#### BEFORE THE OFFICE OF ADMINISTRATIVE HEARINGS STATE OF KANSAS

IN THE MATTER OF THE APPLICATION OF THE CITIES OF HAYS, KANSAS AND RUSSELL, KANSAS FOR APPROVAL TO TRANSFER WATER FROM EDWARDS COUNTY PURSUANT TO THE KANSAS WATER TRANSFER ACT

OAH Case No. 23AG0003 AG

#### PREPARED DIRECT TESTIMONY OF STEVEN P. LARSON ON BEHALF OF WATER PROTECTION ASSOCIATION OF CENTRAL KANSAS AND EDWARDS COUNTY, KANSAS (COLLECTIVELY "INTERVENORS")

May 30, 2023

#### 1 QUESTION: Please state for the record your name and position, and business address.

ANSWER: My name is Steven P. Larson. I am an Executive Vice President and Senior Principal
with S.S. Papadopulos & Associates, Inc., 1801 Rockville Pike, Suite 220, Rockville, Maryland
20852-1649.

#### 5 QUESTION: Mr. Larson, can you describe your qualifications and experience in the field 6 of groundwater hydrology and groundwater modeling?

- ANSWER: I have a Bachelor of Science in Civil Engineering from the University of Minnesota (1969), and a Master of Science in Civil Engineering, also from the University of Minnesota (1971). I am a member of the National Ground Water Association and the American Institute of Hydrology. I am also certified as a Professional Hydrologist with the American Institute of Hydrology.
- Prior to joining S. S. Papadopulos & Associates, Inc. (SSP&A) in 1980, I was employed as a
  hydrologist with the Water Resources Division of the U.S. Geological Survey (USGS) for almost
  9 years. During my tenure with the USGS, I conducted numerous hydrological studies on a variety
- 15 of groundwater and surface water problems. Also during my tenure with the USGS, I was
- 16 responsible for the development and use of groundwater simulation models that were used by other
- 17 scientists in the USGS.
- 18 I have spent the last 43 years with SSP&A conducting and managing projects related to a variety
- 19 of environmental and water-resource issues. During my tenure at SSP&A, I have been involved
- 20 in projects covering a wide spectrum of technical, environmental, and legal issues including
- 21 environmental impact evaluations, evaluations of water-resource development, water-rights
- 22 permitting and adjudication, remedial investigations at CERCLA and other waste-disposal sites,
- 23 feasibility studies, engineering evaluations/cost analyses, and remedial action plans.
- 24 I have also testified as an expert in numerous legal and administrative forums. These cases have
- included permit and licensing hearings, water-rights adjudications, arbitration hearings, interstate
   compact claims, toxic torts, liability claims, various legal actions under CERCLA, property
- 27 damage claims, and insurance claims.
- 28 I have also served as a technical expert in several interstate water disputes. These include: Kansas
- v. Colorado, No. 105, Orig.; Nebraska v. Wyoming, No. 108, Orig.; Kansas v. Nebraska, No. 126,
- 30 Orig.; Montana v. Wyoming, No. 137, Orig.; South Carolina v. North Carolina, No. 138, Orig. and
- 31 Mississippi v. Tennessee; and Memphis, Light, Gas, & Water Division, No. 143, Orig. This work
- 32 has included testimony as an expert in the fields of hydrology, groundwater hydrology, and
- 33 hydrologic modeling.
- 34 I have also served as a consultant and advisor to the State of Kansas on several groundwater
- 35 modeling studies. These efforts include the cooperative development of a groundwater model by
- 36 the States of Kansas, Nebraska and Colorado for the Republican River basin that provides input to

- 37 evaluations of compliance with the Republican River Compact. I have also served on technical
- 38 committees to review the development of groundwater models for the Rattlesnake Creek basin by
- 39 the Kansas Geological Survey and for the Arkansas River basin by Balleau Groundwater on behalf

40 of Groundwater Management District 5. This latter model is the model used by Burns &

41 McDonnell in their evaluation of the R9 Ranch transfer application.

#### 42 QUESTION: What were you asked to do in this matter?

43 ANSWER: Review the reports by Burns & McDonnel (BMcD) that described their analyses of

the potential impacts of changing the groundwater use on the R9 ranch from irrigation to municipalsupply.

- 46 Identify any problems with the BMcD analyses.
- 47 Conduct analyses to correct any problems identified in the BMcD analyses.

#### 48 QUESTION: What reports by BMcD did you review?

ANSWER: An initial report prepared in February 2018 and a revised report prepared in Septemberof 2018.

51 QUESTION: Can you briefly describe what you learned from reviewing those reports?

52 ANSWER: BMcD used a groundwater model developed for the Big Bend Groundwater

53 Management District No. 5 by Balleau Groundwater Inc. to evaluate the potential future impacts

of the change in groundwater use on groundwater conditions in the area surrounding the R9 ranch.

#### 55 QUESTION: Were you familiar with the groundwater model used by BMcD?

56 ANSWER: Yes. I served as a peer reviewer and a member of a Technical Advisory Committee 57 regarding the development of the model by Balleau Groundwater Inc (BGI).

- 58 I was retained by the KDA/DWR to conduct this work.
- 59 Prior to that, I also served as a peer reviewer in much the same capacity on a modeling project for60 the Rattlesnake Creek Subbasin conducted by the KGS.
- 61 As part of my work on the BGI model, I and my staff made various model runs to test and evaluate
- 62 the model as BGI proceeded through its development.

#### 63 QUESTION: What conclusions did you reach from your peer review of the BGI model?

- 64 ANSWER: Some simplification of the model could be made to make it easier to use.
- 65 Groundwater evapotranspiration and changes in evapotranspiration associated with changes in
- 66 groundwater levels are largely untested and, as a result, more uncertain.

- 67 The model can be used to evaluate water resource and water use related issues within Groundwater
- 68 Management District 5.

#### 69 QUESTION: In your review of the BMcD reports, did you find any problems with their 70 analyses?

- 71 ANSWER: Yes. The BMcD evaluation failed to consider how groundwater recharge on irrigated
- 72 land would change when the land was no longer irrigated.
- In developing the model, Balleau Groundwater computed recharge to groundwater from rainfallon irrigated land differently from non-irrigated land.
- 75 This difference was included to consider the fact that soil moisture content on irrigated land would
- 76 be higher than that on non-irrigated land due to the irrigation and that rainfall would have a greater
- capacity to reach the groundwater than it would on non-irrigated land.
- As a result, the groundwater model was premised, in part, on the concept of higher recharge on
   irrigated land versus non-irrigated land which BMcD did not consider in their evaluation.

# 80 QUESTION: Were you able to correct the problems you identified in your review of the 81 BMcD reports?

- 82 ANSWER: Yes. I reran the various simulations of potential future conditions considered by
- 83 BMcD except that I reduced the amount of recharge on the R9 ranch lands that would not be 84 irrigated under future municipal pumping conditions.

#### 85 QUESTION: How did you do that? Can you walk us through the process you used to correct 86 the problems and recalculate the potential impacts associated with the change in 87 groundwater use at the R9 ranch.

88 ANSWER: Yes. The first step was to assemble model input files for the scenarios considered by 89 BMcD. We did not have access to the revised model files used by BMcD. However, we did have 90 access to model files that were used in the initial BMcD report. Beginning with these model files 91 that were available to us, we made various test runs of the model to be sure we could reasonably 92 replicate the model results depicted and tabulated in the revised BMcD report. Some adjustments 93 in model input were necessary to account for adjustments made by BMcD between their initial and 94 revised reports. While there were some differences in model results between our simulations and 95 those shown in the revised BMcD report for one of the scenarios (Scenario 6), the differences were 96 relatively small. We concluded that our model files were sufficiently close to those used by BMcD 97 (which we did not have access to) such that we could proceed with alternative simulations where 98 recharge on irrigated land could be properly considered.

99 The second step was to determine the proper amount of recharge on the R9 ranch lands that would 100 no longer be irrigated under municipal pumping conditions. The BGW report on the development 101 of the model provides curves for estimating groundwater recharge from rainfall. The R9 ranch 102 area was in recharge zone 9 defined by BGW. The BGW report shows two curves for zone 9 that 103 relate rainfall to groundwater recharge, one for pre-1970 conditions (non-irrigated) and one for

104 post-1970 conditions (irrigated). By comparing the post-1970 curve to the pre-1970 curve for a

105 given amount of groundwater recharge, the relative reduction in groundwater recharge on non-

106 irrigated land could be determined. The amount of groundwater recharge for the R9 ranch lands

- 107 if the land was not irrigated was then calculated using the relative reduction and the amount of
- 108 groundwater recharge for the irrigated land contained in the BMcD model files.

The final step was to rerun the model simulation scenarios considered by BMcD using the revised groundwater recharge for those simulations that considered municipal pumping replacing irrigation pumping on the R9 ranch lands. The results from these reruns were then compiled into graphic and tabular forms that could be compared to results shown the revised BMcD report.

# 113 QUESTION: Did you prepare some exhibits to illustrate the results of your evaluation?

114 ANSWER: Yes. I prepared two sets of exhibits. The first set illustrates the comparisons we made

between our results and those shown in the maps and tables in the revised BMcD report for some

116 of the simulation scenarios used by BMcD. The purpose of these exhibits is to demonstrate that

117 our model files were sufficiently close to those used by BMcD which we did not have access to.

118 The second set of exhibits illustrates comparisons of simulated results between those reported by

BMcD in their revised report and results where groundwater recharge on R9 ranch was reduced to

120 properly consider the change in land use from irrigated to non-irrigated. The purpose of these

121 exhibits is to demonstrate the difference in projected future impacts when the reduction in

122 groundwater recharge is properly considered.

# 123 QUESTION: Lets start with the first set of exhibits. Can you walk us through what these 124 exhibits show?

125 ANSWER: Yes. Exhibits 1, 2 and 3 show a comparison of our modeling results with the results 126 obtained by BMcD as depicted in their revised report. The underlying map and the contours in 127 blue are a reproduction of Figures 9, 10 and 13 from the revised report. The contours in blue show 128 the difference in groundwater levels calculated by BMcD for their scenarios 4, 5 and 6. In each of 129 these scenarios, model results for a simulation of potential future municipal pumping are compared 130 to a future simulation of irrigation pumping and the difference in groundwater levels between the 131 two simulations are shown by the blue contours. Note that on Exhibit 1 (Figure 9) the contours 132 represent negative values whereas on Exhibits 2 and 3 (Figures 10 and 13) the contours represent 133 positive values. Negative values mean that groundwater levels are projected to be lower under the 134 municipal pumping condition versus the irrigation pumping condition. Conversely, positive 135 values mean that groundwater levels are projected to be higher under municipal pumping conditions versus irrigation pumping conditions. 136

137 The green contours on Exhibits 1, 2, and 3 show the results we obtained by simulating the same

- scenarios presented by BMcD. On Exhibits 1 and 2, the green contours are essentially directly on
- top of the blue contours showing that our results are essentially the same as the BMcD results. On
- 140 Exhibit 3, the green contours depart slightly from the blue contours, with the green contours being
- 141 slightly offset from some of the blue contours. The overall magnitude of the water level difference
- 142 shown by the green contours is essentially the same as the BMcD results.
- 143 Overall, Exhibits 1, 2 and 3 demonstrate that we have been able to compile model input files that 144 are very close to those used by BMcD even though we did not have access to the BMcD files.
- At this point, we were now in a position to correct the groundwater recharge used for the R9 rancharea under the potential future municipal pumping scenarios.

# 147 QUESTION: Now lets review the second set of exhibits. Can you walk us through what148 these exhibits show?

ANSWER: Yes. Exhibits 4, 5 and 6 show results of properly considering the changes in groundwater recharge that would occur on the R9 ranch lands if the lands were no longer irrigated. Exhibits 4, 5 and 6 each represent the same future pumping scenarios as were shown on Exhibits 1, 2 and 3. Modeling results for water level differences for each scenario that consider the reduction in groundwater recharge that would occur on the R9 ranch lands under future municipal pumping are shown by the red contours on each exhibit.

- Exhibit 4 shows results corresponding to BMcD Scenario 4 in which future municipal pumping 155 156 on the R9 ranch is assumed to be 4,793 AF/year. The average irrigation pumping in this scenario was assumed to be 4,054 AF/year over the 51-year simulation period. Thus the assumed municipal 157 158 pumping in this scenario is about 740 AF/year greater than the assumed irrigation pumping. 159 Consequently, the impacts to future groundwater levels are computed to be lower ranging from a 160 few tenths of a foot to more than one foot near the centers of pumping when only the difference in 161 the pumping rates is considered. These impacts are shown by the green and blue contours on 162 Exhibits 1 and 4.
- 163 However, when the reduction in groundwater recharge on the land that is no longer irrigated under 164 the future municipal pumping scenario is considered, the impacts to groundwater levels are much larger and more expansive as shown by the red contours on Exhibit 4. These larger impacts are a 165 166 result of reductions in groundwater recharge on the R9 ranch lands that average a little over 2,000 167 AF/year over the 51-year simulation period. So even though the average municipal pumping and 168 irrigation pumping are almost the same, the reduced groundwater recharge in the municipal pumping simulation creates significantly lower groundwater levels when compared to the 169 170 irrigation pumping simulation.
- 171 Exhibit 5 shows results for a future pumping scenario under a proposed municipal pumping 172 condition over the 51-year simulation period. In this scenario, the proposed municipal pumping

173 averages 2,426 AF/year over the simulation period. This pumping rate is less than the average

- 174 irrigation pumping of 4,054 AF/year used in the comparison simulation. As a result, groundwater
- 175 levels are projected by BMcD to be higher under the municipal condition than under the irrigation

176 pumping condition. These higher groundwater levels are shown as positive blue and green

177 contours on Exhibits 2 and 5. This is not a surprising result since groundwater recharge on the R9

- ranch lands was assumed to be the same in both the municipal pumping and the irrigation pumping
- 179 simulations.
- 180 Simulation results are quite different when groundwater recharge on the R9 ranch lands is reduced under the municipal pumping scenario. Groundwater recharge on R9 ranch lands was reduced by 181 182 over 2,000 AF/year to represent the change in land use from irrigated to non-irrigated under the 183 municipal pumping simulation. This reduction is greater than the reduction in pumping between 184 the municipal pumping simulation and the irrigation pumping simulation which is about 1,600 185 AF/year. Consequently, groundwater levels are projected to be lower under the municipal pumping simulation than under the irrigation pumping simulation. These lower groundwater 186 187 levels are shown by the negative red contours on Exhibit 5.
- 188 Exhibit 6 shows results for a future condition in which groundwater recharge is reduced during 189 selected years to represent potential effects of drought during the 51-year simulation period. In 190 this scenario, average groundwater recharge is reduced from 4,732 AF/year to 4,390 AF/year. 191 Also, future municipal pumping is assumed to increase from 2,426 AF/year to 2,741 AF/year in 192 response to the periodic drought conditions. Under these assumed conditions, future municipal 193 pumping is still lower than the assumed future irrigation pumping by about 1,300 AF/year. As a 194 result, groundwater levels are projected by BMcD to be higher under the municipal pumping 195 simulation than they are under the irrigation pumping simulation. These higher groundwater levels 196 are shown by the positive blue and green contours on Exhibits 3 and 6.
- 197 Simulation results are again quite different when groundwater recharge on the R9 ranch lands is 198 reduced under the municipal pumping scenario. Groundwater recharge on R9 ranch lands was 199 reduced by about 1,900 AF/year to represent the change in land use from irrigated to non-irrigated 200 under the municipal pumping simulation. This reduction groundwater recharge is somewhat less 201 than the over 2,000 AF/year reduction discussed previously because of the periodic drought 202 conditions that were assumed to reduce overall groundwater recharge on the R9 ranch lands from 203 what it would otherwise have been. This reduction of about 1,900 AF/year is greater than the 204 reduction in pumping between the municipal pumping simulation and the irrigation pumping 205 simulation which is about 1,300 AF/year. The municipal pumping in this scenario is about 300 206 AF/year higher than the pumping in the previous scenario and so the reduction in the municipal 207 pumping simulation from the irrigation pumping simulation is about 300 AF/year less than the 208 previous scenario.
- 209 Since the average amount of reduced pumping in this scenario is again less than the average 210 amount of reduced groundwater recharge, groundwater levels are projected to be lower under the

- 211 municipal pumping simulation than under the irrigation pumping simulation. These lower
- groundwater levels are shown by the negative red contours on Exhibit 6. Recall that on Exhibit 6,
- 213 the green and blue contours are positive and represent higher groundwater levels whereas the red
- 214 contours are negative and represent lower groundwater levels.
- 215 The impacts to groundwater levels shown by the red contours on Exhibit 6 are greater in magnitude
- and extent that those shown on Exhibit 5. The drought scenario used to compute the impacts
- shown on Exhibit 6 has a little larger net negative effect of differences in pumping and recharge
- 218 than the scenario associated with Exhibit 5. Consequently, projected negative impacts are
- somewhat greater for the scenario associated with Exhibit 6.

# QUESTION: As part of your work did you consider the question of the detrimental effect, if any, on individual irrigation wells resulting from the change in groundwater use at the R9 Ranch?

223 ANSWER: Yes. I determined that individual wells would be detrimentally affected.

#### 224 QUESTION: Were you able to identify the specific irrigation wells that you would expect to 225 be detrimentally affected?

226 ANSWER: Yes. They are identified on Exhibit 7.

#### 227 QUESTION: Describe the detrimental effects on individual wells that you anticipate as a 228 consequence of the change in groundwater use at the R9 Ranch.

229 ANSWER: Exhibit 7 shows a tabulation of how many individual wells are located within specific 230 amounts of lowered groundwater levels that are projected to occur under Scenario 4. The second 231 column on Exhibit 7 lists a minimum groundwater level impact where the negative values indicate 232 lower groundwater levels. The third column lists the number of wells that are projected to have 233 negative impacts equal to or greater than the value in column 2. The fourth column separates out 234 what are believed to be non-irrigation wells that are included in column 3. The fifth column 235 separates out irrigation wells that are located west of the river. The last column separates out the 236 remaining irrigation wells that are located east of the river. Wells located within the R9 ranch area 237 were not included in this tabulation.

#### 238 QUESTION: So lets now summarize your work. What do you see are the big takeaways 239 you're your reevaluation of the work done by BMcD?

- 240 ANSWER: First, the change in land use from irrigated to non-irrigated associated with a change
- from irrigation pumping to municipal pumping well reduce the amount of groundwater recharge
- associated with rainfall on the R9 ranch land area.
- 243 The groundwater model used by BMcD to evaluate the potential impacts of a change from
- 244 irrigation pumping to municipal pumping on the R9 ranch lands was premised on the concept of
- 245 higher groundwater recharge from rainfall on irrigated land versus non-irrigated land.

- 246 The failure of the evaluation by BMcD to consider the reduction in groundwater recharge
- 247 associated with the future change in land use from irrigated to non-irrigated causes their evaluation
- to understate the potential future negative impacts to groundwater levels that would occur when
- 249 municipal pumping replaces irrigation pumping on the R9 ranch lands.

#### 250 **QUESTION:** Did you prepare a report that reviews and documents the facts and opinions 251 expressed in your testimony?

- 252 ANSWER: Yes. It is attached as Exhibit 8.
- 253 QUESTION: Have you included with this testimony a copy of your current curriculum 254 vitae?
- 255 ANSWER: Yes. It is attached as Exhibit 9.

Steven P. Larson

#### **VERIFICATION UNDER OATH**

STATE OF Texas

#### COUNTY OF Wise

I, Steven P. Larson, being duly sworn, depose and say:

- 1. I am over the age of eighteen and competent to provide this verification.
- 2. I understand that this verification is made under oath and subject to the penalties of perjury.
- 3. I am the same Steven P. Larson identified in the written testimony to which this verification is attached.
- 4. The facts and opinions stated in the foregoing written testimony are true and correct to the best of my knowledge, information, and belief.
- 5. I have reviewed the attached written testimony and affirm its accuracy.
- 6. I understand that this verification is being made for the purpose of affirming the truthfulness and authenticity of the statements made in the attached written testimony.
- 7. I am aware that this verification may be used as evidence in a court of law or for other legal purposes.
- 8. I hereby consent to the notarization of this verification.

Further, I state nothing but the truth, under the pains and penalties of perjury.

Executed on this *µ*29th day of May , 2023.

Steven P. Larson

Subscribed and sworn to before me this <u>29th</u> day of <u>May</u>, 2023.

Notary Public [Notary Public Seal]



This notarial act was an online notarization







Exhibit 2: Comparison of SSP&A results (green contours) with BMcD results (blue contours) for BMcD Scenario 5.















Exhibit 7. Number of individual wells within selected impact levels.

				Mi to the second s	200 200 200 200 200 200 200 200 200 200
Number	Minimum Groundwater Leven Impact, feet	Total Number of Wells	NUTIFIER OF NOT-ITTIGATION Wells	Wells West of River	Wells East of River
1	-0.05	787	32	42	713
2	-0.1	627	28	40	559
ß	-0.2	425	6	37	379
4	-0.4	235	ĸ	28	204
5	-0.6	137	0	18	119
9	-0.8	93	0	13	80
7	-1	55	0	4	51
8	-1.2	37	0	2	35
6	-1.4	25	0	0	25
10	-1.6	14	0	0	14
11	-1.8	8	0	0	8
12	-2	7	0	0	7
13	-2.2	4	0	0	4
14	-2.4	2	0	0	2
15	-2.6	1	0	0	1
16	-2.8	0	0	0	0

#### EXHIBIT 8 Expert Report

Revaluation of Burns & McDonnell's R9 Ranch Modeling Results



February 1, 2023

1801 Rockville Pike, Suite 220, Rockville, Maryland 20852-1649 • (301) 718-8900

Revaluation of Burns & McDonnell's R9 Ranch Modeling Results

Prepared by:

Steven P. Larson



S.S. PAPADOPULOS & ASSOCIATES, INC. Environmental & Water-Resource Consultants

February 1, 2023

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# Figures

Attachment



#### List of Figures

- Figure 1 Comparison of SSP&A Results (green contours) with BMcD Results (blue contours) for BMcD Scenario 4
- Figure 2 Comparison of SSP&A Results (green contours) with BMcD Results (blue contours) for BMcD Scenario 5
- Figure 3 Comparison of SSP&A Results (green contours) with BMcD Results (blue contours) for BMcD Scenario 6
- Figure 4 Comparison of SSP&A Results Using BMcD Recharge (green contours) with SSP&A Results Using Reduced Groundwater Recharge (red contours) for BMcD Scenario 4
- Figure 5 Comparison of SSP&A Results Using BMcD Recharge (green contours) with SSP&A Results Using Reduced Groundwater Recharge (red contours) for BMcD Scenario 5
- Figure 6 Comparison of SSP&A Results Using BMcD Recharge (green contours) with SSP&A Results Using Reduced Groundwater Recharge (red contours) for BMcD Scenario 6
- Figure 7 Comparison of SSP&A Reduced Recharge Rates to BMcD Recharge Rates Along with Assumed Pumping Over the Simulation Period for Scenario 6 (simulated drought period)

#### List of Attachments

Attachment Curriculum Vitae of Steven P. Larson

REPORT



# Section 1 Qualifications

This report was prepared by Steven P. Larson. Mr. Larson is a Principal with S.S. Papadopulos & Associates, Inc. (SSP&A), a firm that provides consulting services related to environmental and water-resource issues. His area of expertise is hydrology, with emphasis on groundwater hydrology including assessment of soil and groundwater contamination.

Mr. Larson holds a Bachelor of Science in Civil Engineering from the University of Minnesota (1969), and a Master of Science in Civil Engineering, also from the University of Minnesota (1971). He is a member of the National Ground Water Association and the American Institute of Hydrology. He is also certified as a Professional Hydrologist with the American Institute of Hydrology.

Prior to joining SSP&A in 1980, Mr. Larson was employed as a hydrologist with the Water Resources Division of the U.S. Geological Survey (USGS) for almost 9 years. During his tenure with the USGS, he conducted numerous hydrological studies on a variety of groundwater and surface water problems. During his tenure with the USGS, Mr. Larson was responsible for the development and use of groundwater simulation models that were used by other scientists in the USGS.

Mr. Larson has spent the last 40 years with SSP&A conducting and managing projects related to a variety of environmental and water-resource issues. During his tenure at SSP&A, Mr. Larson has been involved in projects covering a wide spectrum of technical, environmental, and legal issues including environmental impact evaluations, evaluations of water-resource development, water-rights permitting and adjudication, remedial investigations at CERCLA and other waste-disposal sites, feasibility studies, engineering evaluations/cost analyses, and remedial action plans.

Mr. Larson has also testified as an expert in numerous legal and administrative forums. These cases have included permit and licensing hearings, water-rights adjudications, arbitration hearings, interstate compact claims, toxic torts, liability claims, various legal actions under CERCLA, property damage claims, and insurance claims.

Mr. Larson has also served as a technical expert in several interstate water disputes. These include: Kansas v. Colorado, No. 105, Orig.; Nebraska v. Wyoming, No. 108, Orig.; Kansas v. Nebraska, No. 126, Orig.; Montana v. Wyoming, No. 137, Orig.; South Carolina v. North Carolina, No. 138, Orig. and Mississippi v. Tennessee; and Memphis, Light, Gas, & Water Division, No. 143, Orig. This work has included testimony as an expert in the fields of hydrology, groundwater hydrology, and hydrologic modeling.

Mr. Larson has also served as a consultant and advisor to the State of Kansas on several groundwater modeling studies. These efforts include the cooperative development of a groundwater model by the States of Kansas, Nebraska and Colorado for the Republican River basin that provides input to evaluations of compliance with the Republican River Compact. Mr. Larson has also served on technical committees to review the development of groundwater models for the Rattlesnake Creek basin by the Kansas Geological Survey and for the Arkansas River basin



by Balleau Groundwater, Inc. (BGW) on behalf of Groundwater Management District 5. The latter model is the model used by Burns & McDonnell (BMcD) in their evaluation of the R9 Ranch transfer application.

A copy Mr. Larson's curriculum vitae (CV) is attached to this report.



# Section 2 Summary of Evaluation

BMcD, on behalf of the Cities of Hays and Russell, Kansas, submitted reports describing the potential impacts of changing the groundwater use on the R9 Ranch from irrigation to municipal supply (BMcD, 2018a; 2018b). The potential impacts of the change in groundwater use were evaluated using a groundwater flow model developed by Big Bend Groundwater Management District No. 5 (BGW, 2010).

Burns & McDonnell prepared two reports describing their modeling evaluation, an initial report (BMcD, 2018a) and a revised report (BMcD, 2018b). The revised report was prepared to correct technical errors in the initial evaluation that were identified by Balleau Groundwater as part of their review of the BMcD evaluation and by BMcD after further review.

The revised evaluation prepared by BMcD did not address "alternative" approaches to the modeling evaluation offered by BGW or Keller-Bliesner Engineering (BMcD, 2018b). The concerns raised by BGW and Keller-Bliesner included concerns about changes in water budgets caused by the transfer.

When irrigated land is taken out of irrigation, soil moisture conditions become dependent on incident precipitation. More importantly, the lack of irrigation to increase and maintain soil moisture impacts the amount of incident precipitation that can recharge the groundwater. This difference in conditions is reflected in the relationships used in the groundwater model to estimate groundwater recharge associated with incident precipitation. Precipitation on irrigated land will produce greater recharge to groundwater than the same precipitation on non-irrigated land. These different relationships are described in the report by BGW on the development of the groundwater model.

The BMcD projected future scenarios did not account for the reduction in groundwater recharge associated with changing the status of lands on the R9 Ranch from irrigated to non-irrigated. The BGW groundwater model was premised on the concept of increased groundwater recharge from precipitation on irrigated lands. To be consistent with this premise when evaluating a transfer, the groundwater recharge on irrigated land must be reduced when that land is no longer irrigated.

The evaluation in this report reevaluates the projected future scenarios used by BMcD considering that the future condition of no irrigation will result in less groundwater recharge from precipitation on the lands that will be taken out of irrigation because of the proposed transfer. This reevaluation demonstrates that the change in groundwater recharge associated with the proposed transfer will exacerbate the negative impacts to groundwater levels and groundwater users in the area surrounding the R9 ranch.



# Section 3 Basis for Evaluation

The groundwater model input files used by BMcD in their revised evaluation were not available to SSP&A. SSP&A was able to obtain the groundwater model input files that BMcD used in their original evaluation. In response to the comments by BGW, BMcD adjusted the groundwater model input files to correct errors that were identified by BGW and by BMcD. The nature of these adjustments was described to a certain extent in documents from BMcD.

Based on these descriptions as well as information prepared by BGW, SSP&A attempted to replicate the adjustments to the groundwater model files made by BMcD. These adjustments included changes to streambed elevations along the Arkansas River and river inflow conditions along the western boundary of the model domain.

The groundwater model changes made by SSP&A to replicate the BMcD revised input files could not be checked directly against model output since SSP&A did not have model output files associated with the BMcD revised calculations. As an alternative check, SSP&A compared results associated with the figures and tables that BMcD included in their revised report. These figures and tables provided a basis for ensuring that the groundwater model files used by SSP&A produced results that were reasonably close to the results shown on the figures and tables in the BMcD revised report.

As an example of these checks, Figures 1 to 3 compare SSP&A results to BMcD results corresponding to Figures 9, 10 and 13 in the revised BMcD report. As shown on Figures 1 and 2, the SSP&A results corresponding to BMcD Scenarios 4 and 5 very closely mimic the BMcD results correspondence between SSP&A results and BMcD revised results for Scenario 6 shown on Figure 13 of the BMcD revised report. There is a slight displacement in the groundwater level differences but the magnitudes of the differences are very close to one another. This indicates that there are some differences in the input files between SSP&A and BMcD associated with Scenario 6. Scenario 6 was a drought scenario where groundwater recharge conditions during certain years of the magnitudes of the differences between the SSP&A version and the BMcD version for Scenario 6 were relatively small, it was concluded that the SSP&A input files were sufficient to evaluate the effects of reduced ground water recharge on irrigated land that would no longer be irrigated because of the proposed transfer.

The first step in the recalculating the impacts associated with the scenarios used by BMcD was to determine how much reduction in groundwater recharge would occur on the R9 ranch lands associated with the transfer and the consequent change in conditions from irrigated land to non-irrigated land. Figures 32 and 33 in the 2010 BGW report on the development of the GMD5 groundwater model and illustrate the procedures used to calculate monthly groundwater recharge from monthly precipitation. The R9 ranch area lies in recharge zone 9 depicted on Figure 33 in the BGW report. The curves on Figure 32 of the BGW report illustrate two curves for estimating recharge in zone 9, one curve for pre-1970 (non-irrigated) and one curve for post-1970 (irrigated). By comparing the post-1970 curve to the pre-1970 curve for a given amount of groundwater

recharge, SSP&A was able to determine the amount of reduction in recharge that would occur when land conditions change from irrigated to non-irrigated.

The scenarios calculated by BMcD to evaluate impacts of the proposed transfer used historical conditions from 1991 to 2007 to represent potential future conditions. This 17-year period was repeated three times to create a 51-year future simulation period. SSP&A adjusted the recharge input file from BMcD by reducing the amount of groundwater recharge on the lands associated with the R9 ranch using the relative positions of the zone 9 recharge curves on Figure 32 of the BGW report. The adjusted recharge input file was then used in recalculating the potential impacts of the proposed transfer for the various scenarios used by BMcD.

The calculations of potential impacts for the various scenarios considered by BMcD assumed that groundwater recharge for the period from 1991 to 2007 on the R9 ranch would not change because of the proposed transfer. However, the estimated groundwater recharge rates used in the groundwater model were premised on the notion that groundwater recharge from precipitation on irrigated land would be greater than on non-irrigated land for the same amount of precipitation. Groundwater recharge from precipitation for the period from 1991 to 2007 over the area of the R9 ranch was calculated to average about 4,732 acre-feet per year or about 5.1 inches per year. Using the zone 9 recharge curves from BGW, SSP&A calculated that groundwater recharge from precipitation for the period from 1991 to 2007 would only be 2,655 acre-feet per year or about 2.8 inches per year if the land was not irrigated. In other words, groundwater recharge from precipitation on the R9 ranch under the conditions associated with the proposed transfer would only be about 56% of the recharge that was estimated for the historical conditions that existed from 1991 to 2007.



# Section 4 Results of SSP&A Evaluation

SSP&A repeated the groundwater model runs corresponding to Scenarios 1 to 6 described by BMcD in their revised report. However, for the scenarios that assumed pumping by the proposed municipal wells (Scenarios 2, 4, 5, and 6), the groundwater recharge was adjusted to reflect the change in land condition from irrigated to non-irrigated as described above.

The reduction in groundwater recharge resulting from the change in land conditions associated with the proposed transfer exacerbates the calculated negative impacts. These exacerbated impacts are illustrated on Figure 4 to 6. Figure 4 shows the difference in groundwater levels over the 51-year simulation period associated with BMcD's Scenario 4. The figure compares the BMcD result (blue and green contours) with the SSP&A result (red contours) where the groundwater recharge on the R9 ranch area was reduced to reflect the change in land condition from irrigated to non-irrigated. The reduction in groundwater levels has increased from generally less than one foot in the BMcD simulation to several feet in the SSP&A simulation. The area of reduced groundwater levels in the SSP&A simulation is also much larger and has the potential to impact many more existing groundwater users than the BMcD result.

Figure 5 shows the difference in groundwater levels over the 51-year simulation associated with BMcD Scenario 5. This figure might appear at first glance to show less impact in the SSP&A simulation than the BMcD simulation, at least in terms of the area of impact. However, the BMcD simulation shows an **increase** in groundwater levels over the simulation period whereas the SSP&A simulation shows a **reduction** in groundwater levels. Note that the BMcD contours (blue and green) are **positive** while the SSP&A contours are **negative**. Thus, when the potential reduction in groundwater recharge on the R9 ranch area is considered, BMcD Scenario 5 results in a negative rather than a positive impact to existing groundwater users.

Results for BMcD Scenario 6 are shown on Figure 6. Scenario 6 is similar to Scenario 5 except that groundwater recharge is reduced for some years during the 51-year simulation period to mimic the potential effects of a drought period like the one that occurred in the 1930's. Figure 7 compares the reduced recharge rates used by SSP&A along with the recharge rate used by BMcD in Scenario 6. Figure 7 also shows the pumping rates from the R9 ranch area that were assumed for Scenario 6. The figure illustrates the increase in pumping that was assumed to occur during the simulated drought period.

In comparing Figure 5 to Figure 6, the impacts in the BMcD simulations (blue and green contours) appear to shrink. However, the BMcD results are an **increase** in groundwater levels and the effects of considering a potential "drought" shown on Figure 6 is a reduction in both the magnitude and extent of the **increased** groundwater levels. In contrast, the SSP&A simulations (red contours) show an increase in both the magnitude and extent of **decreased** groundwater levels associated with BMcD Scenario 6 when potential reductions in groundwater recharge on the R9 ranch are considered.


# Section 5 Conclusions

BMcD evaluated the impacts associated with the proposed change from irrigation use to municipal use by simulating several scenarios of potential future pumping and hydrologic conditions within the R9 ranch area. BMcD used the GMD5 groundwater model to estimate the differences in groundwater levels between a scenario of future irrigation use and a scenario of future municipal use within the R9 ranch. However, BMcD failed to consider the reduction in groundwater recharge that would occur when the land within the R9 ranch area was not irrigated in the municipal pumping scenarios.

The reduction in groundwater recharge within the R9 ranch area when land is no longer irrigated was estimated to average about 2,000 acre-feet per year over the 51-year simulation period that BMcD used in their simulations. This reduction in groundwater recharge was calculated using precipitation-recharge curves that formed one of the bases for the GMD5 groundwater model that BMcD used in their evaluation.

The inclusion of a reduction in groundwater recharge in the potential future scenarios of municipal pumping significantly increases the impacts to groundwater levels by five times or more in places near the ranch boundary from those projected in the BMcD evaluations. The areal extent of reduced groundwater levels was also significantly increased from about 15 square miles to over 150 square miles when the reduction in groundwater recharge was appropriately considered in simulations of potential municipal pumping from the R9 ranch area.



# Section 6 References

Balleau Groundwater, Inc. (BGW). 2010. Hydrologic Model of Big Bend Groundwater Management District No. 5. June.

Burns & McDonnell (BMcD). 2018a. R9 Ranch Modeling Results. February 13.

Burns & McDonnell (BMcD). 2018b. R9 Ranch Modeling Results - Revision 2. September 24.

**FIGURES** 







Figure 2: Comparison of SSP&A results (green contours) with BMcD results (blue contours) for BMcD Scenario 5.









contours) with SSP&A results using reduced groundwater recharge (red Figure 5: Comparison of SSP&A results using BMcD recharge (green contours) for BMcD Scenario 5.







recharge rates along with assumed pumping over the simulation period for Scenario 6 (simulated drought period). ATTACHMENT

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### **AREAS OF EXPERTISE**

- Groundwater Hydrology
- Contaminant Fate and Transport
- Site Investigation and Remediation

### **SUMMARY OF QUALIFICATIONS**

Mr. Larson is a recognized authority on numerical simulation models and their application in the analysis of a variety of groundwater problems. He has developed such models for analyzing groundwater flow, mass- and heat-transport in groundwater systems, contaminant migration, recovery of petroleum products from groundwater, saltwater intrusion in coastal aguifers, and thermal energy storage in aguifers. In addition, he has been in the forefront of combining these methods with linear programming techniques to optimize the development of groundwater supplies or the remediation of contaminated groundwater. Mr. Larson has conducted training courses on the use of these models and provided technical support on their application to a variety of hydrologic conditions. He has authored and co-authored publications on the application of aquifer simulation models that are widely used by practicing hydrologists. He has served as an expert witness in numerous judicial forums regarding groundwater issues and the application of simulation models for demonstrating the fate of soil/groundwater contamination and the effect of remediation alternatives.

### **REPRESENTATIVE EXPERIENCE**

### S.S. Papadopulos & Associates, Inc., Rockville, Maryland

As senior principal of the company, Mr. Larson assists in the management of the company and in the conduct and management of projects dealing with a wide variety of environmental and water-resource issues. During his many years at SSP&A, he has been involved in numerous projects covering a wide spectrum of technical, environmental, and legal issues including:

- Numerical Modeling
- Spatial Interpolation
- Expert Testimony

### YEARS OF EXPERIENCE: 50+

#### EDUCATION

- **MS**, Civil Engineering University of Minnesota, Minneapolis, 1971
- **BS**, Civil Engineering (High Distinction) University of Minnesota, Minneapolis, 1969

#### REGISTRATIONS

Professional Hydrologist 93-HGW-1032

#### **PROFESSIONAL HISTORY**

- S.S. Papadopulos & Associates, Inc., Executive Vice President, 1980 to present.
- U.S. Geological Survey,
- Water Resources Division, Reston, Virginia: Hydrologist, 1975 – 1980 Water Resources Division, St. Paul, Minnesota: Hydrologist, 1971 – 1975 Water Resources Division, National
- Training Center, Denver, Colorado: Hydrologist, 1971
- St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minnesota: Research Assistant, 1969 – 1971
- Site Evaluations Remedial investigations, feasibility studies, engineering evaluation/cost analyses, and remedial action plans at CERCLA and other waste disposal sites including the Stringfellow site in California, the FMC Fridley site in Minnesota, the Chem Dyne site in Ohio, the Conservation Chemical site in Missouri, the Hardage-Criner site in Oklahoma, and the Hastings site in Nebraska.
- Groundwater Contamination Evaluations, CERCLA and Other Waste-Disposal Sites Love Canal, New York; Savannah River Plant, South Carolina; Tucson Airport, Arizona; Ottati & Goss site, New Hampshire; Martin-Marietta site, Colorado; and Western Processing site, Washington State.
- Environmental Impact Evaluations of the Effects of Water Development, Wyoming and South Dakota For proposed coal slurry operations in Wyoming, of in-situ mining for trona minerals in Wyoming, and of groundwater development on the shallow-water-table in South Dakota.

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- Water-Supply Development Evaluations Potential impacts of salt-water intrusion on watersupply development, in Oman, Portugal and Florida; and analysis of potential impacts of power-plant cooling water on groundwater and surface water in Wyoming.
- Evaluations of Permitting, Licensing, and Environmental Issues Associated with Mining Coal mining in Wyoming, Montana, and Arizona; copper mining in Montana and Utah; trona mining in Wyoming; and uranium mining in New Mexico.
- Evaluations of the Effects of Discharge on Groundwater from Chemical-Manufacturing Waste Disposal — Wyoming, Virginia, and New York.
- Water-Rights Permitting Evaluations and Adjudication New Mexico, Texas, Colorado, Kansas, Wyoming, Nebraska, Arizona, and Idaho.
- Environmental Audits, Groundwater Monitoring Plans, and Other Environmental Investigations

   Oaks Landfill in Maryland, the FMC Carteret facility in Wyoming, the former IBM facility in Indiana, and the Insilco site in Florida.

### SPECIFIC PROJECT EXPERIENCE

- Montrose Chemical Corporation Superfund Site, California Provides technical support to Montrose regarding modeling of groundwater flow and chemical transport. Assists Montrose in conducting evaluations of a groundwater recovery and treatment program that has been developed to provide mitigation of groundwater impacted by monochlorobenzene and other chemicals associated with former manufacturing operations at the site.
- Osage Road Site, Oklahoma Provides technical support to Halliburton regarding investigation and evaluation of groundwater impacted by perchlorate associated with former missile casing cleaning operations that had been conducted at the site. Work has included compilation and mapping of groundwater levels and perchlorate concentrations in groundwater. The work has also included design of an interim groundwater remediation system and evaluations of system performance since its installation.
- Far-Mar-Co Subsite, Hastings Site, Nebraska Supervised the preparation of an engineering evaluation/cost analysis (EE/CA) to support implementation of remediation of groundwater contamination. Worked with regulatory agencies to gain approval of the EE/CA and progress toward design and implementation. Previously, on behalf of Morrison Enterprises, supervised completion of a remedial investigation and a feasibility study involving carbon tetrachloride and ethylene dibromide contamination.
- Stringfellow Site, near Riverside, California Served as the principal technical advisor on groundwater issues to the Pyrite Canyon Group that overviewed investigations and remedial activities sponsored by the responsible parties. Designed and evaluated several investigations and remediation programs. Represented the client as a technical spokesperson in workshops, technical seminars, and meetings with regulatory agencies and other interested parties. Prepared key documents to support the decision-making process toward the final Record of Decision.
- In the case of Kansas v. Colorado before the U.S. Supreme Court Served on a team of technical advisors to the State of Kansas in its litigation with Colorado over violations of the Arkansas River Compact. Assisted in obtaining a finding of compact violation regarding the pumping of groundwater from wells along the river valley in Colorado. Continued as a technical expert as the case moved into subsequent phases involving the quantification of depletions of supply, assessments of damage, and future compliance by Colorado.

### EXPERT AND FACT WITNESS EXPERIENCE

 Litigation associated with soil and groundwater contamination at CERCLA, RCRA, and other facility sites in California, Kansas, Missouri, Oklahoma, Tennessee, Montana, Florida, Iowa, and Nebraska.

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- Toxic tort, property damage, and liability litigation regarding soil and groundwater contamination at sites or facilities in New York, Tennessee, Texas, Virginia, Ohio, and other states.
- Insurance recovery litigation associated with contamination at a variety of sites or facilities for commercial clients such as General Electric, FMC Corporation, Upjohn, AT&T, Rohr Industries, Beazer East/Koppers, North American Phillips, DOW Chemical, Occidental Chemical, and Southern California Edison. Water-rights permitting litigation and water adjudication including cases in New Mexico, Colorado, and Arizona, as well as interstate river compact disputes involving the states of Kansas, Colorado, Wyoming, Nebraska, South Carolina and Tennessee.

### U.S. Geological Survey, Water Resources Division, Reston, Virginia

Originated, planned and conducted research in the development of numerical simulation models and techniques for the analysis of a variety of problems related to groundwater systems. Applied the developed models to actual field situations for verification and further refinement and documented these models in a manner suitable for use by others. Served as coordinator and instructor for training courses on groundwater simulation models and methodologies conducted by the Division and provided primary technical assistance to many groundwater projects conducted by District. Participated in and represented the Survey in national and international meetings. Conducted groundwater studies of national and regional interest and participated in or was detailed to overseas projects conducted or managed by other U.S. agencies and the World Bank.

### U.S. Geological Survey, Water Resources Division, St. Paul, Minnesota

Served as Project Chief and participated in studies involving the evaluation of groundwater resources, the assessment of stream-water quality, and the analysis of surface-water/groundwater relationships in various parts of Minnesota.

### U.S. Geological Survey, Water Resources Division, National Training Center, Denver

Participated in an extended training program providing in-depth training on both office and field techniques for the collection and the analysis of data and the conduct of surface-water, groundwater, and water-quality studies.

### St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minnesota

As a Research Assistant, participated in the development and operation of an urban-runoff model to predict sewer flow distribution for the Minneapolis – St. Paul Sanitary District. Assisted in runoff prediction studies for St. Paul and participated in a project to survey and summarize computer programs used in water resources engineering.

### **PROFESSIONAL SOCIETIES**

National Groundwater Association American Institute of Hydrology

### **AWARDS AND HONORS**

Civil Servant of the Year, U.S. Geological Survey, 1974 U.S. Geological Survey Incentive Award, 1974 American Society of Civil Engineering Student Award, 1969

### **PUBLICATIONS AND PRESENTATIONS**

Barth, G., S.P. Larson, G. Lewis, and K. Green, 2011. Prediction Uncertainty of Drawdown in the Seven-Rivers Augmentation Well Field. Presentation at the National Groundwater Association (NGWA) Conference 2011. Baltimore, MD. June 2011, 15.



Groundwater Hydrologist

- Spiliotopoulos, A., M. Karanovic, and S. Larson, 2008. Development of Transient Flow Models for the Solomon River Basin. Presentation at MODFLOW and More 2008: Ground Water and Public Policy Conference, May 18-21, 2008, Golden, CO.
- Papadopulos, S.S., and S.P. Larson, 2007. The Drawdown Distribution in and Around a Well Pumping from a Two-Region Aquifer. Presentation at the 119<sup>th</sup> Annual Meeting of the Geological Society of America, Denver, CO, October 27-31, 2007. <u>in</u> *Abstracts and Programs*, v. 39, no. 6. p. 189. Geological Society of America, Boulder, CO.
- Larson, S.P., 2007. The Use of Complex Computer Modeling of Groundwater Systems. Presentation at the 53<sup>rd</sup> Annual Rocky Mountain Mineral Law Institute, Vancouver, British Columbia, July 19-21, 2007. 21.
- Larson, S.P., 2006. Simplicity in Modeling Use of Analytical Models with PEST. Presentation at MODFLOW and More 2006, Managing Ground-Water Systems, International Ground Water Modeling Center, Colorado School of Mines Golden, CO, May 22-24, 2006: v. 2, pp. 579-583.
- Tonkin, M.J., S. Larson, and C. Muffels, 2004. Assessment of Hydraulic Capture through Interpolation of Measured Water Level Data. Presentation at Conference on Accelerating Site Closeout, Improving Performance, and Reducing Costs through Optimization, U.S. Environmental Protection Agency, Federal Remediation Technology Roundtable, June 15-17, 2004, Dallas, TX.
- Tonkin, M.J. and S. Larson, 2002. Kriging Water Levels with a Regional-Linear and Point-Logarithmic Drifts: *Ground Water*, v. 40, no. 2 (March-April), pp. 185-193.
- Blum, V.S., S. Israel, and S.P. Larson, 2001. Adapting MODFLOW to Simulate Water Movement in the Unsaturated Zone. <u>in</u> *Proceedings of MODFLOW 2001 and Other Modeling Odysseys*, International Groundwater Modeling Center (IGWMC), September 11-14, 2001, Colorado School of Mines, Golden, Colorado, pp. 60-65.
- Larson, S.P., C. Andrews, and C. Neville, 1995. Parameter Estimation in Groundwater Modeling: Research, Development, and Application (Abstract). American Geophysical Union (AGU) Spring Meeting, Baltimore, May 30–June 2, 1995, Hydrology Sessions (invited speaker). S145, Abstract H51C-02 0835h.
- Andrews, C.B., and S. Larson, 1988. Evolution of Water Quality in the Lower Rio Grande Valley, New Mexico. *Eos*, v. 69, no. 16, p. 357.
- Larson, S.P., C. Andrews, M. Howland, and D. Feinstein, 1987. Three-Dimensional Modeling Analysis of Groundwater Pumping Schemes for Containment of Shallow Groundwater Contamination. <u>in</u> *Solving Ground Water Problems with Models*. Dublin, OH: National Water Well Association. pp. 517-536.
- Bennett, G.D., A. Kontis, and S. Larson, 1982. Representation of Multi-Aquifer Well Effects in Three-Dimensional Groundwater Flow Simulation. *Ground Water*, v. 20, no. 3, pp. 334-341.
- Helgesen, J.O., S. Larson, and A. Razem, 1982. *Model Modifications for Simulation of Flow Through Stratified Rocks in Eastern Ohio*. U.S. Geological Survey, Water-Resources Investigations 82-4019.
- Larson, S.P., S. Papadopulos, and J. Kelly, 1981. Simulation Analysis of a Double-Transmissivity Concept for the Madison Aquifer System (abstract). *Proceedings of the 10th Annual Rocky Mountain Ground-Water Conference*, Laramie, Wyoming, April 30-May 2, 1981. p. 76.
- Mercer, J.W., S. Larson, and C. Faust, 1980. *Finite-Difference Model to Simulate the Real Flow of Saltwater and Fresh Water Separated by an Interface*. U.S. Geological Survey, Open-File Report, pp. 80-407.
- Mercer, J.W., S. Larson, and C. Faust, 1980. Simulation of Saltwater Interface Motion. *Ground Water*, v. 18, no. 4, pp. 374-385.
- Larson, S.P., 1978. *Direct Solution Algorithm for the Two-Dimensional Ground-Water Flow Model*. U.S. Geological Survey, Open-File Report 79-202, p. 25.

Groundwater Hydrologist

Page 5

- Papadopulos, S.S., and S. Larson, 1978. Aquifer Storage of Heated Water: Part II Numerical Simulation of Field Results. *Ground Water*, v. 16, no. 4, pp. 242-248.
- Burnham, W.L., S. Larson, and H. Cooper Jr., 1977. Distribution of Injected Waste-Water in the Saline Lava Aquifer, Wailuku-Kahului Waste-Water Treatment Facility, Kahului, Maui, Hawaii. U.S. Geological Survey, Open File Report 77-469.
- Larson, S.P., T. Maddock III, and S. Papadopulos, 1977. Optimization Techniques Applied to Ground-Water Development. Presentation at the Congress of the International Association of Hydrogeologists, Birmingham, England, July 24-30, 1977. <u>in Memoires</u>, 13, Part 1. E57-E66.
- Larson, S.P., S. Papadopulos, H. Cooper, Jr., and W. Burnham, 1977. Simulation of Wastewater Injection into a Coastal Aquifer System near Kahului, Maui, Hawaii. Presentation at the American Society of Civil Engineers' (ASCE) 25t<sup>h</sup> Annual Hydraulic Division Specialty Conference on the Hydraulics in the Coastal Zone, Texas A&M University, College Station, TX, August 10-12, 1977. <u>in</u> Proceedings -Hydraulics Division Specialty Conference, v. 25, pp. 107-116.
- Larson, S.P., and P. Trescott, 1977. Solution of Water-Table and Anisotropic Flow Problems Using the Strongly Implicit Procedure: *Journal of Research of U.S. Geological Survey*, v.5, no. 6, pp. 815-821.
- Trescott, P.C., and S. Larson, 1977. Comparison of Iterative Methods of Solving Two-Dimensional Ground-Water Flow Equations. *Water Resources Research*, v. 13, no. 1, pp. 125-136.
- Trescott, P.C., and S. Larson, 1977. Solution of Three-Dimensional Ground-Water Flow Equations Using the Strongly Implicit Procedure. *Journal of Hydrology, v.* 35, pp. 49-60.
- Larson, S.P., 1976. An Appraisal of Ground Water for Irrigation in the Appleton Area, West-Central Minnesota. U.S. Geological Survey, Water Supply Paper 2039-B, p. 34.
- Larson, S.P., W. Mann IV, T. Steele, and R. Susag, 1976. *Graphic and Analytical Methods for Assessment of Stream-Water Quality: Mississippi River in the Minneapolis St. Paul Metropolitan Area, Minnesota.* U.S. Geological Survey, Water Resources Investigations Open-File Report 76-94. 55.
- Trescott, P.C., and S. Larson, 1976. Supplement to Open-File Report 75-438 Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow. U.S. Geological Survey, Open-File Report 76-591. 21.
- Trescott, P.C., G. Pinder, and S. Larson, 1976. *Finite Difference Model for Aquifer Simulation in Two Dimensions with Results of Numerical Experiments*. Automated Data Processing and Computations. Techniques of Water-Resources Investigations Book 7. Chapter C1, p.116.
- Larson, S.P., M. McBride, and R. Wolf, 1975. Digital Models of a Glacial Outwash Aquifer in the Pearl-Sallie Lakes Area, West-Central Minnesota. U.S. Geological Survey, Water Resources Investigations 75-40. 39.
- Larson-Higdem, D.C., S. Larson, and R. Norvitch, 1975. *Configuration of the Water Table and Distribution of Downward Leakage to the Prairie du Chien/Jordan Aquifer in the Minneapolis -St. Paul Metropolitan Area*. U.S. Geological Survey, Open-File Report 75-342. 33.
- Bowers, C.E., A. Pabst, and S. Larson, 1972. *Computer Programs in Hydrology*. University of Minnesota, Water Resources Research Center Bulletin 44. 172.
- Bowers, C.E., A. Pabst, and S. Larson, 1971. *Computer Program for Statistical Analysis of Annual Flood Data by the Log-Pearson Type III Method*. University of Minnesota, Water Resources Research Center Bulletin 39. 26.

### **DEPOSITION AND TESTIMONY EXPERIENCE**

### **DEPOSITIONS**

2022 Lazy S Ranch Properties, LLC vs. Valero Terminaling and Distribution Company, et al. U.S. District Court for the Eastern District of Oklahoma. Case No. CIV-19-425-RAW. September 30.

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- 2020 Orange County Water District vs. Sabic Innovative Plastics US, LLC, et al. Case No. 30-2008-00078246-CU-TT-CXC. December 7.
- 2020 Michele Baker et al. vs Saint-Gobain Performance Plastics Co. and Honeywell International Inc. et al. December 1.
- 2018 James Blocker and Jami Blocker, et al. vs. ConocoPhillips Company. U.S. District Court for the Western District of Oklahoma. Case No. CIV-17-248-D. July 10.
- 2017 Mississippi vs. Tennessee, City of Memphis and Memphis Light, Gas, & Water Division. U.S. Supreme Court. No. 143, Orig. September 19.
- 2017 Albin Family Revocable Living Trust, et al. vs. Halliburton Energy Services, Inc. U.S. District Court for the Western District of Oklahoma. Case No. CIV-16-910-M. July 25.
- 2015 In the Matter of the Application by the City of Gallup for Permit to Appropriate Ground Water within the Gallup Underground Water Basin of New Mexico. Before the New Mexico State Engineer. Hearing No. 99-003. March 11.
- 2015 Mitchell McCormick, et al. vs. Halliburton Company, et al. U.S. District Court for the Western District of Oklahoma. Case No. 11-CV-01272-M. January 15.
- 2014 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. January 30. (Arbitration)
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. August 5. (Arbitration)
- 2013 Mitchell McCormick, et al. vs. Halliburton Company, et al. U.S. District Court for the Western District of Oklahoma. July 30.
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. July 24. (Arbitration)
- 2013 Montana vs. Wyoming and North Dakota. Supreme Court of the United States. No. 137, Original. July 16.
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. June 11.
- 2013 State of New Mexico ex rel. State Engineer vs Kerr-McGee Corporation et al., State of New Mexico, County of Cibola, Thirteenth Judicial District Court, No. CB-83-190-CV & CB-83-220-CV (Consolidated). April 9 - 11.
- 2013 Montana vs. Wyoming and North Dakota. Supreme Court of the United States. No. 137, Original. February 12.
- 2013 Orange County vs. Sabic Innovative Plastics US, LLC., et al. Superior Court of the State of California for the County of Orange. Case No. 30-2008-00078246-CU-TT-CXC. January 29.
- 2012 State of New Mexico ex rel. State Engineer vs Kerr-McGee Corporation et al., State of New Mexico, County of Cibola, Thirteenth Judicial District Court, No. CB-83-190-CV & CB-83-220-CV (Consolidated). October 10-12.
- 2012 Orange County Water District vs Northrop Corporation, et al., Superior Court of the State of California in and for the County of Orange, No. 04CC00715. July 11 and August 1.
- 2012 Atlantic Richfield vs State of California, et al., Superior Court of the State of California, County of Los Angeles, Central District. No. BC 380474. June 21-22.
- 2012 Michael O. Thomas and Patricia Thomas vs ConocoPhillips, Inc. et al., In the Circuit Court in and for Escambia County, Florida, Case No. 2008 CA 001381. June 12.
- 2012 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. April 9.
- 2012 Ron Block, et al. vs. Daniel and Mary Lou Helix, et al. Superior Court of California, County of Contra Costa. No. CIVMSC05-01725. March 27.
- 2012 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. February 15.
- 2011 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. November 15.

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- 2010 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. June 29.
- 2010 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. March 3.
- 2009 Morrison Enterprises and the City of Hastings, Nebraska vs Dravo Corporation. U.S. District Court for the District of Nebraska. No. 4:08-CV-3142 (Confidential section). July 23.
- 2009 State of Oklahoma vs. Tyson Foods et al. U.S. District Court for the Northern District of Oklahoma. 05-cv-349-TCK-SAJ. April 10.
- 2009 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. February 24.
- 2009 Timm Adams et al. vs. United States of America et al. U.S. District Court for the District of Idaho. CIV 03-0049-E-BLW. January 16.
- 2008 Gloria Ned et al. vs. Union Pacific Railroad. 14th Judicial District Court, Parish of Calcasieu, State of Louisiana. 2003-001100 (Consolidated Cases). August 15.
- 2008 Jeff Alban et al. vs. ExxonMobil Corporation et al. Circuit Court for Baltimore County. 03-C-06-010932. January 24.
- 2007 City of Neodesha, Kansas et al. vs. BP Corporation North America. District Court of Wilson County, Kansas. 2004-CV-19. July 24.
- 2006 Nikko Materials USA, Inc., dba Gould Electronics v. NavCom Defense Electronics Inc., Ernest Jarvis, and Hyrum Jarvis. United States District Court, Central District of California. CV05-4158-JFW (VBKx). September 25-26.
- 2005 Rodney Montello et al. vs. Alcoa Inc. et al. vs. Whittaker Corporation. United States District Court for the Southern District of Texas, Victoria Division. C.A. No. V-02-84. December 19.
- 2005 Goodrich Corporation vs. Commercial Union Insurance Company et al. In the Court of Common Pleas, Summit County, Ohio. Case No. CV 99 02 0410. September 20.
- 2005 Santa Fe Pacific Gold Corporation vs. United Nuclear Corporation vs. The Travelers Indemnity Company and Century Indemnity Company, Inc. Eleventh Judicial District Court, County of McKinley, State of New Mexico. Case No. CV-97-139II. September 8.
- 2005 Nathaniel Allen et al. vs. Aerojet-General Corporation et al. Superior Court of the State of California for the County of Sacramento. Case No. 98AS01025. August 29.
- 2005 Aerojet-General Corporation vs. Fidelity & Casualty Co. of New York et al., Aerojet-General Corporation vs. Commercial Union Insurance Company, as Successor-In-Interest to Employers' Surplus Lines Insurance Company, etc. et al. Superior Court of the State of California in and for the County of Sacramento. Case No. 527932. July 20.
- 2005 United States of America vs. Jay James Jackson et al. U.S. District Court for the District of Nebraska. Case No. 8:04CV64. June 9.
- 2005 Palmisano vs. Olin Corporation. U.S. District Court, Northern District of California, San Jose Division. Case No. 5:03-cv-01607-RMW. March 7.
- 2005 Cheryl Lanoux et al. vs. Crompton Manufacturing Company et al. 23rd Judicial District Court, Parish of Ascension, State of Louisiana. Suit No. 72,897, Division: "B". February 25.
- 2004 RHI Holdings, Inc. vs. American Employers Insurance Company. Commonwealth of Massachusetts Superior Court Department. Civil Action No. 01-5443-G. December 7.
- 2004 Massachusetts Electric Company et al. vs. Travelers Casualty & Surety Company et al. Commonwealth of Massachusetts Superior Court. Civil Action No. 99-00467B. November 18-19.
- 2004 PECO Energy Company vs. Insurance Company of North America, et al. Court of Common Pleas of Chester County, Pennsylvania. Case No. 99-07386. June 14-15.

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- 2004 Kerr-McGee Corporation and Kerr-McGee Chemical, LLC, vs. Hartford Accident and Indemnity Company and Liberty Mutual Insurance Company. Superior Court of New Jersey Law Division: Somerset County. Docket No.: SOM-L-229-01. May 26.
- 2003 American States Water Company et al. vs. State of California et al. Superior Court of the State of California in and for the County of Sacramento. No. 98AS01998. August 14 15.
- 2003 Waste Management, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Case No. HUD-L-931-92. May 15.
- 2003 Waste Management, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Case No. HUD-L-931-92. May 6.
- 2003 Landowners, LTD. vs. Litton Industries, Black Copy, Robert Silver, dba Vito's Autobody, West Coast Corporation, doing business as Peabody's Custom Paint and Autobody Specialist, David Mangola, Robert Mangola, David Silver and DOES 1-50, Inclusive. Superior Court of the State of California in and for the County of Los Angeles. Case No.: BC255187. March 25.
- 2003 Bernice Samples et al. vs. Conoco, Inc.; Agrico Chemical Company, Inc; and Escambia Treating Company, Inc. Circuit Court of the First Judicial Circuit in and for Escambia County, Florida. Case No. 01-631-CA-01. March 20.
- 2002 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105 Original. December.
- 2002 PECO Energy Co. vs. Insurance Company of North America et al. Court of Common Plea Chester County, Pennsylvania. No. 99-07386. September 26 and 27.
- 2002 Associated Indemnity Corporation, and The American Insurance Company, vs. The Dow Chemical Company. U.S. District Court for the Eastern District of Michigan, Northern Division. No. 99 CV 76397. June 11 and 12.
- 2002 Bernice Samples et al. vs. Conoco, Inc.; Agrico Chemical Company, Inc; and Escambia Treating Company, Inc. Circuit Court for the First Judicial Court in and for Escambia County. Case No. 01-631-CA-01. June 7.
- 2002 State of New Mexico et al. vs. General Electric Company et al. The U.S. District Court for the District of New Mexico. Case No. CV 99-1254 BSJ/DJS and CV 99-1118 BSJ/LFG. April.
- 2002 Redlands Tort Litigation. Superior Court of the State of California for the County of San Bernardino. No. RCV 31496. February.
- 2001 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105 Original. August 2 and 3.
- 2001 Pfizer Inc. vs. Employers Insurance of Wausau. Superior Court of New Jersey Chancery Division: Middlesex County. Docket No. MID-C-108-92. July.
- 2001 Unisys Corporation et al. vs. Insurance Company of North America. New Jersey Superior Court, Law Division. Case No. L-1434-94-S. April.
- 2001 Gwendolyn Guillory et al. vs. Union Pacific Corporation et al. 14th Judicial District Court, Parish of Calcasieu, State of Louisiana. Case No. 98-5405. January 18.
- 2000 Chevy Chase Bank FSB vs. Shell Oil Company and Motiva Enterprises, LLC. U.S. District Court for the District of Maryland, Southern Division. Case No. PJM 00-CV-1557. November 22.
- 2000 American Home Products et al. vs. Adriatic Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Docket No. HUD-L-5002-92. October.
- 2000 Sherwin-Williams vs. Artra, et al. U.S. District Court for the District of Maryland. Case No. S-91-2744. September.
- 2000 Long Island Lighting Company vs. Allianz Underwriters Insurance Company et al. Supreme Court of the State of New York, County of New York. Index No. 97-604715. August and September.

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- 2000 Texaco, Inc. vs. H.T. Olinde, et al. U.S. Bankruptcy Court, Southern District of New York. Case Nos. 87 B 20142 (ASH), 87 B 20143 (ASH), and 87 B 20144 (ASH). August.
- 2000 United States of America, People of California vs. J.B. Stringfellow, Jr. et al. U.S. District Court for the Central District of California. Case No. CV 83-2501 R. March 20.
- 2000 Maurice L. McIntire et al. vs. Motorola, Inc. District of Arizona. Case No. CIV 91-2067 PHX PGR. February 14, 15, and 16.
- 2000 Warner-Lambert and Parke-Davis Company vs. Admiral Insurance et al. Superior Court of New Jersey Law Division: Middlesex County. Docket No. L-10456-94.
- 1999 Consolidated Edison Company of New York, Inc. vs. Allstate Insurance Company et al. Superior Court of the State of New York. Case No. 98/600142. November 4.
- 1999 Merck & Co., Inc. vs. Federal Insurance Company et al. Superior Court of New Jersey Chancery Division: Middlesex County. Docket No. CM-340-96. November.
- 1999 Aerojet-General Corporation and Cordova Chemical Company vs. Transport Indemnity Insurance Co. et al. Superior Court of the State of California, County of Sacramento. No. 98AS05598. October.
- 1999 Niagara Mohawk Power Corporation vs. Jones Chemicals, Inc., et al. U.S. District Court, Northern District of New York. Case No. 95-CV-717. August 11.
- 1999 Pfizer Inc. vs. Employers Insurance of Wausau. Superior Court of New Jersey Chancery Division: Middlesex County. Docket No. MID-C-108-92. July.
- 1999 Niagara Mohawk Power Corporation. U.S. District Court, Northern District of New York. Case No. 95-CV-717. June 29.
- 1999 Textron, Inc. vs. Ashland, Inc., Archer Daniels Midland Company; and Millenium Petrochemicals, Inc. Superior Court of New Jersey Law Division; Essex County. Docket No. ESX-L-1562-98. June.
- 1999 The Mennen Company vs. Federal Insurance Company. Superior Court of New Jersey Law Division: Union City. Civil Action UNN-L-2031-97 (Consolidated Case Nos. UNN-C-10-97 & MRS-L-4051-96). May.
- 1999 E.I. duPont de Nemours and Company and Conoco Inc. vs. Condea Vista Company. District Court, Harris County, Texas, 55th Judicial District. Case No. 97-23468. April 22.
- 1999 Jersey Central Power & Light Company vs. American Casualty Company of Reading, PA et al. Superior Court of New Jersey, Chancery Division, Middlesex County. Docket No. C-299-94. March 17 and 18.
- 1998 Zurich Insurance Company vs. Joseph Dixon Crucible Company et al. Superior Court of New Jersey Law Division: Hudson County. Docket No. L-4898-96. November.
- 1998 M/A COM, Inc. vs. Liberty Mutual Insurance Company and Employers Insurance of Wausau. Superior Court of New Jersey Law Division: Middlesex County. Docket No. L-874-97. October.
- 1998 Aetna Casualty & Surety Company vs. Dow Chemical Company, and American Guarantee and Liability Company et al. U.S. District Court for the Eastern District of Michigan. Case No. 93 CV 73601 DT. June 23-25.
- 1998 C.E. Bradley Laboratories, Inc. vs. Commercial Union Insurance Company et al. State of Vermont Superior Court of Windham County. No. S427-95 WMC. May.
- 1998 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105 Original. April 30.
- 1998 Kay Bettis et al. vs. Ruetgers-Nease Corporation et al. U.S. District Court for the Northern District of Ohio, Eastern Division. Case No. 4:90 CV 0502. March 17-18.
- 1998 State of Nebraska, vs. State of Wyoming. Supreme Court of the United States. No. 108. March.

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- 1998 Sally Comeaux et al. vs. Vista Chemical Company et al. 14th Judicial District, Parish of Calcasieu, State of Louisiana. No. 95-6539. February 6.
- 1997 Harris Corporation vs. Travelers Indemnity Company and Commercial Union Insurance Company. U.S. District Court, Middle District of Florida, Orlando Division. Case No. 96-166-ORL-19. November 6.
- 1997 Morrison Enterprises vs. Aetna Casualty & Surety Company et al. District Court of Adams County, Nebraska. Case No. 94128. October 22.
- 1997 Air Products and Chemicals, Inc. vs. Hartford Accident and Indemnity Co. Superior Court of New Jersey Law Division: Middlesex. Docket No. L-17134-89. October.
- 1997 Dianne Lofgren et al. vs. Motorola, Inc. et al. Superior Court of the State of Arizona in and for the County of Maricopa. Case No. CV 93-05521, CV 93-15612, CV 94-08956, CV 95-05322 (consolidated). October.
- 1997 Vermont American Corporation vs. American Employers Insurance Company et al. State of Vermont, Washington County, Washington Superior Court. Docket No. S 330-6-95 Wncv. July 7-8 and August.
- 1997 WMX Technologies, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey, Law Division Hudson County. Docket No. HUD-L-931-92. June, July, October, and November.
- 1997 Morrison Enterprises vs. Aetna Casualty & Surety Company et al. District Court of Adams County, Nebraska. Case No. 94128. June 12.
- 1997 Asarco, Inc. et al. vs. Andalex Resources, Inc. et al. vs. Trammell Crow et al. U.S. District Court for the Western District of Missouri. Case No. 94-0698-CV-W-BB. May 29.
- 1996 Interstate Power Company vs. American Home Assurance et al. Iowa District Court for Clinton County. Case No. LA 21793. December 18 and 19.
- 1996 Interstate Power Company vs. American Home Assurance et al. Iowa District Court for Clinton County. Case No. LA 21793 - Confidential-Protective Order. October 29, 30, 31, and November 4.
- 1996 Quantum Chemical Corporation vs. Royal Indemnity Company et al., In re: Bridge Products Site, Alta Vista, Virginia. Superior Court of the State of California, for the County of San Francisco. Case No. 965527. September 11.
- 1996 Contract Freighters, Inc. vs. International Paper Company. U.S. District Court, District of Missouri. Case No. 95-5022-CV-SW-1. June 19 and 20 and August 9.
- 1996 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105, Original. March 5, July and August.
- 1996 McDonnell Douglas Corporation vs. Allstate Insurance Company et al. February 2.
- 1996 Beazer East, Inc. vs. CSX Transportation, Inc. U.S. District Court, Western District Pennsylvania. Civil Action No. 93-0861.
- 1996 State of Montana vs. Atlantic Richfield Company. U.S. District Court, District of Montana, Helena Division. No. CV-83-317-HLN-PGH.
- 1995 Vermont American Corporation vs. American Employers' Insurance Company et al. State of Vermont, Washington County, Washington Superior Court. Case No. S 330-6-95-Wncv. July 7 and 8.
- 1995 Harry Hendler, Paul Garrett, Tillie Goldring, as Trustees et al. vs. United States Court of Federal Claims. U.S. Court of Federal Claims. Case No. 456-84-L. April 3.
- 1995 Koppers Company, Inc. vs. The Aetna Casualty & Surety Company et al. U.S. District Court for the Western District of Pennsylvania. Civil Action No. 85-2136. January 19.

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- 1995 Reichhold Chemicals, Inc. vs. Textron Inc., et al. U.S. District Court, Northern Dist. Florida. Case No. 92-30393RV.
- 1995 Hawks and Meehan vs. City of Coffeyville, et al. U.S. District Court, Kansas. Civil Action No. 93-2555-KHV.
- 1995 North American Philips Corporation vs. Aetna Casualty & Surety Company et al. Superior Court of the State of Delaware, New Castle County. Case No. 88C-JA-155-1-C. December 1 and 2, 1994 and January 3, 1995.
- 1994 Rockwell International vs. Aetna Casualty and Surety Company et al., In re: Stringfellow. Superior Court of the State of California for the County of Los Angeles. Case No. BC 050 767. May 26.
- 1993 American Telephone & Telegraph Company vs. Aetna Casualty & Surety Company et al. Superior Court of New Jersey, Law Division - Essex County. Case No. W-56681-88 - Confidential-Subject to Protective Order. December 10.
- 1993 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1993 Aluminum Company of America vs. Beazer East vs. Chicago Bridge & Iron. U.S. District Court for the Western District of Pennsylvania. Civil Action No. 91-0092. October 4.
- 1993 The Upjohn Company et al. vs. Aetna Casualty & Surety Company et al. U.S. District Court for the Western District of Michigan. Case No. K-88-124-CA4. September 13, 14, and 15.
- 1993 United States of America vs. Morrison-Quirk. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-720.
- 1993 FMC Corporation vs. Liberty Mutual Insurance Corporation. California Superior Court, Santa Clara County. No. 643058.
- 1992 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105, Original. February 5 and 6.
- 1992 Interstate Power Company vs. Kansas City Power & Light et al. U.S. District Court for the Northern District of Iowa, Central Division. Case No. C89-3033. January 24.
- 1992 Tanglewood East Homeowners Association vs. First Federal Savings & Loan Association of Conroe et al. U.S. District Court of Texas, Houston Division. Civil Action No. H-84-4798.
- 1992 Intersil vs. Western Microwave. U.S. District Court Northern District. Case No. C-90-20701-JW.
- 1992 United States of America, People of California vs. J. B. Stringfellow, Jr. et al. U.S. District Court for the Central District of California. No. CV 83-2501 JMI.
- 1991 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1991 Edwin H. Clark, II vs. Irvin F. Simon; Chem-Solv, Inc. et al. vs. The Aetna Casualty & Surety Company of Hartford et al. vs. Love Controls Corporation. Superior Court of the State of Delaware in and for Kent County. Case No. 85C-MY-1. June 6.
- 1991 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court for the Western District of New York. Civil Action No. 79-990C.
- 1990 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105, Original. June 13.
- 1990 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court, Western District of New York. Case No. CIV 79-990 (JTC). May 7 and 8, June 4 and 5, August 8, and October 4.
- 1989 United States of America vs. Royal N. Hardage et al., Advance Chemical Company et al. vs. ABCO, Inc. et al. U.S. District Court for the Western District of Oklahoma. Case No. CIV-86-1401. November 7.

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- 1989 United States of America, People of the State of California vs. J. B. Stringfellow, Jr. et al. U.S. District Court for the Central District of California. Case No. CV 83-2501 JMI. February 13.
- 1989 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court, Western District of New York. Case No. CIV 79-990 (JTC). January 17 and 18.
- 1988 United States of America vs. Royal N. Hardage et al., Advance Chemical Company et al. vs. ABCO, Inc. et al. U.S. District Court, Western District of Oklahoma. Case No. CIV-86-1401-P. November 30 and December 14.
- 1988 United States of America vs. Royal N. Hardage et al. and Advance Chemical Co. et al., ABCO, Inc. et al. U.S. District Court for the Western District of Oklahoma. Case No. CIV-86-1401-P. July 14.
- 1986 Anne Anderson et al. vs. Cryovac, Inc. et al. 1st Circuit. Case No. 805 F2dl.
- 1986 Mel Foster Company Properties, Inc. vs. The American Oil Company et al. Iowa District Court for Scott County. Law No. 69134.
- 1986 United States of America vs. Ottati & Goss. U.S. District Court for the District of New Hampshire. Civil Action 80-225-L.
- 1985 State of New Mexico, ex rel. S.E. Reynolds, State Engineer, and Pecos Valley Artesian Conservancy District vs. L. T. Lewis et al. United States of America, Mescalero Apache Tribe and State of New Mexico, ex rel. S.E. Reynolds, State Engineer, and Pecos Valley Artesian Conservancy District vs. Hagerman Canal Company et al. District Court for the County of Chaves, State of New Mexico. Case No. 20294 and 22600 - Consolidated. December 20.
- 1984 United States of America vs. Conservation Chemical Company et al. U.S. District Court for the Western District of Missouri, Western Division. Case No. 82-0983-CV-W-5.

#### **TESTIMONY**

- 2022 Orange County Water District vs. Sabic Innovative Plastics US, LLC, et al. Case No. 30-2008-00078246-CU-TT-CXC. April.
- 2021 Orange County Water District vs. Sabic Innovative Plastics US, LLC, et al. Case No. 30-2008-00078246-CU-TT-CXC. July.
- 2019 Mississippi vs. Tennessee, City of Memphis and Memphis Light, Gas & Water Division. U.S. Supreme Court. No. 143, Orig. May 22 23.
- 2016 State of New Mexico ex rel. State Engineer vs. Kerr-McGee Corporation, et al. State of New Mexico, County of Cibola, Thirteenth Judicial District Court, Case Nos. CB-83-190-CV and CB-83-220-CV (consolidated). November 14 – 15.
- 2014 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. March 6. (Arbitration)
- 2013 State of Montana vs. State of Wyoming and State of North Dakota. Supreme Court of the United States. No. 137, Original. November 12.
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. October 1 3. (Arbitration)
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. August 27. (Arbitration)
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. August 15.
- 2012 Orange County Water District vs Northrop Corporation, et.al. Superior Court of the State of California in and for the County of Orange, No. 04CC00715. August 23.
- 2012 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No.126, Orig. August 14.
- 2011 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. March 23.
- 2010 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. October 7.

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- 2010 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. July 12 14.
- 2010 State of Oklahoma vs. Tyson Foods et al. U.S. District Court for the Northern District of Oklahoma. 05-cv-349-TCK-SAJ. January 4-5.
- 2009 Timm Adams et al. vs. United States of America and E.I. DuPont de Nemours and Company, a Delaware corporation. U.S. District Court, District of Idaho. Case No. CIV-03-0049-E-BLW. August 6.
- 2009 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. March 9 19.
- 2009 Gloria Ned et al. vs. Union Pacific Railroad. 14th Judicial District Court, Parish of Calcasieu, State of Louisiana. 2003-001100 (Consolidated Cases). January 6, March 27.
- 2007 City of Neodesha, Kansas et al. vs. BP Corporation North America. District Court of Wilson County, Kansas. 2004-CV-19. December.
- 2006 Nikko Materials USA, Inc., dba Gould Electronics v. NavCom Defense Electronics Inc., Ernest Jarvis, and Hyrum Jarvis. United States District Court, Central District of California. CV05-4158-JFW (VBKx). December 7.
- 2006 Rules Governing New Withdrawals of Ground Water in Water Division 3 Affecting the Rate or Direction of Movement of Water in the Confined Aquifer System AKA "Confined Aquifer New Use Rules for Division 3" in Alamosa, Conejos, Costilla, Rio Grande, and Saguache Counties. District Court, Water Division No. 3, Colorado. Case No. 2004CW24. March.
- 2005 Goodrich Corporation vs. Commercial Union Insurance Company et al. In the Court of Common Pleas, Summit County, Ohio. Case No. CV 99 02 0410. December.
- 2005 Redlands Tort Litigation. Superior Court of the State of California for the County of San Bernardino. No. RCV 31496. March 21-22.
- 2004 Waste Management, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Case No. HUD-L-931-92. January 6.
- 2003 State of New Mexico et al. vs. General Electric Company et al. The U.S. District Court for the District of New Mexico. Case No. CV 99-1254 BSJ/DJS and CV 99-1118 BSJ/LFG. December 10.
- 2002 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. December.
- 2002 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. August.
- 2001 Sherwin-Williams vs. Artra et al. U.S. District Court for the District of Maryland. Civil Action No. S-91-2744. November.
- 2001 Gwendolyn Guillory et al. vs. Union Pacific Corporation et al. Fourteenth Judicial District Court, Parish of Calcasieu, State of Louisiana. No. 98-5405. January.
- 2000 Consolidated Edison Company of New York, Inc. vs. Allstate Insurance Company et al. Supreme Court of the State of New York. Index No. 98/600142, Part 27. July.
- 2000 Merck & Co., Inc vs. Federal Insurance Company et al. Superior Court of New Jersey, Chancery Division, Middlesex. Docket No. CM-340-96. June.
- 2000 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. January.
- 1999 Aetna Casualty & Surety Company vs. Dow Chemical Corporation, Dow Corning, Inc., and American Guarantee and Liability Company et al. U.S. District Court for the Eastern District of Michigan. Case No. 93 CV 73601 DT. February.
- 1998 Air Products and Chemicals, Inc. vs. Hartford Accident and Indemnity Company. Superior Court of New Jersey Law Division: Middlesex. Docket No. L-17134-89. December.

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- 1998 In the Matter of the Waste Management Act (RSBC, 1996, C.482) between Beazer East, Inc. and Atlantic Industries, Ltd. et al. Environmental Appeal Board, Vancouver, British Columbia. August 19 and 20.
- 1998 Texaco Inc., Texaco Capital Inc. et al., Debtor. U.S. Bankruptcy Court, Southern District of New York. Case No. 87-20142 Chapter 11. January 23.
- 1998 State of Montana vs. Atlantic Richfield Company. U.S. District Court, District of Montana, Helena Division. Case No. CV-83-317-HLN-PGH. January.
- 1997 Asarco, Inc. et al. vs. Andalex Resources, Inc. et al. U.S. District Court for the Western District of Missouri. Civil Action No. 94-0698-CV-W-BB. November.
- 1996 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. November.
- 1996 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. March.
- 1995 Henry Hendler et al. vs. The United States. U.S. Court of Federal Claims. Case No. 456-84L. October 24.
- 1995 North American Philips Corporation vs. Aetna Casualty & Surety Company et al. Superior Court of the State of Delaware, New Castle County. Case No. 88C-JA-155-1-C. August 1 and 2.
- 1995 Koppers Company, Inc. vs. Aetna Casualty & Surety Company et al. U.S. District Court, Western District Pennsylvania. Civil Action No. 85-2136. April.
- 1993 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1992 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. March.
- 1991 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1991 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court for the Western District of New York. Civil Action No. 79-990C. April.
- 1991 United States of America, the State of New York and UDC-Love Canal vs. Hooker Chemicals & Plastics Corp. et al., Volumes XXXX-A and B. U.S. District Court, Western District of New York. Case No. CIV 79-990. February 25.
- 1990 General Electric Company vs. Electric Mutual Liability Insurance Company. New York. Index No. 16774-88. May.
- 1989 United States of America vs. Royal N. Hardage et al., Advance Chemical Company et al. vs. ABCO, Inc. et al. U.S. District Court, Western District of Oklahoma. Case No. CIV 86-1401-p. December 13.
- 1989 United States of America et al. vs. J. B. Stringfellow, Jr. et al. U.S. District Court, Central District of California. Case No. CV-83-2501 JMI (Mcx). April 24 and 25.
- 1987 In the Matter of the City of El Paso, Texas, before the State Engineer of the State of New Mexico. Nos. LRG-92 through LRG-357 and HU-12 through HU-71. June.
- 1986 Mel Foster Company Properties, Inc. vs. The American Oil Company et al. Iowa District Court for Scott County. Law No. 69134. September.
- 1986 State of New Mexico and Pecos Valley Artesian Conservancy District vs. L.T. Lewis et al., United States of America and Mescalero Apache Tribe; and State of New Mexico and Pecos Valley Artesian Conservancy District vs. Hagerman Canal Company et al. U.S. District Court for the County of Chaves, State of New Mexico. Case Nos. 20294 and 22600. March.



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- 1986 United States of America vs. Plains Electric Generation and Transmission Cooperative, Inc. District Court for the Thirteenth Judicial District, State of New Mexico, County of Cibola. Application Nos. B-167-A into 1605 and B-17 et al., Comb.; B-1003-AA into B-87-B et al.; 1605 & B-979 into B-87-B et al. January.
- 1985 In the Matter of the Adoption of Rules and Regulations Applying Exclusively to the Withdrawal of Ground Water from the Dawson, Denver, Arapahoe, and Laramie-Fox Hills Aquifers of the Denver Basin. November 4.
- 1985 United States of America vs. Conservation Chemical Company et al. U.S. District Court for the Western District of Missouri, Western Division. Case No. 82-0983-CV-W-5. March.
- 1984 United States of America vs. Conservation Chemical Company et al. U.S. District Court for the Western District of Missouri, Western Division. Case No. 82-0983-CV-W-5. August and October.
- 1984 Hearings before the Environmental Quality Council, State of Wyoming. Permit Application No. TFN-1 2/285. January.
- 1982-1985 Hearings before the State Engineer, State of New Mexico. Application Nos. G-22 through G-22-S-58; G-22 et al.; PR and G-22 through S-9 (November 1982; January and April 1983).

Application Nos. B-72 into 1605 and B-17 et al. Comb.; B-43-H into 1605 and B-17 et al. Comb.; B-43-F and B-43-I into 1605 and B-17 et al. Comb.; B-87-D into 1605 and B-17 et al. Comb.; B-87-C into 1605 and B-17 et al. Comb. (March 1984).

Application Nos. B-49-B-B into B-44, B-45 and B-45-X; B-1003-A-B into B-44, B-45 and B-45-X; 1605, B-44, B-45 and B-45-X-D (October 1984).

Application No. B-167-A into 1605 and B-17 et al. Comb. (October 1984).

Application Nos. B-1003-AA into B-87-B-S through B-87-B-S-6 and 1605 and B-979 into B-87-B-S through B-87-B-S-6 (February 1985).

- 1982 County Board of Appeals, Montgomery County, Maryland. Case No. S-836. October.
- 1982 Woodrow Sterling et al. vs. Velsicol Chemical Corporation. U.S. District Court, Western District of Tennessee, Eastern Division. July.

### EXHIBIT 9 Curriculum Vitae



Groundwater Hydrologist

### **AREAS OF EXPERTISE**

- Groundwater Hydrology
- Contaminant Fate and Transport
- Site Investigation and Remediation

### **SUMMARY OF QUALIFICATIONS**

Mr. Larson is a recognized authority on numerical simulation models and their application in the analysis of a variety of groundwater problems. He has developed such models for analyzing groundwater flow, mass- and heat-transport in groundwater systems, contaminant migration, recovery of petroleum products from groundwater, saltwater intrusion in coastal aguifers, and thermal energy storage in aguifers. In addition, he has been in the forefront of combining these methods with linear programming techniques to optimize the development of groundwater supplies or the remediation of contaminated groundwater. Mr. Larson has conducted training courses on the use of these models and provided technical support on their application to a variety of hydrologic conditions. He has authored and co-authored publications on the application of aguifer simulation models that are widely used by practicing hydrologists. He has served as an expert witness in numerous judicial forums regarding groundwater issues and the application of simulation models for demonstrating the fate of soil/groundwater contamination and the effect of remediation alternatives

### **REPRESENTATIVE EXPERIENCE**

### S.S. Papadopulos & Associates, Inc., Bethesda, Maryland

As senior principal of the company, Mr. Larson assists in the management of the company and in the conduct and

- Numerical Modeling
- Spatial Interpolation
  - Expert Testimony

### YEARS OF EXPERIENCE: 40+

#### **EDUCATION**

- MS, Civil Engineering, University of Minnesota – Minneapolis, 1971
   BS, Civil Engineering (with high distinction), University of Minnesota –
- Minneapolis, 1969

### REGISTRATIONS

Certified Professional Hydrologist

#### **PROFESSIONAL HISTORY**

- S.S. Papadopulos & Associates, Inc., Executive Vice President, 1980 to present
- U.S. Geological Survey: Water Resources Division, Reston, Virginia: Hydrologist, 1975–1980.
- Water Resources Division, St. Paul, Minnesota: Hydrologist, 1971–1975 Water Resources Division – National
- Training Center, Denver, Colorado: Hydrologist, 1971.
- **St. Anthony Falls Hydraulic Laboratory**, Minneapolis, Minnesota: Research Assistant, 1969–1971.

management of projects dealing with a wide variety of environmental and water-resource issues. During his many years at SSP&A, he has been involved in numerous projects covering a wide spectrum of technical, environmental, and legal issues including:

- Site Evaluations Remedial investigations, feasibility studies, engineering evaluation/cost analyses, and remedial action plans at CERCLA and other waste disposal sites including the Stringfellow site in California, the FMC Fridley site in Minnesota, the Chem Dyne site in Ohio, the Conservation Chemical site in Missouri, the Hardage-Criner site in Oklahoma, and the Hastings site in Nebraska.
- Groundwater Contamination Evaluations, CERCLA and Other Waste-Disposal Sites Love Canal, New York; Savannah River Plant, South Carolina; Tucson Airport, Arizona; Ottati & Goss site, New Hampshire; Martin-Marietta site, Colorado; and Western Processing site, Washington State.
- Environmental Impact Evaluations of the Effects of Water Development, Wyoming and South Dakota — For proposed coal slurry operations in Wyoming, of in-situ mining for trona minerals in Wyoming, and of groundwater development on the shallow-water-table in South Dakota.

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- Water-Supply Development Evaluations Potential impacts of salt-water intrusion on watersupply development, in Oman, Portugal and Florida; and analysis of potential impacts of power-plant cooling water on groundwater and surface water in Wyoming.
- Evaluations of Permitting, Licensing, and Environmental Issues Associated with Mining Coal mining in Wyoming, Montana, and Arizona; copper mining in Montana and Utah; trona mining in Wyoming; and uranium mining in New Mexico.
- Evaluations of the Effects of Discharge on Groundwater from Chemical-Manufacturing Waste Disposal — Wyoming, Virginia, and New York.
- Water-Rights Permitting Evaluations and Adjudication New Mexico, Texas, Colorado, Kansas, Wyoming, Nebraska, Arizona, and Idaho.
- Environmental Audits, Groundwater Monitoring Plans, and Other Environmental Investigations — Oaks Landfill in Maryland, the FMC Carteret facility in Wyoming, the former IBM facility in Indiana, and the Insilco site in Florida.

### **SPECIFIC PROJECT EXPERIENCE**

- Far-Mar-Co Subsite, Hastings Site, Nebraska Supervised the preparation of an engineering evaluation/cost analysis (EE/CA) to support implementation of remediation of groundwater contamination. Worked with regulatory agencies to gain approval of the EE/CA and progress toward design and implementation. Previously, on behalf of Morrison Enterprises, supervised completion of a remedial investigation and a feasibility study involving carbon tetrachloride and ethylene dibromide contamination.
- Stringfellow Site, near Riverside, California Served as the principal technical advisor on groundwater issues to the Pyrite Canyon Group that overviewed investigations and remedial activities sponsored by the responsible parties. Designed and evaluated several investigations and remediation programs. Represented the client as a technical spokesperson in workshops, technical seminars, and meetings with regulatory agencies and other interested parties. Prepared key documents to support the decision-making process toward the final Record of Decision.
- In the case of Kansas v. Colorado before the U.S. Supreme Court Served on a team of technical advisors to the State of Kansas in its litigation with Colorado over violations of the Arkansas River Compact. Assisted in obtaining a finding of compact violation regarding the pumping of groundwater from wells along the river valley in Colorado. Continued as a technical expert as the case moves into subsequent phases involving the quantification of depletions of supply, assessments of damage, and future compliance by Colorado.

### **EXPERT AND FACT WITNESS EXPERIENCE**

- Litigation associated with soil and groundwater contamination at CERCLA, RCRA, and other facility sites in California, Kansas, Missouri, Oklahoma, Tennessee, Montana, Florida, Iowa, and Nebraska.
- Toxic tort, property damage, and liability litigation regarding soil and groundwater contamination at sites or facilities in New York, Tennessee, Texas, Virginia, Ohio, and other states.
- Insurance recovery litigation associated with contamination at a variety of sites or facilities for commercial clients such as General Electric, FMC Corporation, Upjohn, AT&T, Rohr Industries, Beazer East/Koppers, North American Phillips, DOW Chemical, Occidental Chemical, and Southern California Edison.
- Water-rights permitting litigation and water adjudication including cases in New Mexico, Colorado, and Arizona, as well as interstate river compact disputes involving the states of Kansas, Colorado, Wyoming, and Nebraska.

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### U.S. Geological Survey, Water Resources Division, Reston, Virginia

Originated, planned and conducted research in the development of numerical simulation models and techniques for the analysis of a variety of problems related to groundwater systems. Applied the developed models to actual field situations for verification and further refinement, and documented these models in a manner suitable for use by others. Served as coordinator and instructor for training courses on groundwater simulation models and methodologies conducted by the Division, and provided primary technical assistance to many groundwater projects conducted by District. Participated in and represented the Survey in national and international meetings. Conducted groundwater studies of national and regional interest, and participated in or was detailed to overseas projects conducted or managed by other U.S. agencies and the World Bank.

### U.S. Geological Survey, Water Resources Division, St. Paul, Minnesota

Served as Project Chief and participated in studies involving the evaluation of groundwater resources, the assessment of stream-water quality, and the analysis of surface-water/groundwater relationships in various parts of Minnesota.

### U.S. Geological Survey, Water Resources Division, National Training Center, Denver

Participated in an extended training program providing in-depth training on both office and field techniques for the collection and the analysis of data and the conduct of surface-water, groundwater, and water-quality studies.

### St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minnesota

As a Research Assistant, participated in the development and operation of an urban-runoff model to predict sewer flow distribution for the Minneapolis–St. Paul Sanitary District. Assisted in runoff prediction studies for St. Paul and participated in a project to survey and summarize computer programs used in water resources engineering.

### **PROFESSIONAL SOCIETIES**

Association of Ground Water Scientists and Engineers American Institute of Hydrology

### **AWARDS AND HONORS**

Civil Servant of the Year, U.S. Geological Survey, 1974 U.S. Geological Survey Incentive Award, 1974 American Society of Civil Engineering Student Award, 1969

### **PUBLICATIONS AND PRESENTATIONS**

- Barth, G., S.P. Larson, G. Lewis, and K. Green, 2011. Prediction Uncertainty of Drawdown in the Seven-Rivers Augmentation Well Field. Presentation at the National Groundwater Association (NGWA) Conference 2011. Baltimore, MD. June 2011, 15.
- Spiliotopoulos, A., M. Karanovic, and S. Larson, 2008. Development of Transient Flow Models for the Solomon River Basin. Presentation at MODFLOW and More 2008: Ground Water and Public Policy Conference, May 18-21, 2008, Golden, CO.
- Papadopulos, S.S., and S.P. Larson, 2007. The Drawdown Distribution in and Around a Well Pumping from a Two-Region Aquifer. Presentation at the 119<sup>th</sup> Annual Meeting of the Geological Society of America, Denver, CO, October 27-31, 2007. <u>in Abstracts and Programs</u>, v. 39, no. 6. p. 189. Geological Society of America, Boulder, CO.

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- Larson, S.P., 2007. The Use of Complex Computer Modeling of Groundwater Systems. Presentation at the 53<sup>rd</sup> Annual Rocky Mountain Mineral Law Institute, Vancouver, British Columbia, July 19-21, 2007. 21.
- Larson, S.P., 2006. Simplicity in Modeling Use of Analytical Models with PEST. Presentation at MODFLOW and More 2006, Managing Ground-Water Systems, International Ground Water Modeling Center, Colorado School of Mines Golden, CO, May 22-24, 2006: v. 2, pp. 579-583.
- Tonkin, M.J., S. Larson, and C. Muffels, 2004. Assessment of Hydraulic Capture through Interpolation of Measured Water Level Data. Presentation at Conference on Accelerating Site Closeout, Improving Performance, and Reducing Costs through Optimization, U.S. Environmental Protection Agency, Federal Remediation Technology Roundtable, June 15-17, 2004, Dallas, TX.
- Tonkin, M.J. and S. Larson, 2002. Kriging Water Levels with a Regional-Linear and Point-Logarithmic Drifts: *Ground Water*, v. 40, no. 2 (March-April), pp. 185-193.
- Blum, V.S., S. Israel, and S.P. Larson, 2001. Adapting MODFLOW to Simulate Water Movement in the Unsaturated Zone. <u>in</u> *Proceedings of MODFLOW 2001 and Other Modeling Odysseys*, International Groundwater Modeling Center (IGWMC), September 11-14, 2001, Colorado School of Mines, Golden, Colorado, pp. 60-65.
- Larson, S.P., C. Andrews, and C. Neville, 1995. Parameter Estimation in Groundwater Modeling: Research, Development, and Application (Abstract). American Geophysical Union (AGU) Spring Meeting, Baltimore, May 30–June 2, 1995, Hydrology Sessions (invited speaker). S145, Abstract H51C-02 0835h.
- Andrews, C.B., and S. Larson, 1988. Evolution of Water Quality in the Lower Rio Grande Valley, New Mexico. *Eos*, v. 69, no. 16, p. 357.
- Larson, S.P., C. Andrews, M. Howland, and D. Feinstein, 1987. Three-Dimensional Modeling Analysis of Groundwater Pumping Schemes for Containment of Shallow Groundwater Contamination. <u>in</u> *Solving Ground Water Problems with Models*. Dublin, OH: National Water Well Association. pp. 517-536.
- Bennett, G.D., A. Kontis, and S. Larson, 1982. Representation of Multi-Aquifer Well Effects in Three-Dimensional Groundwater Flow Simulation. *Ground Water*, v. 20, no. 3, pp. 334-341.
- Helgesen, J.O., S. Larson, and A. Razem, 1982. *Model Modifications for Simulation of Flow Through Stratified Rocks in Eastern Ohio*. U.S. Geological Survey, Water-Resources Investigations 82-4019.
- Larson, S.P., S. Papadopulos, and J. Kelly, 1981. Simulation Analysis of a Double-Transmissivity Concept for the Madison Aquifer System (abstract). *Proceedings of the 10th Annual Rocky Mountain Ground-Water Conference*, Laramie, Wyoming, April 30-May 2, 1981. p. 76.
- Mercer, J.W., S. Larson, and C. Faust, 1980. *Finite-Difference Model to Simulate the Real Flow of Saltwater and Fresh Water Separated by an Interface*. U.S. Geological Survey, Open-File Report, pp. 80-407.
- Mercer, J.W., S. Larson, and C. Faust, 1980. Simulation of Saltwater Interface Motion. *Ground Water*, v. 18, no. 4, pp. 374-385.
- Larson, S.P., 1978. *Direct Solution Algorithm for the Two-Dimensional Ground-Water Flow Model*. U.S. Geological Survey, Open-File Report 79-202, p. 25.
- Papadopulos, S.S., and S. Larson, 1978. Aquifer Storage of Heated Water: Part II Numerical Simulation of Field Results. *Ground Water*, v. 16, no. 4, pp. 242-248.
- Burnham, W.L., S. Larson, and H. Cooper Jr., 1977. *Distribution of Injected Waste-Water in the Saline Lava Aquifer, Wailuku-Kahului Waste-Water Treatment Facility, Kahului, Maui, Hawaii*. U.S. Geological Survey, Open File Report 77-469.
- Larson, S.P., T. Maddock III, and S. Papadopulos, 1977. Optimization Techniques Applied to Ground-Water Development. Presentation at the Congress of the International Association of Hydrogeologists, Birmingham, England, July 24-30, 1977. <u>in Memoires</u>, 13, Part 1. E57-E66.

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- Larson, S.P., S. Papadopulos, H. Cooper, Jr., and W. Burnham, 1977. Simulation of Wastewater Injection into a Coastal Aquifer System near Kahului, Maui, Hawaii. Presentation at the American Society of Civil Engineers' (ASCE) 25t<sup>h</sup> Annual Hydraulic Division Specialty Conference on the Hydraulics in the Coastal Zone, Texas A&M University, College Station, TX, August 10-12, 1977. <u>in</u> Proceedings - Hydraulics Division Specialty Conference, v. 25, pp. 107-116.
- Larson, S.P., and P. Trescott, 1977. Solution of Water-Table and Anisotropic Flow Problems Using the Strongly Implicit Procedure: *Journal of Research of U.S. Geological Survey*, v.5, no. 6, pp. 815-821.
- Trescott, P.C., and S. Larson, 1977. Comparison of Iterative Methods of Solving Two-Dimensional Ground-Water Flow Equations. *Water Resources Research*, v. 13, no. 1, pp. 125-136.
- Trescott, P.C., and S. Larson, 1977. Solution of Three-Dimensional Ground-Water Flow Equations Using the Strongly Implicit Procedure. *Journal of Hydrology, v.* 35, pp. 49-60.
- Larson, S.P., 1976. An Appraisal of Ground Water for Irrigation in the Appleton Area, West-Central Minnesota. U.S. Geological Survey, Water Supply Paper 2039-B, p. 34.
- Larson, S.P., W. Mann IV, T. Steele, and R. Susag, 1976. *Graphic and Analytical Methods for Assessment of Stream-Water Quality: Mississippi River in the Minneapolis St. Paul Metropolitan Area, Minnesota*. U.S. Geological Survey, Water Resources Investigations Open-File Report 76-94. 55.
- Trescott, P.C., and S. Larson, 1976. Supplement to Open-File Report 75-438 Documentation of Finite-Difference Model for Simulation of Three-Dimensional Ground-Water Flow. U.S. Geological Survey, Open-File Report 76-591. 21.
- Trescott, P.C., G. Pinder, and S. Larson, 1976. *Finite Difference Model for Aquifer Simulation in Two Dimensions with Results of Numerical Experiments*. Automated Data Processing and Computations. Techniques of Water-Resources Investigations Book 7. Chapter C1, p.116.
- Larson, S.P., M. McBride, and R. Wolf, 1975. Digital Models of a Glacial Outwash Aquifer in the Pearl-Sallie Lakes Area, West-Central Minnesota. U.S. Geological Survey, Water Resources Investigations 75-40. 39.
- Larson-Higdem, D.C., S. Larson, and R. Norvitch, 1975. *Configuration of the Water Table and Distribution of Downward Leakage to the Prairie du Chien/Jordan Aquifer in the Minneapolis -St. Paul Metropolitan Area*. U.S. Geological Survey, Open-File Report 75-342. 33.
- Bowers, C.E., A. Pabst, and S. Larson, 1972. *Computer Programs in Hydrology*. University of Minnesota, Water Resources Research Center Bulletin 44. 172.
- Bowers, C.E., A. Pabst, and S. Larson, 1971. *Computer Program for Statistical Analysis of Annual Flood Data by the Log-Pearson Type III Method*. University of Minnesota, Water Resources Research Center Bulletin 39. 26.

### **DEPOSITION AND TESTIMONY EXPERIENCE**

#### **DEPOSITIONS**

- 2018 James Blocker and Jami Blocker, et al. vs. ConocoPhillips Company. U.S. District Court for the Western District of Oklahoma. Case No. CIV-17-248-D. July 10.
- 2017 State of Mississippi vs. State of Tennessee, City of Memphis and Memphis Light, Gas, & Water Division. U.S. Supreme Court. No. 143, Orig. September 19.
- 2017 Albin Family Revocable Living Trust, et al. vs. Halliburton Energy Services, Inc. U.S. District Court for the Western District of Oklahoma. Case No. CIV-16-910-M. July 25.
- 2015 In the Matter of the Application by the City of Gallup for Permit to Appropriate Ground Water within the Gallup Underground Water Basin of New Mexico. Before the New Mexico State Engineer. Hearing No. 99-003. March 11.

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- 2015 Mitchell McCormick, et al. vs. Halliburton Company, et al. U.S. District Court for the Western District of Oklahoma. Case No. 11-CV-01272-M. January 15.
- 2014 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. January 30. (Arbitration)
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. August 5. (Arbitration)
- 2013 Mitchell McCormick, et al. vs. Halliburton Company, et al. U.S. District Court for the Western District of Oklahoma. July 30.
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. July 24. (Arbitration)
- 2013 State of Montana vs. State of Wyoming and State of North Dakota. Supreme Court of the United States. No. 137, Original. July 16.
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. June 11.
- 2013 State of New Mexico ex rel. State Engineer vs Kerr-McGee Corporation et al., State of New Mexico, County of Cibola, Thirteenth Judicial District Court, No. CB-83-190-CV & CB-83-220-CV (Consolidated). April 9 - 11.
- 2013 State of Montana vs. State of Wyoming and State of North Dakota. Supreme Court of the United States. No. 137, Original. February 12.
- 2013 Orange County vs. Sabic Innovative Plastics US, LLC., et al. Superior Court of the State of California for the County of Orange. Case No. 30-2008-00078246-CU-TT-CXC. January 29.
- 2012 State of New Mexico ex rel. State Engineer vs Kerr-McGee Corporation et al., State of New Mexico, County of Cibola, Thirteenth Judicial District Court, No. CB-83-190-CV & CB-83-220-CV (Consolidated). October 10-12.
- 2012 Orange County Water District vs Northrop Corporation, et al., Superior Court of the State of California in and for the County of Orange, No. 04CC00715. July 11 and August 1.
- 2012 Atlantic Richfield vs State of California, et al., Superior Court of the State of California, County of Los Angeles, Central District. No. BC 380474. June 21-22.
- 2012 Michael O. Thomas and Patricia Thomas vs ConocoPhillips, Inc. et al., In the Circuit Court in and for Escambia County, Florida, Case No. 2008 CA 001381. June 12.
- 2012 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. April 9.
- 2012 Ron Block, et al. vs. Daniel and Mary Lou Helix, et al. Superior Court of California, County of Contra Costa. No. CIVMSC05-01725. March 27.
- 2012 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. February 15.
- 2011 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. November 15.
- 2010 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. June 29.
- 2010 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. March 3.
- 2009 Morrison Enterprises and the City of Hastings, Nebraska vs Dravo Corporation. U.S. District Court for the District of Nebraska. No. 4:08-CV-3142 (Confidential section). July 23.
- 2009 State of Oklahoma vs. Tyson Foods et al. U.S. District Court for the Northern District of Oklahoma. 05-cv-349-TCK-SAJ. April 10.
- 2009 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. February 24.
- 2009 Timm Adams et al. vs. United States of America et al. U.S. District Court for the District of Idaho. CIV 03-0049-E-BLW. January 16.
- 2008 Gloria Ned et al. vs. Union Pacific Railroad. 14th Judicial District Court, Parish of Calcasieu, State of Louisiana. 2003-001100 (Consolidated Cases). August 15.

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- 2008 Jeff Alban et al. vs. ExxonMobil Corporation et al. Circuit Court for Baltimore County. 03-C-06-010932. January 24.
- 2007 City of Neodesha, Kansas et al. vs. BP Corporation North America. District Court of Wilson County, Kansas. 2004-CV-19. July 24.
- 2006 Nikko Materials USA, Inc., dba Gould Electronics v. NavCom Defense Electronics Inc., Ernest Jarvis, and Hyrum Jarvis. United States District Court, Central District of California. CV05-4158-JFW (VBKx). September 25-26.
- 2005 Rodney Montello et al. vs. Alcoa Inc. et al. vs. Whittaker Corporation. United States District Court for the Southern District of Texas, Victoria Division. C.A. No. V-02-84. December 19.
- 2005 Goodrich Corporation vs. Commercial Union Insurance Company et al. In the Court of Common Pleas, Summit County, Ohio. Case No. CV 99 02 0410. September 20.
- 2005 Santa Fe Pacific Gold Corporation vs. United Nuclear Corporation vs. The Travelers Indemnity Company and Century Indemnity Company, Inc. Eleventh Judicial District Court, County of McKinley, State of New Mexico. Case No. CV-97-139II. September 8.
- 2005 Nathaniel Allen et al. vs. Aerojet-General Corporation et al. Superior Court of the State of California for the County of Sacramento. Case No. 98AS01025. August 29.
- 2005 Aerojet-General Corporation vs. Fidelity & Casualty Co. of New York et al., Aerojet-General Corporation vs. Commercial Union Insurance Company, as Successor-In-Interest to Employers' Surplus Lines Insurance Company, etc. et al. Superior Court of the State of California in and for the County of Sacramento. Case No. 527932. July 20.
- 2005 United States of America vs. Jay James Jackson et al. U.S. District Court for the District of Nebraska. Case No. 8:04CV64. June 9.
- 2005 Palmisano vs. Olin Corporation. U.S. District Court, Northern District of California, San Jose Division. Case No. 5:03-cv-01607-RMW. March 7.
- 2005 Cheryl Lanoux et al. vs. Crompton Manufacturing Company et al. 23rd Judicial District Court, Parish of Ascension, State of Louisiana. Suit No. 72,897, Division: "B". February 25.
- 2004 RHI Holdings, Inc. vs. American Employers Insurance Company. Commonwealth of Massachusetts Superior Court Department. Civil Action No. 01-5443-G. December 7.
- 2004 Massachusetts Electric Company et al. vs. Travelers Casualty & Surety Company et al. Commonwealth of Massachusetts Superior Court. Civil Action No. 99-00467B. November 18-19.
- 2004 PECO Energy Company vs. Insurance Company of North America, et al. Court of Common Pleas of Chester County, Pennsylvania. Case No. 99-07386. June 14-15.
- 2004 Kerr-McGee Corporation and Kerr-McGee Chemical, LLC, vs. Hartford Accident and Indemnity Company and Liberty Mutual Insurance Company. Superior Court of New Jersey Law Division: Somerset County. Docket No.: SOM-L-229-01. May 26.
- 2003 American States Water Company et al. vs. State of California et al. Superior Court of the State of California in and for the County of Sacramento. No. 98AS01998. August 14 15.
- 2003 Waste Management, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Case No. HUD-L-931-92. May 15.
- 2003 Waste Management, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Case No. HUD-L-931-92. May 6.
- 2003 Landowners, LTD. vs. Litton Industries, Black Copy, Robert Silver, dba Vito's Autobody, West Coast Corporation, doing business as Peabody's Custom Paint and Autobody Specialist, David Mangola, Robert Mangola, David Silver and DOES 1-50, Inclusive. Superior Court of the State of California in and for the County of Los Angeles. Case No.: BC255187. March 25.

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- 2003 Bernice Samples et al. vs. Conoco, Inc.; Agrico Chemical Company, Inc; and Escambia Treating Company, Inc. Circuit Court of the First Judicial Circuit in and for Escambia County, Florida. Case No. 01-631-CA-01. March 20.
- 2002 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105 Original. December.
- 2002 PECO Energy Co. vs. Insurance Company of North America et al. Court of Common Plea Chester County, Pennsylvania. No. 99-07386. September 26 and 27.
- 2002 Associated Indemnity Corporation, and The American Insurance Company, vs. The Dow Chemical Company. U.S. District Court for the Eastern District of Michigan, Northern Division. No. 99 CV 76397. June 11 and 12.
- 2002 Bernice Samples et al. vs. Conoco, Inc.; Agrico Chemical Company, Inc; and Escambia Treating Company, Inc. Circuit Court for the First Judicial Court in and for Escambia County. Case No. 01-631-CA-01. June 7.
- 2002 State of New Mexico et al. vs. General Electric Company et al. The U.S. District Court for the District of New Mexico. Case No. CV 99-1254 BSJ/DJS and CV 99-1118 BSJ/LFG. April.
- 2002 Redlands Tort Litigation. Superior Court of the State of California for the County of San Bernardino. No. RCV 31496. February.
- 2001 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105 Original. August 2 and 3.
- 2001 Pfizer Inc. vs. Employers Insurance of Wausau. Superior Court of New Jersey Chancery Division: Middlesex County. Docket No. MID-C-108-92. July.
- 2001 Unisys Corporation et al. vs. Insurance Company of North America. New Jersey Superior Court, Law Division. Case No. L-1434-94-S. April.
- 2001 Gwendolyn Guillory et al. vs. Union Pacific Corporation et al. 14th Judicial District Court, Parish of Calcasieu, State of Louisiana. Case No. 98-5405. January 18.
- 2000 Chevy Chase Bank FSB vs. Shell Oil Company and Motiva Enterprises, LLC. U.S. District Court for the District of Maryland, Southern Division. Case No. PJM 00-CV-1557. November 22.
- 2000 American Home Products et al. vs. Adriatic Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Docket No. HUD-L-5002-92. October.
- 2000 Sherwin-Williams vs. Artra, et al. U.S. District Court for the District of Maryland. Case No. S-91-2744. September.
- 2000 Long Island Lighting Company vs. Allianz Underwriters Insurance Company et al. Supreme Court of the State of New York, County of New York. Index No. 97-604715. August and September.
- 2000 Texaco, Inc. vs. H.T. Olinde, et al. U.S. Bankruptcy Court, Southern District of New York. Case Nos. 87 B 20142 (ASH), 87 B 20143 (ASH), and 87 B 20144 (ASH). August.
- 2000 United States of America, People of California vs. J.B. Stringfellow, Jr. et al. U.S. District Court for the Central District of California. Case No. CV 83-2501 R. March 20.
- 2000 Maurice L. McIntire et al. vs. Motorola, Inc. District of Arizona. Case No. CIV 91-2067 PHX PGR. February 14, 15, and 16.
- 2000 Warner-Lambert and Parke-Davis Company vs. Admiral Insurance et al. Superior Court of New Jersey Law Division: Middlesex County. Docket No. L-10456-94.
- 1999 Consolidated Edison Company of New York, Inc. vs. Allstate Insurance Company et al. Superior Court of the State of New York. Case No. 98/600142. November 4.
- 1999 Merck & Co., Inc. vs. Federal Insurance Company et al. Superior Court of New Jersey Chancery Division: Middlesex County. Docket No. CM-340-96. November.

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- 1999 Aerojet-General Corporation and Cordova Chemical Company vs. Transport Indemnity Insurance Co. et al. Superior Court of the State of California, County of Sacramento. No. 98AS05598. October.
- 1999 Niagara Mohawk Power Corporation vs. Jones Chemicals, Inc., et al. U.S. District Court, Northern District of New York. Case No. 95-CV-717. August 11.
- 1999 Pfizer Inc. vs. Employers Insurance of Wausau. Superior Court of New Jersey Chancery Division: Middlesex County. Docket No. MID-C-108-92. July.
- 1999 Niagara Mohawk Power Corporation. U.S. District Court, Northern District of New York. Case No. 95-CV-717. June 29.
- 1999 Textron, Inc. vs. Ashland, Inc., Archer Daniels Midland Company; and Millenium Petrochemicals, Inc. Superior Court of New Jersey Law Division; Essex County. Docket No. ESX-L-1562-98. June.
- 1999 The Mennen Company vs. Federal Insurance Company. Superior Court of New Jersey Law Division: Union City. Civil Action UNN-L-2031-97 (Consolidated Case Nos. UNN-C-10-97 & MRS-L-4051-96). May.
- 1999 E.I. duPont de Nemours and Company and Conoco Inc. vs. Condea Vista Company. District Court, Harris County, Texas, 55th Judicial District. Case No. 97-23468. April 22.
- 1999 Jersey Central Power & Light Company vs. American Casualty Company of Reading, PA et al. Superior Court of New Jersey, Chancery Division, Middlesex County. Docket No. C-299-94. March 17 and 18.
- 1998 Zurich Insurance Company vs. Joseph Dixon Crucible Company et al. Superior Court of New Jersey Law Division: Hudson County. Docket No. L-4898-96. November.
- 1998 M/A COM, Inc. vs. Liberty Mutual Insurance Company and Employers Insurance of Wausau. Superior Court of New Jersey Law Division: Middlesex County. Docket No. L-874-97. October.
- 1998 Aetna Casualty & Surety Company vs. Dow Chemical Company, and American Guarantee and Liability Company et al. U.S. District Court for the Eastern District of Michigan. Case No. 93 CV 73601 DT. June 23-25.
- 1998 C.E. Bradley Laboratories, Inc. vs. Commercial Union Insurance Company et al. State of Vermont Superior Court of Windham County. No. S427-95 WMC. May.
- 1998 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105 Original. April 30.
- 1998 Kay Bettis et al. vs. Ruetgers-Nease Corporation et al. U.S. District Court for the Northern District of Ohio, Eastern Division. Case No. 4:90 CV 0502. March 17-18.
- 1998 State of Nebraska, vs. State of Wyoming. Supreme Court of the United States. No. 108. March.
- 1998 Sally Comeaux et al. vs. Vista Chemical Company et al. 14th Judicial District, Parish of Calcasieu, State of Louisiana. No. 95-6539. February 6.
- 1997 Harris Corporation vs. Travelers Indemnity Company and Commercial Union Insurance Company. U.S. District Court, Middle District of Florida, Orlando Division. Case No. 96-166-ORL-19. November 6.
- 1997 Morrison Enterprises vs. Aetna Casualty & Surety Company et al. District Court of Adams County, Nebraska. Case No. 94128. October 22.
- 1997 Air Products and Chemicals, Inc. vs. Hartford Accident and Indemnity Co. Superior Court of New Jersey Law Division: Middlesex. Docket No. L-17134-89. October.
- 1997 Dianne Lofgren et al. vs. Motorola, Inc. et al. Superior Court of the State of Arizona in and for the County of Maricopa. Case No. CV 93-05521, CV 93-15612, CV 94-08956, CV 95-05322 (consolidated). October.
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- 1997 Vermont American Corporation vs. American Employers Insurance Company et al. State of Vermont, Washington County, Washington Superior Court. Docket No. S 330-6-95 Wncv. July 7-8 and August.
- 1997 WMX Technologies, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey, Law Division Hudson County. Docket No. HUD-L-931-92. June, July, October, and November.
- 1997 Morrison Enterprises vs. Aetna Casualty & Surety Company et al. District Court of Adams County, Nebraska. Case No. 94128. June 12.
- 1997 Asarco, Inc. et al. vs. Andalex Resources, Inc. et al. vs. Trammell Crow et al. U.S. District Court for the Western District of Missouri. Case No. 94-0698-CV-W-BB. May 29.
- 1996 Interstate Power Company vs. American Home Assurance et al. Iowa District Court for Clinton County. Case No. LA 21793. December 18 and 19.
- 1996 Interstate Power Company vs. American Home Assurance et al. Iowa District Court for Clinton County. Case No. LA 21793 Confidential-Protective Order. October 29, 30, 31, and November 4.
- 1996 Quantum Chemical Corporation vs. Royal Indemnity Company et al., In re: Bridge Products Site, Alta Vista, Virginia. Superior Court of the State of California, for the County of San Francisco. Case No. 965527. September 11.
- 1996 Contract Freighters, Inc. vs. International Paper Company. U.S. District Court, District of Missouri. Case No. 95-5022-CV-SW-1. June 19 and 20 and August 9.
- 1996 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. Case No. 105, Original. March 5, July and August.
- 1996 McDonnell Douglas Corporation vs. Allstate Insurance Company et al. February 2.
- 1996 Beazer East, Inc. vs. CSX Transportation, Inc. U.S. District Court, Western District Pennsylvania. Civil Action No. 93-0861.
- 1996 State of Montana vs. Atlantic Richfield Company. U.S. District Court, District of Montana, Helena Division. No. CV-83-317-HLN-PGH.
- 1995 Vermont American Corporation vs. American Employers' Insurance Company et al. State of Vermont, Washington County, Washington Superior Court. Case No. S 330-6-95-Wncv. July 7 and 8.
- 1995 Harry Hendler, Paul Garrett, Tillie Goldring, as Trustees et al. vs. United States Court of Federal Claims. U.S. Court of Federal Claims. Case No. 456-84-L. April 3.
- 1995 Koppers Company, Inc. vs. The Aetna Casualty & Surety Company et al. U.S. District Court for the Western District of Pennsylvania. Civil Action No. 85-2136. January 19.
- 1995 Reichhold Chemicals, Inc. vs. Textron Inc., et al. U.S. District Court, Northern Dist. Florida. Case No. 92-30393RV.
- 1995 Hawks and Meehan vs. City of Coffeyville, et al. U.S. District Court, Kansas. Civil Action No. 93-2555-KHV.
- 1994–1995 North American Philips Corporation vs. Aetna Casualty & Surety Company et al. Superior Court of the State of Delaware, New Castle County. Case No. 88C-JA-155-1-C. December 1 and 2, 1994 and January 3, 1995.
- 1994 Rockwell International vs. Aetna Casualty and Surety Company et al., In re: Stringfellow. Superior Court of the State of California for the County of Los Angeles. Case No. BC 050 767. May 26.
- 1993 American Telephone & Telegraph Company vs. Aetna Casualty & Surety Company et al. Superior Court of New Jersey, Law Division - Essex County. Case No. W-56681-88 - Confidential-Subject to Protective Order. December 10.

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- 1993 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1993 Aluminum Company of America vs. Beazer East vs. Chicago Bridge & Iron. U.S. District Court for the Western District of Pennsylvania. Civil Action No. 91-0092. October 4.
- 1993 The Upjohn Company et al. vs. Aetna Casualty & Surety Company et al. U.S. District Court for the Western District of Michigan. Case No. K-88-124-CA4. September 13, 14, and 15.
- 1993 United States of America vs. Morrison-Quirk. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-720.
- 1993 FMC Corporation vs. Liberty Mutual Insurance Corporation. California Superior Court, Santa Clara County. No. 643058.
- 1992 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105, Original. February 5 and 6.
- 1992 Interstate Power Company vs. Kansas City Power & Light et al. U.S. District Court for the Northern District of Iowa, Central Division. Case No. C89-3033. January 24.
- 1992 Tanglewood East Homeowners Association vs. First Federal Savings & Loan Association of Conroe et al. U.S. District Court of Texas, Houston Division. Civil Action No. H-84-4798.
- 1992 Intersil vs. Western Microwave. U.S. District Court Northern District. Case No. C-90-20701-JW.
- 1992 United States of America, People of California vs. J. B. Stringfellow, Jr. et al. U.S. District Court for the Central District of California. No. CV 83-2501 JMI.
- 1991 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1991 Edwin H. Clark, II vs. Irvin F. Simon; Chem-Solv, Inc. et al. vs. The Aetna Casualty & Surety Company of Hartford et al. vs. Love Controls Corporation. Superior Court of the State of Delaware in and for Kent County. Case No. 85C-MY-1. June 6.
- 1991 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court for the Western District of New York. Civil Action No. 79-990C.
- 1990 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105, Original. June 13.
- 1990 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court, Western District of New York. Case No. CIV 79-990 (JTC). May 7 and 8, June 4 and 5, August 8, and October 4.
- 1989 United States of America vs. Royal N. Hardage et al., Advance Chemical Company et al. vs. ABCO, Inc. et al. U.S. District Court for the Western District of Oklahoma. Case No. CIV-86-1401. November 7.
- 1989 United States of America, People of the State of California vs. J. B. Stringfellow, Jr. et al. U.S. District Court for the Central District of California. Case No. CV 83-2501 JMI. February 13.
- 1989 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court, Western District of New York. Case No. CIV 79-990 (JTC). January 17 and 18.
- 1988 United States of America vs. Royal N. Hardage et al., Advance Chemical Company et al. vs. ABCO, Inc. et al. U.S. District Court, Western District of Oklahoma. Case No. CIV-86-1401-P. November 30 and December 14.
- 1988 United States of America vs. Royal N. Hardage et al. and Advance Chemical Co. et al., ABCO, Inc. et al. U.S. District Court for the Western District of Oklahoma. Case No. CIV-86-1401-P. July 14.
- 1986 Anne Anderson et al. vs. Cryovac, Inc. et al. 1st Circuit. Case No. 805 F2dl.

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- 1986 Mel Foster Company Properties, Inc. vs. The American Oil Company et al. Iowa District Court for Scott County. Law No. 69134.
- 1986 United States of America vs. Ottati & Goss. U.S. District Court for the District of New Hampshire. Civil Action 80-225-L.
- 1985 State of New Mexico, ex rel. S.E. Reynolds, State Engineer, and Pecos Valley Artesian Conservancy District vs. L. T. Lewis et al. United States of America, Mescalero Apache Tribe and State of New Mexico, ex rel. S.E. Reynolds, State Engineer, and Pecos Valley Artesian Conservancy District vs. Hagerman Canal Company et al. District Court for the County of Chaves, State of New Mexico. Case No. 20294 and 22600 - Consolidated. December 20.
- 1984 United States of America vs. Conservation Chemical Company et al. U.S. District Court for the Western District of Missouri, Western Division. Case No. 82-0983-CV-W-5.

#### **TESTIMONY**

- 2016 State of New Mexico ex rel. State Engineer vs. Kerr-McGee Corporation, et al. State of New Mexico, County of Cibola, Thirteenth Judicial District Court, Case Nos. CB-83-190-CV and CB-83-220-CV (consolidated). November 14 – 15.
- 2014 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. March 6. (Arbitration)
- 2013 State of Montana vs. State of Wyoming and State of North Dakota. Supreme Court of the United States. No. 137, Original. November 12.
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. October 1 3. (Arbitration)
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. August 27. (Arbitration)
- 2013 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. August 15.
- 2012 Orange County Water District vs Northrop Corporation, et.al. Superior Court of the State of California in and for the County of Orange, No. 04CC00715. August 23.
- 2012 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No.126, Orig. August 14.
- 2011 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. March 23.
- 2010 OneBeacon America Insurance Company vs. Narragansett Electric Company. Volume I. Commonwealth of Massachusetts, Suffolk County Superior Court. 05-3086-BLS-I. October 7.
- 2010 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. July 12 14.
- 2010 State of Oklahoma vs. Tyson Foods et al. U.S. District Court for the Northern District of Oklahoma. 05-cv-349-TCK-SAJ. January 4-5.
- 2009 Timm Adams et al. vs. United States of America and E.I. DuPont de Nemours and Company, a Delaware corporation. U.S. District Court, District of Idaho. Case No. CIV-03-0049-E-BLW. August 6.
- 2009 Kansas vs. Nebraska and Colorado. U.S. Supreme Court. No. 126, Orig. March 9 19.
- 2009 Gloria Ned et al. vs. Union Pacific Railroad. 14th Judicial District Court, Parish of Calcasieu, State of Louisiana. 2003-001100 (Consolidated Cases). January 6, March 27.
- 2007 City of Neodesha, Kansas et al. vs. BP Corporation North America. District Court of Wilson County, Kansas. 2004-CV-19. December.
- 2006 Nikko Materials USA, Inc., dba Gould Electronics v. NavCom Defense Electronics Inc., Ernest Jarvis, and Hyrum Jarvis. United States District Court, Central District of California. CV05-4158-JFW (VBKx). December 7.
- 2006 Rules Governing New Withdrawals of Ground Water in Water Division 3 Affecting the Rate or Direction of Movement of Water in the Confined Aquifer System AKA "Confined Aquifer New Use

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Rules for Division 3" in Alamosa, Conejos, Costilla, Rio Grande, and Saguache Counties. District Court, Water Division No. 3, Colorado. Case No. 2004CW24. March.

- 2005 Goodrich Corporation vs. Commercial Union Insurance Company et al. In the Court of Common Pleas, Summit County, Ohio. Case No. CV 99 02 0410. December.
- 2005 Redlands Tort Litigation. Superior Court of the State of California for the County of San Bernardino. No. RCV 31496. March 21-22.
- 2004 Waste Management, Inc. et al. vs. The Admiral Insurance Company et al. Superior Court of New Jersey Law Division: Hudson County. Case No. HUD-L-931-92. January 6.
- 2003 State of New Mexico et al. vs. General Electric Company et al. The U.S. District Court for the District of New Mexico. Case No. CV 99-1254 BSJ/DJS and CV 99-1118 BSJ/LFG. December 10.
- 2002 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. December.
- 2002 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. August.
- 2001 Sherwin-Williams vs. Artra et al. U.S. District Court for the District of Maryland. Civil Action No. S-91-2744. November.
- 2001 Gwendolyn Guillory et al. vs. Union Pacific Corporation et al. Fourteenth Judicial District Court, Parish of Calcasieu, State of Louisiana. No. 98-5405. January.
- 2000 Consolidated Edison Company of New York, Inc. vs. Allstate Insurance Company et al. Supreme Court of the State of New York. Index No. 98/600142, Part 27. July.
- 2000 Merck & Co., Inc vs. Federal Insurance Company et al. Superior Court of New Jersey, Chancery Division, Middlesex. Docket No. CM-340-96. June.
- 2000 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. January.
- 1999 Aetna Casualty & Surety Company vs. Dow Chemical Corporation, Dow Corning, Inc., and American Guarantee and Liability Company et al. U.S. District Court for the Eastern District of Michigan. Case No. 93 CV 73601 DT. February.
- 1998 Air Products and Chemicals, Inc. vs. Hartford Accident and Indemnity Company. Superior Court of New Jersey Law Division: Middlesex. Docket No. L-17134-89. December.
- 1998 In the Matter of the Waste Management Act (RSBC, 1996, C.482) between Beazer East, Inc. and Atlantic Industries, Ltd. et al. Environmental Appeal Board, Vancouver, British Columbia. August 19 and 20.
- 1998 Texaco Inc., Texaco Capital Inc. et al., Debtor. U.S. Bankruptcy Court, Southern District of New York. Case No. 87-20142 Chapter 11. January 23.
- 1998 State of Montana vs. Atlantic Richfield Company. U.S. District Court, District of Montana, Helena Division. Case No. CV-83-317-HLN-PGH. January.
- 1997 Asarco, Inc. et al. vs. Andalex Resources, Inc. et al. U.S. District Court for the Western District of Missouri. Civil Action No. 94-0698-CV-W-BB. November.
- 1996 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. November.
- 1996 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. March.
- 1995 Henry Hendler et al. vs. The United States. U.S. Court of Federal Claims. Case No. 456-84L. October 24.

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- 1995 North American Philips Corporation vs. Aetna Casualty & Surety Company et al. Superior Court of the State of Delaware, New Castle County. Case No. 88C-JA-155-1-C. August 1 and 2.
- 1995 Koppers Company, Inc. vs. Aetna Casualty & Surety Company et al. U.S. District Court, Western District Pennsylvania. Civil Action No. 85-2136. April.
- 1993 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1992 State of Kansas vs. State of Colorado and United States of America. Supreme Court of the United States. No. 105 Original. March.
- 1991 Farmland Industries, Inc. vs. Morrison-Quirk Grain Corporation. U.S. District Court, District of Nebraska. Civil Action No. CV88-L-718. November.
- 1991 United States of America et al. vs. Occidental Chemical Corporation et al. U.S. District Court for the Western District of New York. Civil Action No. 79-990C. April.
- 1991 United States of America, the State of New York and UDC-Love Canal vs. Hooker Chemicals & Plastics Corp. et al., Volumes XXXX-A and B. U.S. District Court, Western District of New York. Case No. CIV 79-990. February 25.
- 1990 General Electric Company vs. Electric Mutual Liability Insurance Company. New York. Index No. 16774-88. May.
- 1989 United States of America vs. Royal N. Hardage et al., Advance Chemical Company et al. vs. ABCO, Inc. et al. U.S. District Court, Western District of Oklahoma. Case No. CIV 86-1401-p. December 13.
- 1989 United States of America et al. vs. J. B. Stringfellow, Jr. et al. U.S. District Court, Central District of California. Case No. CV-83-2501 JMI (Mcx). April 24 and 25.
- 1987 In the Matter of the City of El Paso, Texas, before the State Engineer of the State of New Mexico. Nos. LRG-92 through LRG-357 and HU-12 through HU-71. June.
- 1986 Mel Foster Company Properties, Inc. vs. The American Oil Company et al. Iowa District Court for Scott County. Law No. 69134. September.
- 1986 State of New Mexico and Pecos Valley Artesian Conservancy District vs. L.T. Lewis et al., United States of America and Mescalero Apache Tribe; and State of New Mexico and Pecos Valley Artesian Conservancy District vs. Hagerman Canal Company et al. U.S. District Court for the County of Chaves, State of New Mexico. Case Nos. 20294 and 22600. March.
- 1986 United States of America vs. Plains Electric Generation and Transmission Cooperative, Inc. District Court for the Thirteenth Judicial District, State of New Mexico, County of Cibola. Application Nos. B-167-A into 1605 and B-17 et al., Comb.; B-1003-AA into B-87-B et al.; 1605 & B-979 into B-87-B et al. January.
- 1985 In the Matter of the Adoption of Rules and Regulations Applying Exclusively to the Withdrawal of Ground Water from the Dawson, Denver, Arapahoe, and Laramie-Fox Hills Aquifers of the Denver Basin. November 4.
- 1985 United States of America vs. Conservation Chemical Company et al. U.S. District Court for the Western District of Missouri, Western Division. Case No. 82-0983-CV-W-5. March.
- 1984 United States of America vs. Conservation Chemical Company et al. U.S. District Court for the Western District of Missouri, Western Division. Case No. 82-0983-CV-W-5. August and October.
- 1984 Hearings before the Environmental Quality Council, State of Wyoming. Permit Application No. TFN-1 2/285. January.
- 1982-1985 Hearings before the State Engineer, State of New Mexico. Application Nos. G-22 through G-22-S-58; G-22 et al.; PR and G-22 through S-9 (November 1982; January and April 1983).



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Application Nos. B-72 into 1605 and B-17 et al. Comb.; B-43-H into 1605 and B-17 et al. Comb.; B-43-F and B-43-I into 1605 and B-17 et al. Comb.; B-87-D into 1605 and B-17 et al. Comb.; B-87-C into 1605 and B-17 et al. Comb. (March 1984).
Application Nos. B-49-B-B into B-44, B-45 and B-45-X; B-1003-A-B into B-44, B-45 and B-45-X; 1605, B-44, B-45 and B-45-X-D (October 1984).
Application No. B-167-A into 1605 and B-17 et al. Comb. (October 1984).
Application Nos. B-1003-AA into B-87-B-S through B-87-B-S-6 and 1605 and B-979 into B-87-B-S through B-87-B-S-6 (February 1985).

- 1982 County Board of Appeals, Montgomery County, Maryland. Case No. S-836. October.
- 1982 Woodrow Sterling et al. vs. Velsicol Chemical Corporation. U.S. District Court, Western District of Tennessee, Eastern Division. July.