TO: **SPOKANE RIVER INSTREAM FLOW WORK GROUP**

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SUBJECT: **SVRP MODEL RUN-ID/WA GROWTH COMPARISON**

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SPOKANE COUNTY
WATER RESOURCES

T E C H N I C A L M E M O R A N D O M

Introduction

This technical memorandum describes groundwater flow modeling performed in support of Washington State Department of Ecology (Ecology) Grant G0800066-Development of an Instream Flow (ISF) Rule Recommendation for the Spokane River. A technical memorandum from Spokane County Water Resources dated November 27, 2007 presented results of a model run that simulated the impact of 100% Washington State municipal water right withdrawal on Spokane River Flows. The results show that flow reduction in August at the Spokane Gage from the years 2000 through 2005 ranged between 208 cfs and 280 cfs. These results were presented to the work group at the December 11, 2007 meeting. This model run did not evaluate impacts from increased withdrawal in Idaho. At that meeting work group members expressed an interest in the impacts of increased withdrawals in Idaho on Spokane River flows. To evaluate those impacts three model scenarios were constructed:

1. Increased withdrawal in Idaho with no increase in Washington
2. Increased withdrawal in Washington with no increase in Idaho; and,
3. Increased withdrawal in Idaho and Washington.

Model Setup

Withdrawal increases were based on population projections for 2025 (Table 1). The Kootenai County Planning Department projects a 57% increase in population and the State of Washington Office of Financial Management projects a 29% increase in Spokane County population by 2025. A portion of the aquifer is located in Bonner County, ID, but the Kootenai County growth projection was utilized for the entire Idaho portion of the model.

Table 1 – Projected Population Growth

County	Population			2005-2025	
	1990	2005	2025	Increase	% Increase
Kootenai	69,795	131,500	207,000	75,500	57%
Spokane	361,333	436,300	561,102	124,802	29%

To simulate the three scenarios described above the Well Package was modified. The Well Package represents the following withdrawals from and returns to the aquifer:

1. Water purveyor withdrawals;
2. Domestic withdrawals outside water service areas;
3. Self supplied industrial withdrawals;
4. Net agricultural withdrawals;
5. Septic system returns; and
6. Landscape percolation returns.

To simulate impacts to Spokane River flows from growth values for water purveyor withdrawals, domestic withdrawals outside water service areas, septic system returns, and landscape percolation returns were increased by 57% for model cells located in Idaho and 29% for model cells located in Washington. Three different combinations of original values and growth adjusted values were assembled for the model runs.

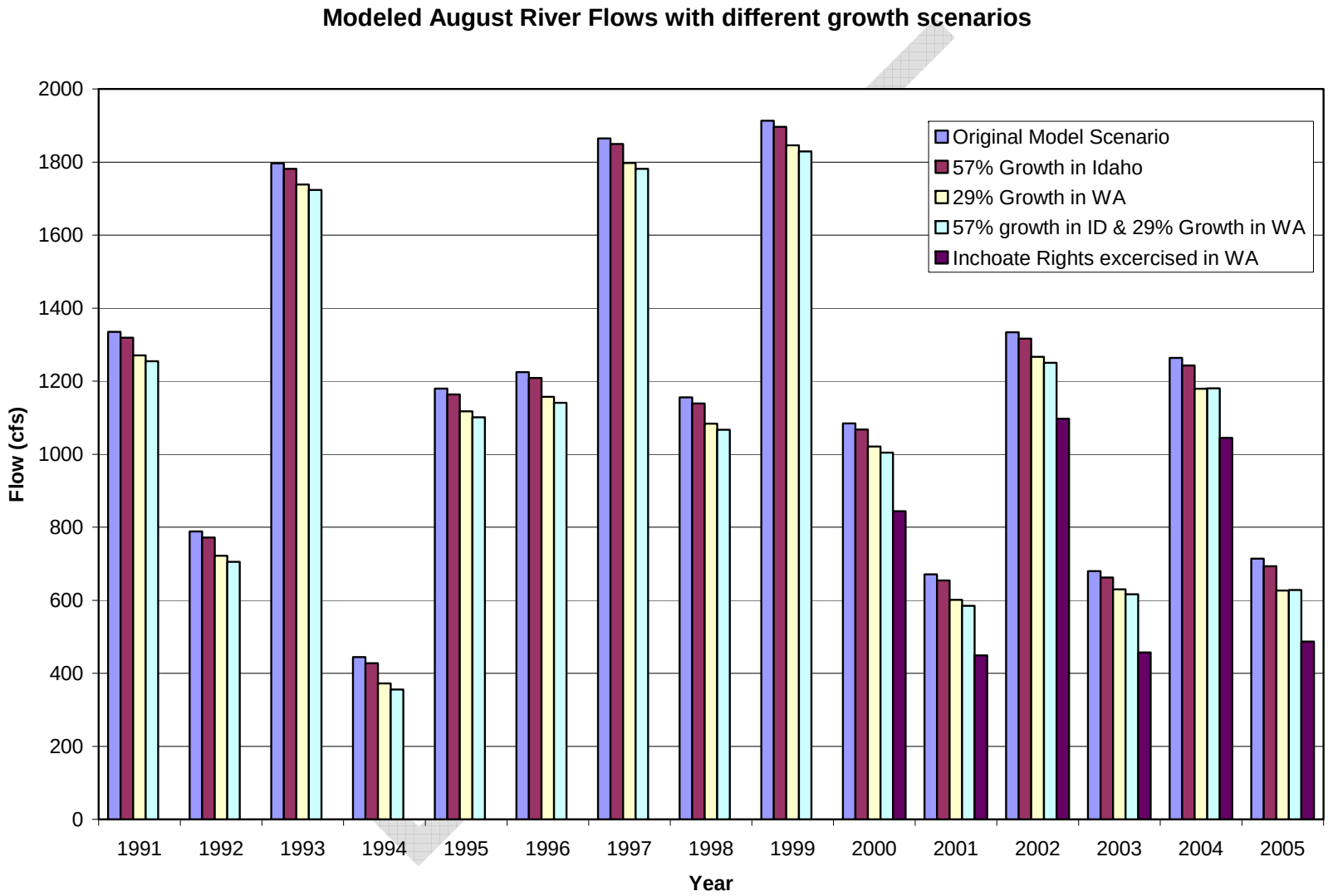
Results

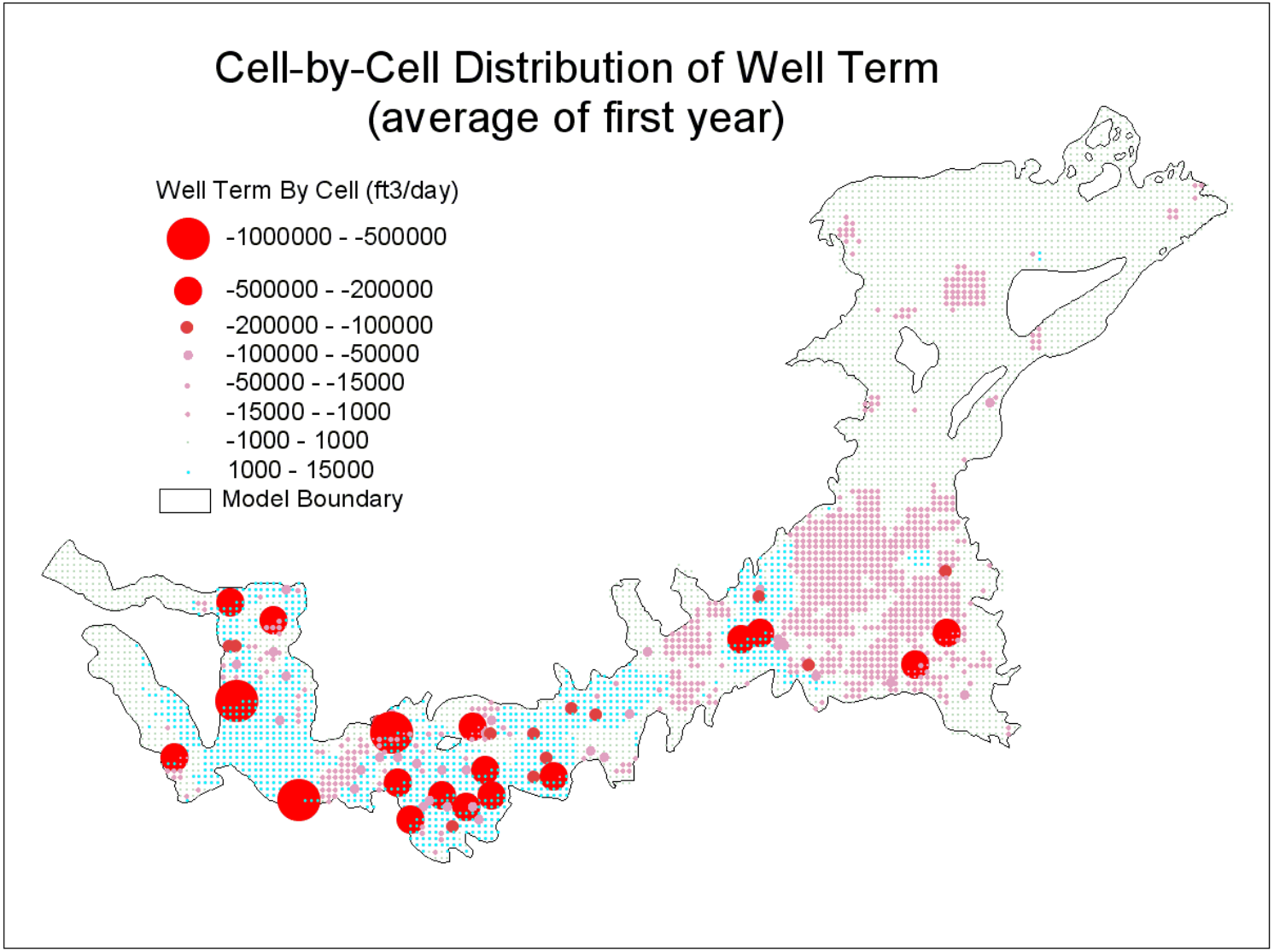
Over the period of 1990-2005 if Idaho water use was 57% greater than was originally modeled and Washington water use did not change there would be an average reduction in August Spokane River flows as measured at the Spokane at Spokane Gage of 1.75%. If Washington water use was increased by 29% and Idaho water use did not change the reduction would be 6.96%, and if water use increased in both states the average reduction would be 8.34%. In comparison, if all of the Washington municipal water rights were exercised and there was no change in Idaho water use the average reduction in August river flows over the period 2000-2005 would be 25.80%. The water use increases for each state were based on population projections for 2025. It is important to note that a 57% increase in population does not usually result in a 57% increase in water use.

The results demonstrate that even though Idaho is experiencing significant growth (57%) the impact on river flows from increased water use is on average ¼ of the impact of increased water use in Washington. The map on page 5, which was presented at the SVRP Summit, shows the magnitude of Washington's water use in comparison to Idaho.

Comparison of Modeled Spokane River Flows in Response to Growth in Idaho and Washington

Year	Original Model Scenario (cfs)	57% Growth in Idaho		29% Growth in WA		57% growth in ID & 29% Growth in WA		Inchoate Rights excercised in WA	
		Flow (cfs)	% reduction	Flow (cfs)	% reduction	Flow (cfs)	% reduction	Flow (cfs)	% reduction
1991	1335	1319	1.2%	1270	4.8%	1254	6.0%		
1992	789	772	2.1%	722	8.4%	705	10.6%		
1993	1796	1781	0.8%	1739	3.2%	1724	4.0%		
1994	445	428	3.7%	372	16.3%	356	20.0%		
1995	1180	1164	1.4%	1117	5.3%	1101	6.7%		
1996	1225	1208	1.3%	1157	5.5%	1141	6.9%		
1997	1865	1850	0.8%	1797	3.6%	1782	4.5%		
1998	1155	1139	1.4%	1083	6.2%	1067	7.6%		
1999	1913	1896	0.9%	1846	3.5%	1829	4.4%		
2000	1084	1067	1.5%	1021	5.8%	1004	7.4%	844	22.15%
2001	671	654	2.4%	601	10.3%	585	12.8%	449	33.04%
2002	1334	1316	1.3%	1267	5.1%	1251	6.3%	1097	17.77%
2003	680	662	2.6%	630	7.3%	617	9.3%	457	32.77%
2004	1264	1243	1.7%	1179	6.7%	1181	6.6%	1045	17.32%
2005	714	693	2.9%	627	12.2%	628	12.0%	487	31.77%
Average Percent Reduction			**1.75%**		**6.96%**		**8.34%**		**25.80%**


Modeled August River Flows with different growth scenarios
Flow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
Year
Original Model Scenario
57% Growth in Idaho
29% Growth in WA
57% growth in ID & 29% Growth in WA
Inchoate Rights excercised in WA


Cell-by-Cell Distribution of Well Term
(average of first year)
Well Term By Cell (ft3/day)
-1000000 - -500000
-500000 - -200000
-200000 - -100000
-100000 - -50000
-50000 - -15000
-15000 - -1000
-1000 - 1000
1000 - 15000
Model Boundary