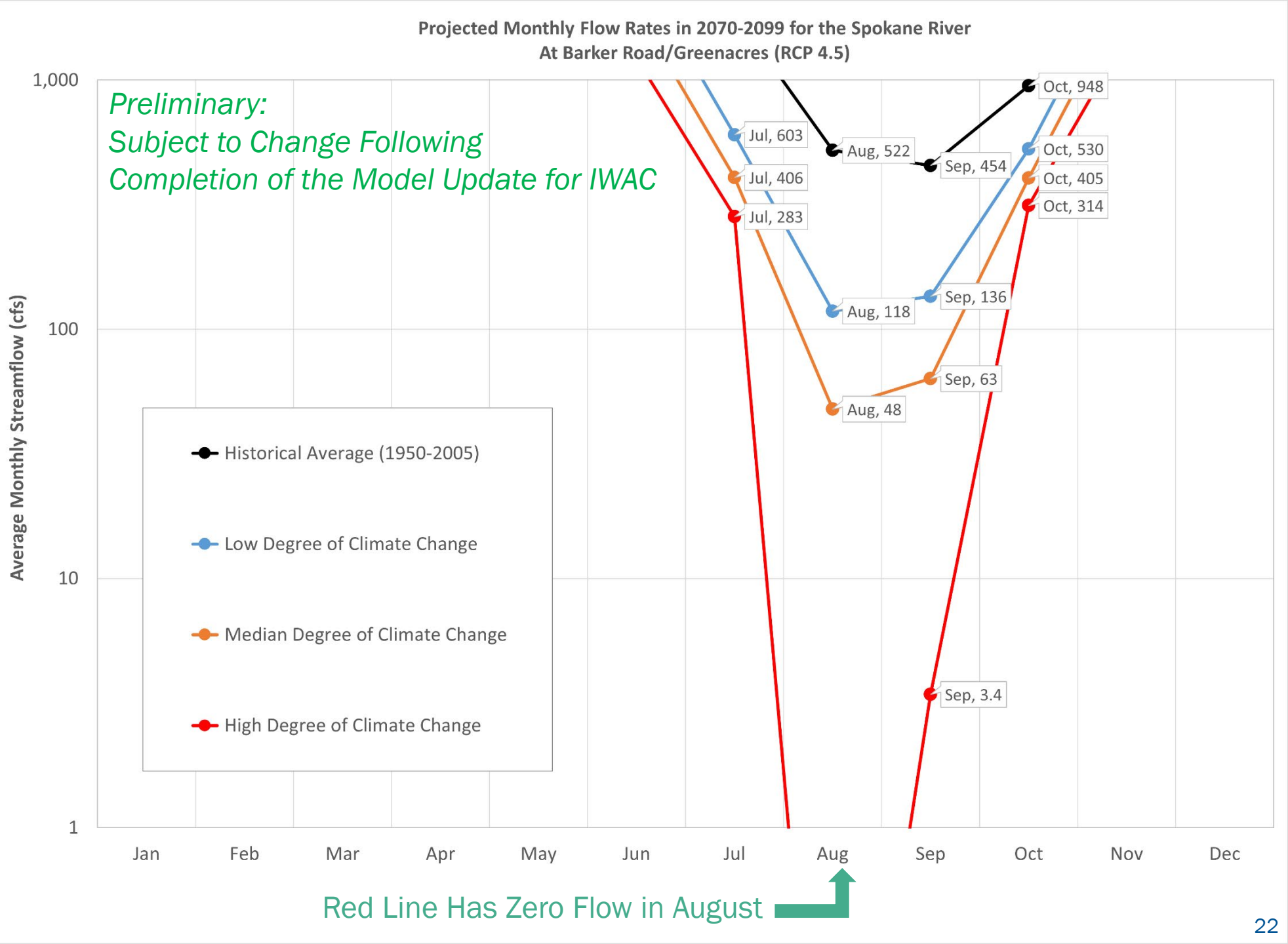


Similar Relationships During Past 2+ Years As In June 2018

So What Might the Future Hold?

Modeled Future Streamflows at Barker Road/ Greenacres

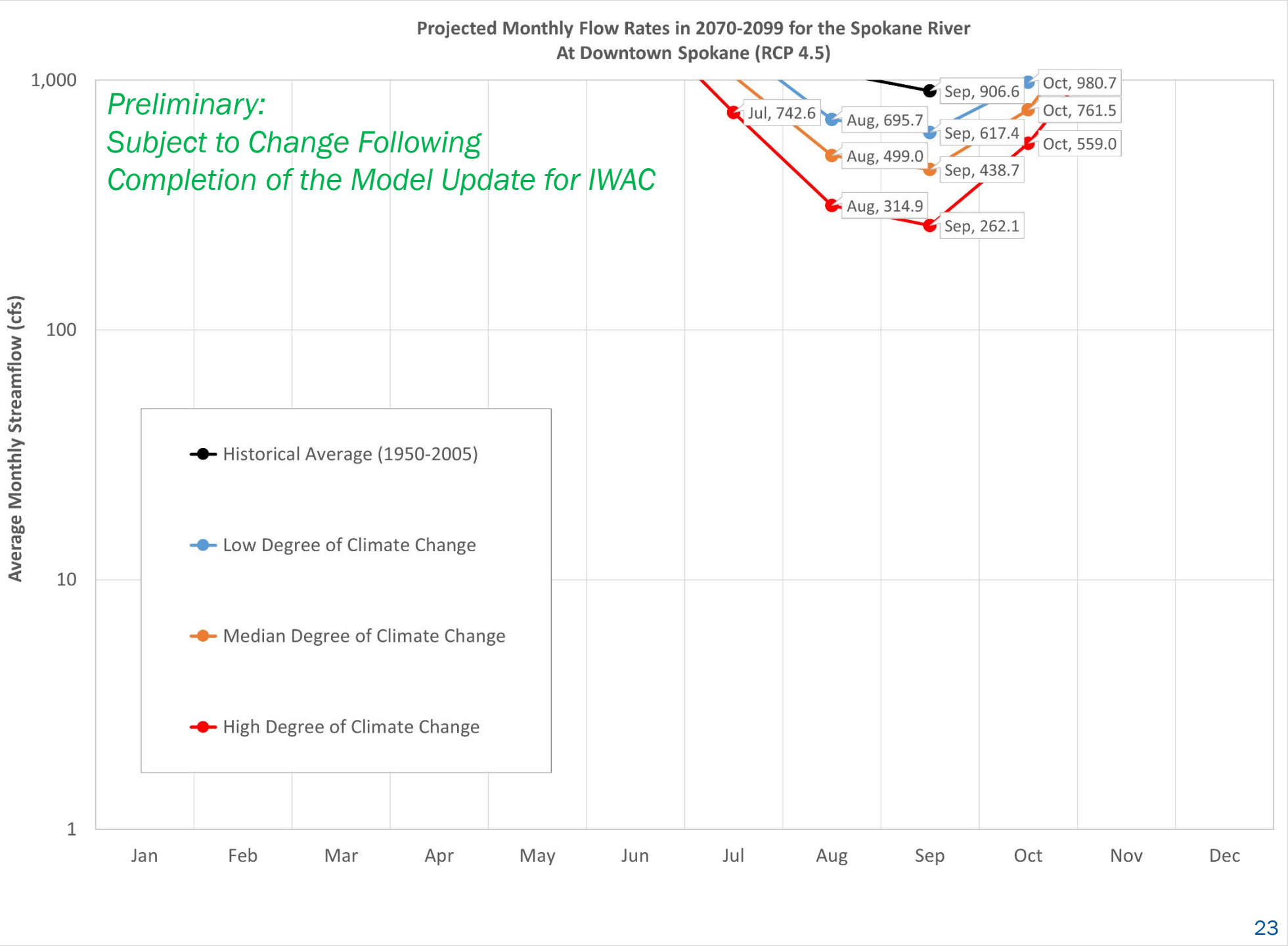
Under a Somewhat Optimistic Greenhouse Gas Emissions Scenario for the 2070s-2090s



GSI Water Solutions

Modeled Future Streamflows at Spokane Falls

Under a Somewhat Optimistic Greenhouse Gas Emissions Scenario for the 2070s-2090)



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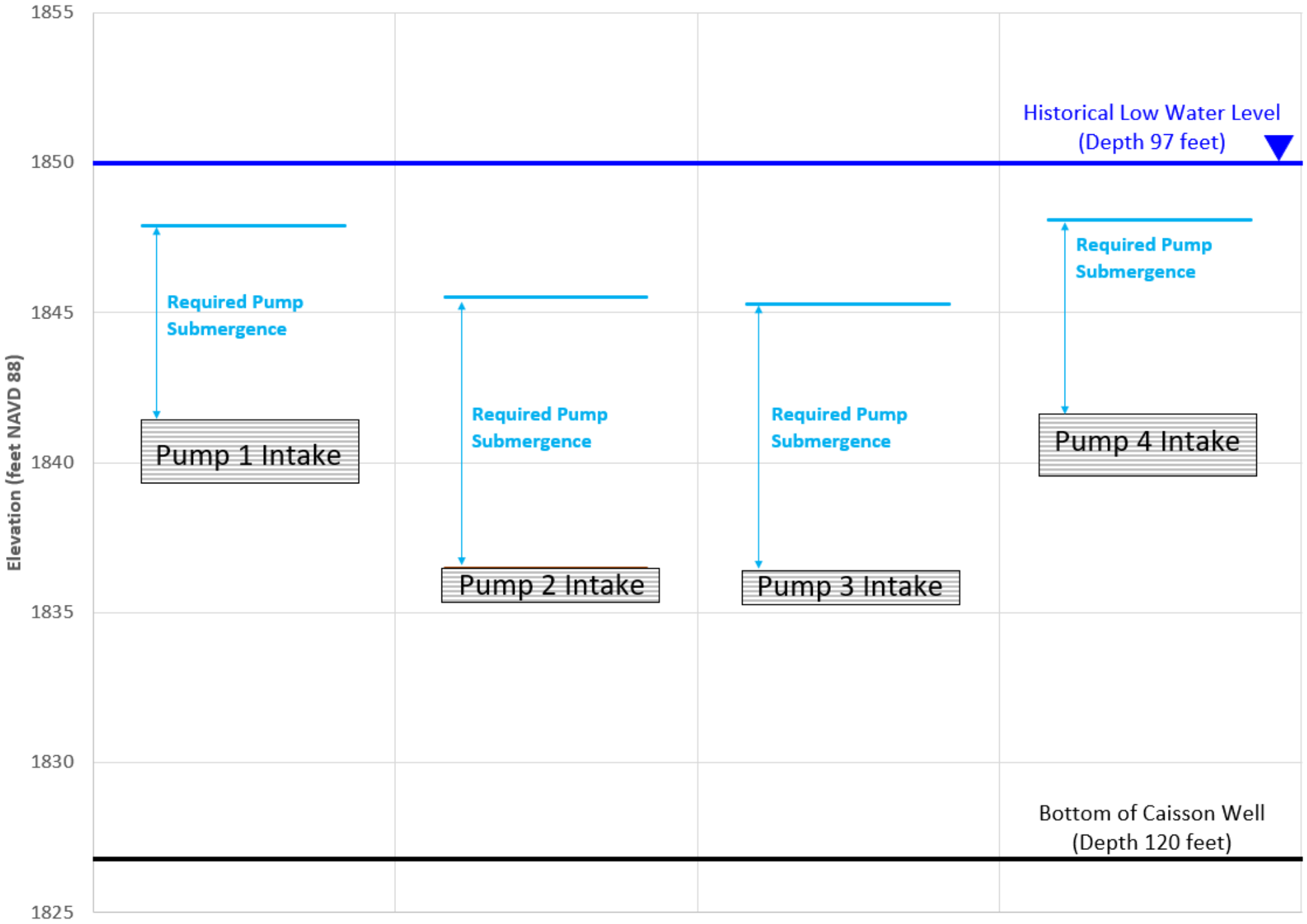
Historical Low Groundwater Levels at the City of Spokane's Nevada Well Station



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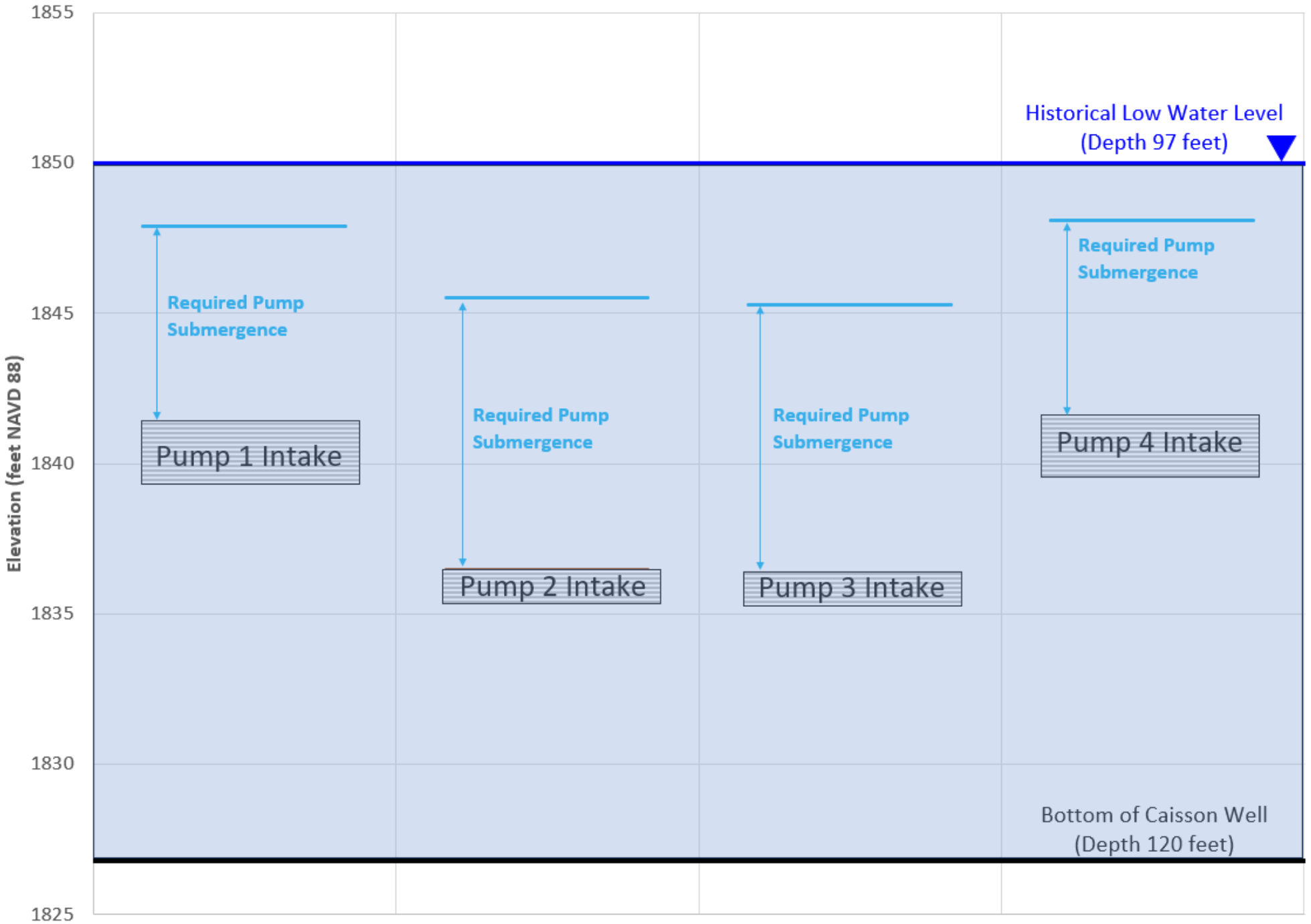
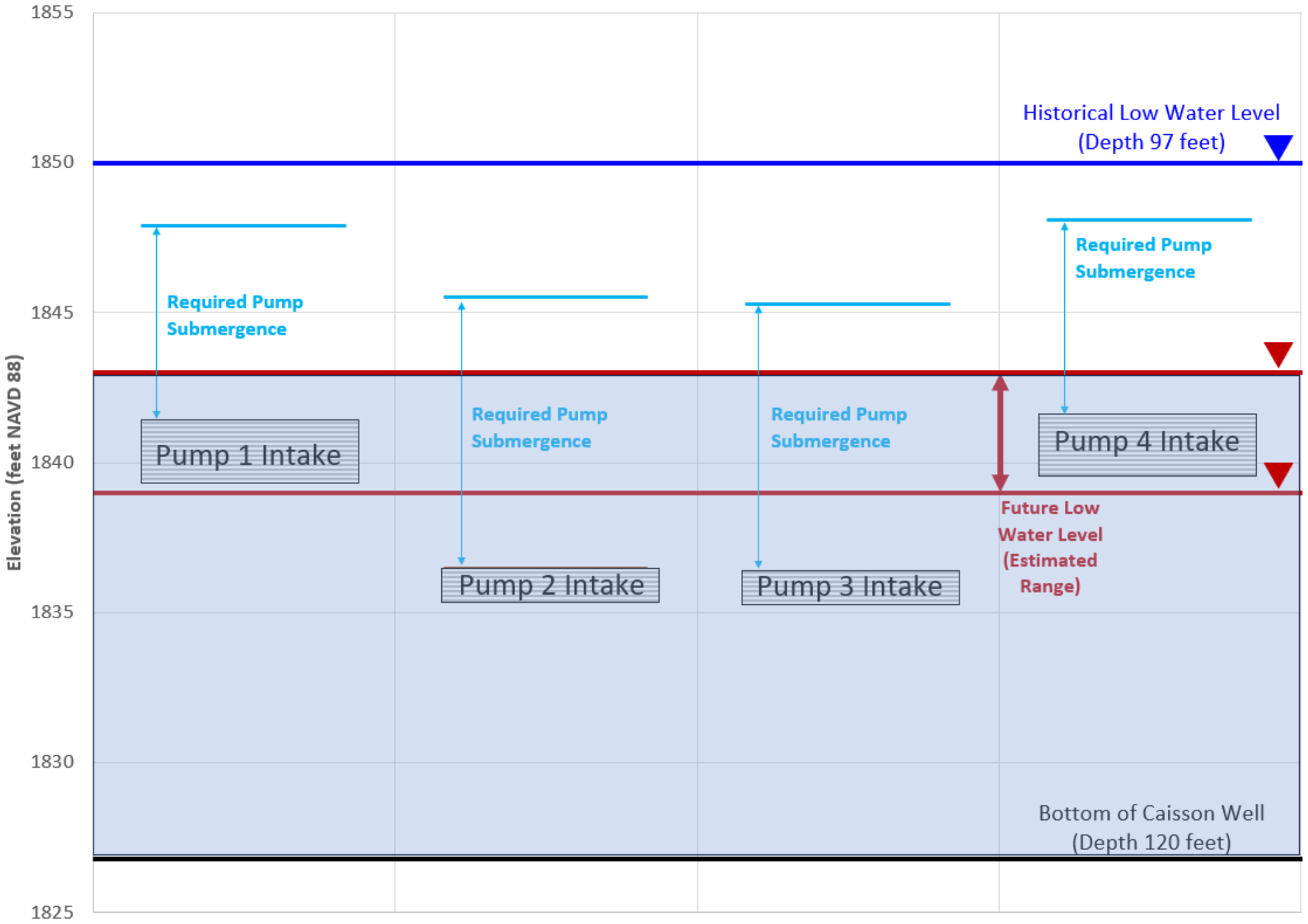


Historical Low vs. Potential Future Low Groundwater Levels at the City of Spokane's Nevada Well Station



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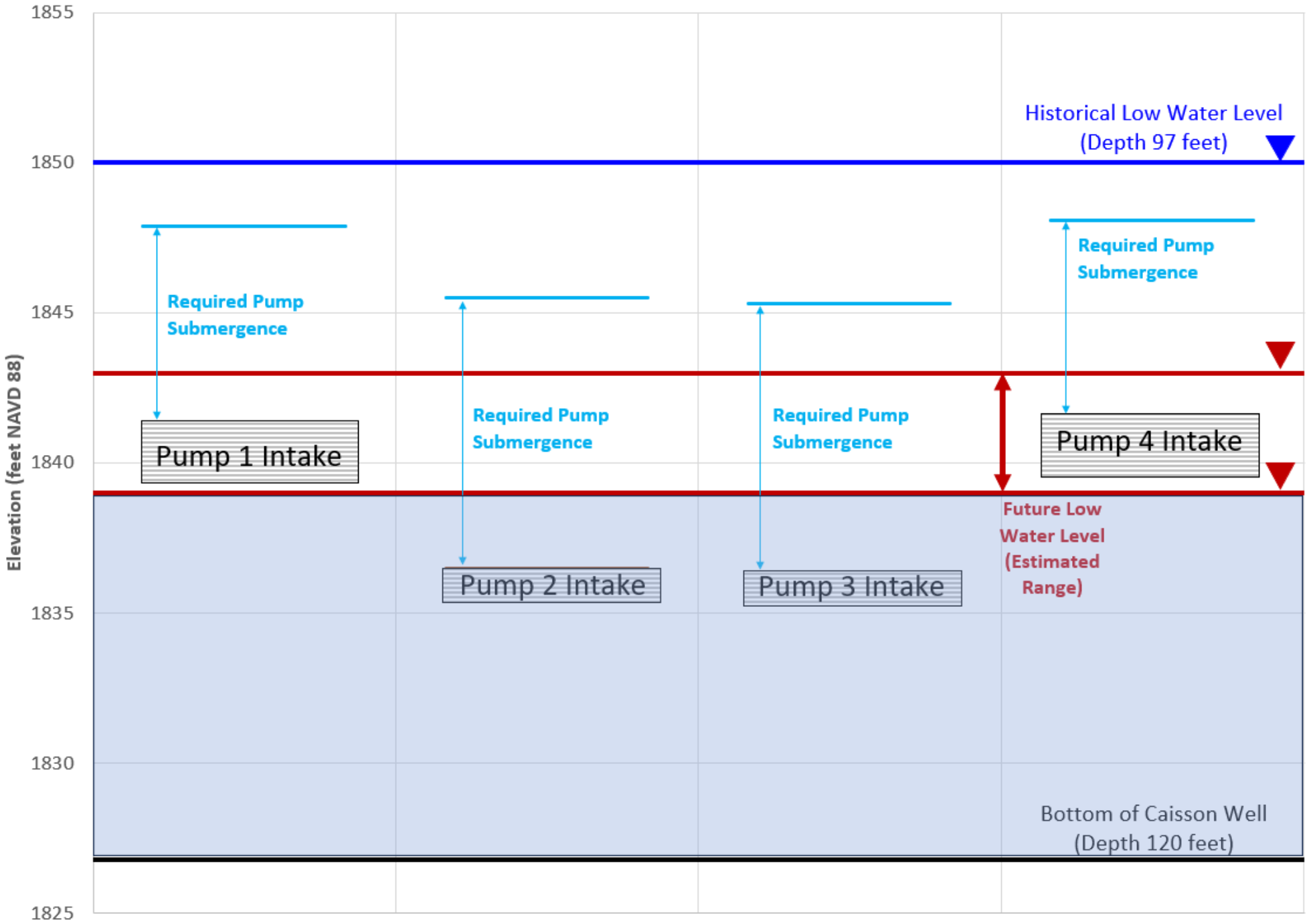

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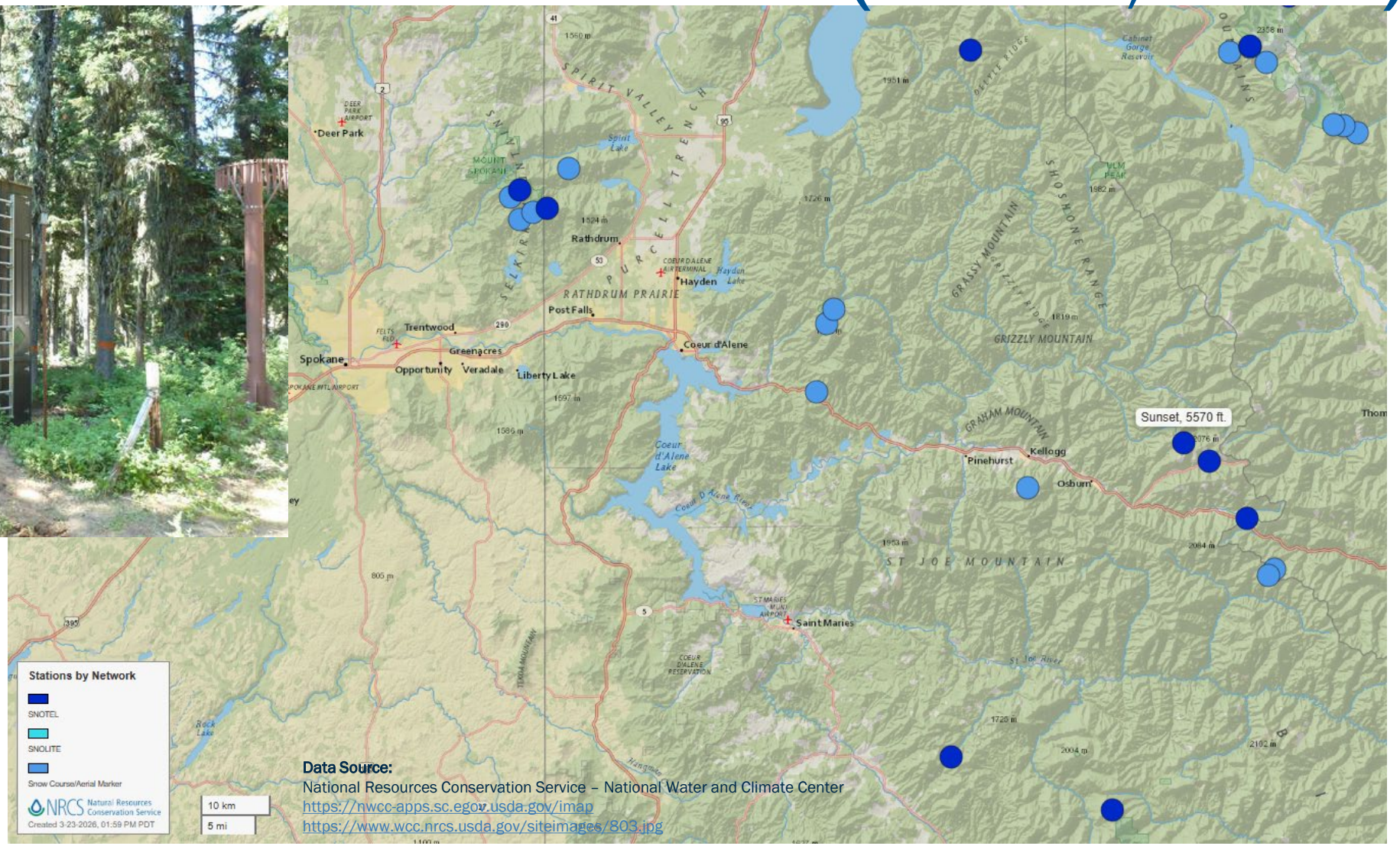
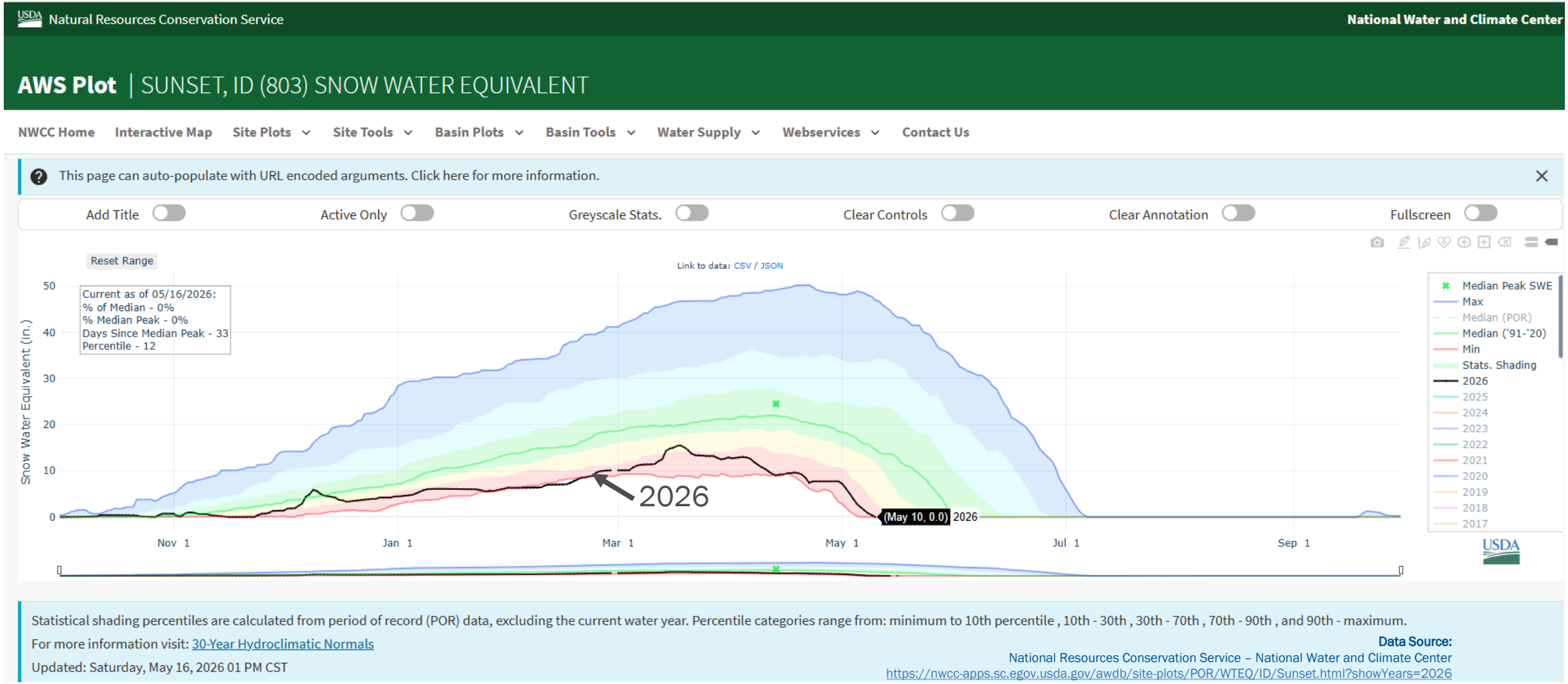
SWE at Sunset SNOTEL Station (Elev. 5,570 ft)



SWE at Sunset SNOTEL Station (Elev. 5,570 ft)



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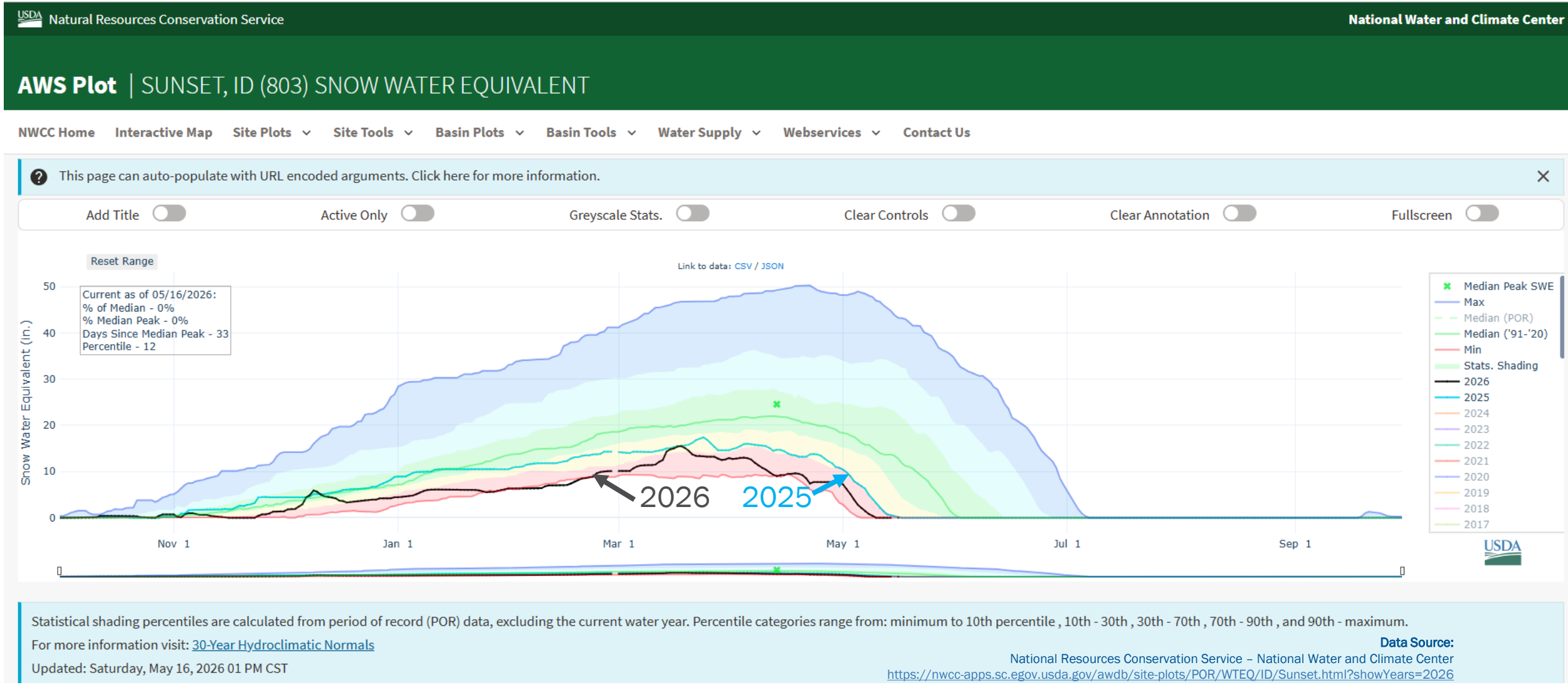

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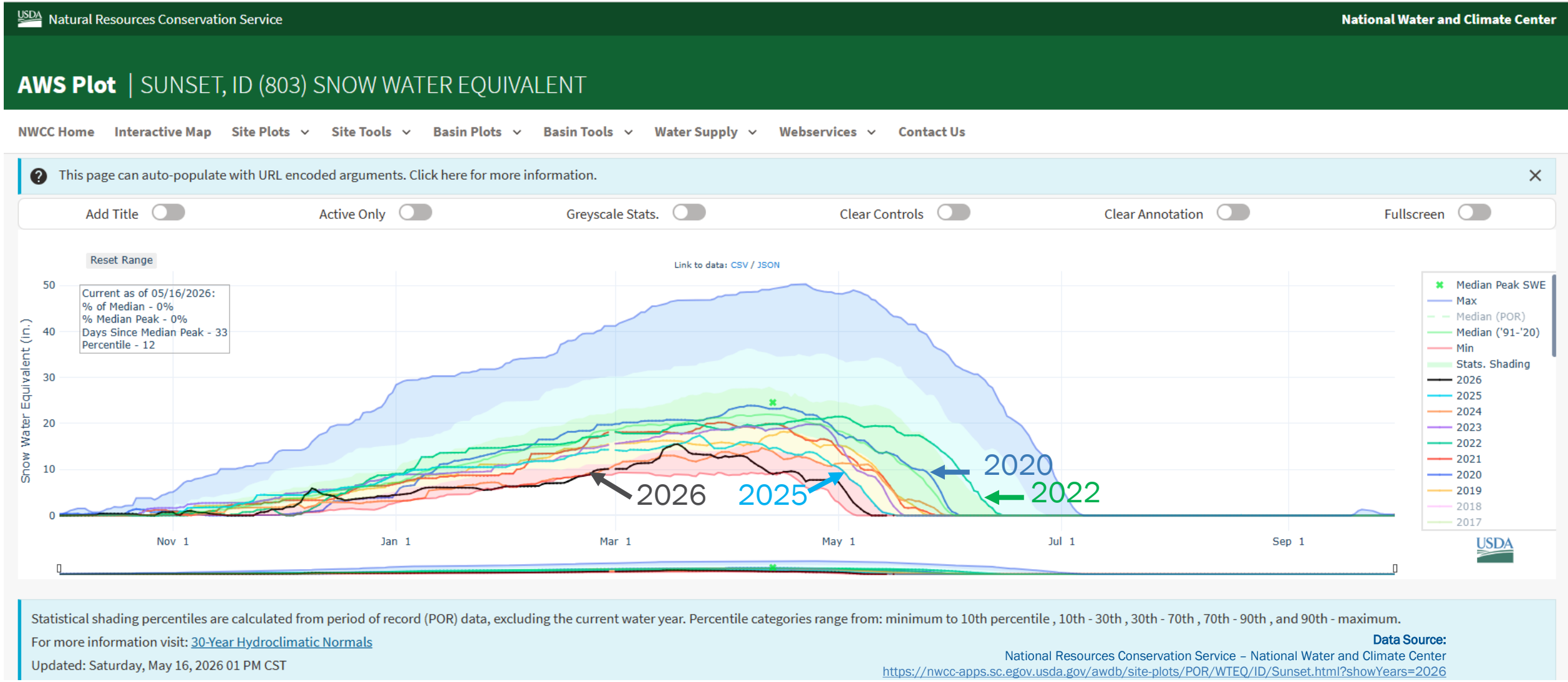

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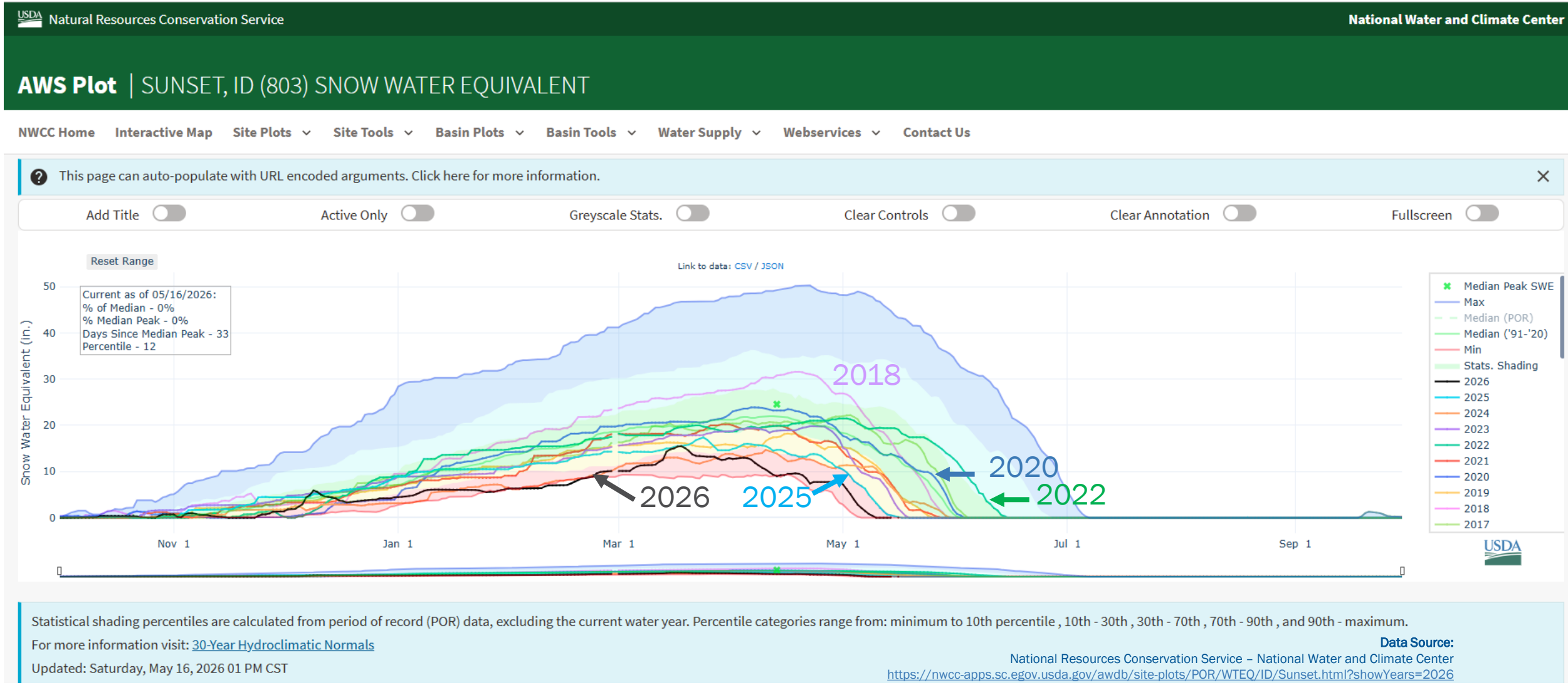

Questions?

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Registered Geologist (RG), OR
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Water Resources Consultant
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Photo by John Porcello
Sept. 11, 2025