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Non-binding Arbitrations Before
Jeffrey C. Fereday, Arbitrator

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Initiated Pursuant to Final Settlement Stipulation
Kansas v. Nebraska & Colorado
No. 126, Orig., U.S. Supreme Court
Decree of May 29, 2003, 538 U.S. 720

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Nebraska's Alternative Water Short Year Plan
(Arbitration Initiated February 8, 2013)

and

Nebraska's Rock Creek Augmentation Plan
(Arbitration Initiated March 21, 2013)

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PRE-FILED TESTIMONY OF KANSAS EXPERT STEVEN P. LARSON

August 21, 2013

Section 1 – Qualifications

Q: Please state your name and business address for the record.

A: My name is Steven P. Larson. My business address is 7944 Wisconsin Avenue, Bethesda, Maryland.

Q: Please describe your educational background.

A: I hold a bachelors degree in civil engineering from the University of Minnesota that I received in 1969 and I also hold a masters degree in civil engineering from the University of Minnesota that I received in 1971.

Q: Please describe your employment history after you received those degrees.

A: After obtaining my masters degree in 1971, I was hired by the Water Resources Division of the United States Geological Survey as a hydrologist. My first assignment with the United States Geological Survey, or USGS as it is often referred to, was to attend a 6-month training program in Denver, Colorado to learn about the various activities, projects and work products of the Water Resources Division. Following that training I was assigned to the district office of the Water Resources Division in St. Paul, Minnesota. From 1971 to 1975 I conducted various water resource related projects within the State of Minnesota including several projects that involved the development, calibration and application of groundwater models. In 1975, I was transferred to the National Headquarters of the USGS in Reston, Virginia to work in a research capacity within the Northeast Region of the Water Resources Division. My duties in that position were basically threefold. One was to conduct research into the

development and use of computer models for simulating various groundwater flow processes. Second, I conducted training courses for other hydrologists within and outside the USGS in the use and application of various groundwater flow models. Third, I provided consulting support to hydrologists in other offices of the Water Resources Division to assist them in using and applying groundwater flow models.

In 1980, I left the USGS and joined S. S. Papadopulos and Associates, Inc. At S. S. Papadopulos and Associates, Inc. we provide consulting services regarding environmental and water resource problems. I have been with S. S. Papadopulos and Associates, Inc. for more than 30 years. During that time, I have worked on a variety of water resource and environmental problems for clients in both the public and private sector. As part of my work, I have also provided expert testimony in a number of forums ranging from administrative hearings to original actions before the U. S. Supreme Court.

Q: Please give us some examples of projects that you have worked on that would be relevant to your work in this matter.

A: I worked for the State of Kansas in the case of Kansas versus Colorado dealing with the Arkansas River Compact. My role in that case was to evaluate impacts to stream flows associated with groundwater use and other water projects that occurred historically along the river. I served as an expert in the areas of hydrology, water rights engineering and modeling analysis and provided expert testimony before the special master in the case. I have worked for the State of Nebraska in the case of Nebraska versus Wyoming regarding development and

water use along the Platte River. My role in that case was to review groundwater and surface water models of the river system and nearby areas and to evaluate stream flow data and changes in stream flow that occurred over time. I prepared an expert report in the case describing my evaluations and conclusions but the case was settled before going to trial. I have worked for the State of South Carolina in the case of South Carolina versus North Carolina regarding development and water use along the Catawba River. My role in that case was to review and evaluate stream flow data and a reservoir operations model called CHEOPS that was developed to simulate river flows and power production from several hydroelectric plants located along the river system. I have also worked for the State of New Mexico regarding groundwater development along the Pecos River and efforts by New Mexico to maintain compliance with the Pecos River Compact. My role in that case has been to update and recalibrate the Roswell Artesian Basin Groundwater Model and to evaluate impacts from new well fields designed to provide augmentation water for purposes of compact compliance. I am currently working for the State of Montana in the case of Montana versus Wyoming. My role in that case is to provide expert analysis and testimony regarding groundwater related issues.

Perhaps most relevant is my prior work in this case. I have worked for the State of Kansas in the case of Kansas versus Nebraska since its inception. I have served as Kansas' principal modeling expert in the development of the RRCA Groundwater Model as part of the Final Settlement Stipulation. I was a member of the Modeling Committee on behalf of Kansas and actively participated in the

development and calibration of the RRCA Groundwater Model. As a result of this work, I am intimately familiar with the structure and application of the RRCA Groundwater Model for purposes of quantifying impacts to stream flows along the Republican River stream system.

Q: I have marked as Exhibit WSY/RC K1, a copy of your curriculum vitae. Is Exhibit WSY/RC K1 a copy of your curriculum vitae?

A: Yes it is.

To the arbitrator: The State of Kansas offers Mr. Larson as an expert in the areas of hydrology and hydrologic modeling analysis

Section 2 – Expert Report and Exhibits

Q: Have you prepared any expert reports in this matter?

A: Yes, I have prepared one expert report.

Q: I have marked as Exhibit WSY/RC K2, a copy of your expert report. Is Exhibit WSY/RC K2 a copy of your expert report?

A: Yes it is.

Q: Please describe generally the expert report that you prepared.

A: The report deals with three general areas, 1) the use of the RRCA Groundwater Model to calculate the augmentation credit, 2) hydrologic trends of groundwater levels and stream flows in and near the area of the proposed project, and 3) comparisons to show how the RRCA Groundwater Model is tracking the hydrologic trends.

Q: Are the three areas you listed described in your expert report?

A: Yes. My report describes the various evaluations we conducted in each of these areas and provides various charts and tables to illustrate and quantify the results of our evaluations.

Q: With respect to the first general area that you addressed in your report, would you summarize what you did and what you determined?

A: Yes. The FSS indicates in Section IV-H that the augmentation credit will be calculated using the RRCA Groundwater Model. So we provided an example of how such a calculation can be made using a hypothetical future scenario that Nebraska used to evaluate certain aspects of their augmentation plan. We compiled the results of our calculations in chart and table form. The results illustrate the nature and magnitude of gains and losses that augmentation water would experience within the modeled stream network.

Q: With respect to the second general area addressed by your report, would you summarize what you did and what you determined?

A: The second general area that we addressed was to evaluate the hydrologic conditions in and near the proposed well field in terms of groundwater levels and changes in groundwater levels and in terms of stream flow conditions and changes in stream flow conditions in Rock Creek. We also looked at the general stream flow conditions in the reach of the Republican River from the Colorado State line to Swanson Reservoir. Augmentation water added to Rock Creek that flows into this reach of the river could be subjected to additional losses as it flows toward Swanson Reservoir. In summary, the hydrologic data indicated persistent downward trends over the past several decades with respect to both

groundwater levels in and around the proposed well field and stream flow in Rock Creek at the stream gage located just above the confluence with the Republican River. As these downward trends continue into the future, the potential for increased losses to augmentation water added to the Rock Creek stream system will also increase. Stream flow data also show that there are extended periods of time where none of the inflows to the Republican River between the Colorado State line and Swanson Reservoir reach the reservoir. Since this reach of the river includes tributary flow from Rock Creek, additional losses of augmentation water can be expected to occur and reduce the amount of augmentation water that reaches Swanson Reservoir.

Q: With respect to the third general area addressed by your report, would you summarize what you did and what you determined?

A: Since augmentation credits should be calculated using the RRCA Groundwater Model, we thought it would be appropriate to evaluate how well the model was tracking the downward trends in the hydrologic data that we had compiled. So we compared model calculations of groundwater level trends to measured data from wells in the area surrounding the proposed well field. The results of our comparisons indicated that, overall, the model was tracking the downward trends in groundwater levels reasonably well. However, there was a tendency of the model to underestimate the downward trends during recent years. If this tendency were to continue into the future, losses to augmentation water calculated by the model could be underestimated.

Q: As part of your work did you review the augmentation project report submitted by Nebraska?

A: Yes. In fact, as I discussed earlier, we used some of the information from hypothetical future scenarios that Nebraska had developed in our calculations of augmentation credit using the RRCA Groundwater Model.

Q: Does the Nebraska plan use the RRCA Groundwater Model to determine the augmentation credit?

A: The plan acknowledges that the FSS indicates that the model will be used to calculate the credit, with the caveat "assuming, of course, that the project involves an activity that implicates groundwater Computed Beneficial Consumptive Use (CBCU)". However, there is no description of how the model would be used to calculate the credit if the caveat were satisfied. And the examples provided in the plan indicate that the credit is simply the amount of augmentation water discharged into the stream. In the Nebraska responsive report, they indicate that the measured amount of discharge should be used as the augmentation credit as opposed to a modeled estimate. So it does not appear that Nebraska will use the RRCA Groundwater Model to compute the augmentation credit.

Q: Is measuring the amount of augmentation water discharged into the stream the same as using the RRCA Groundwater Model to calculate the augmentation credit?

A: No. One would assume that the amount of augmentation water to be added to the stream system would be measured rather than simply estimated. But the

measured discharge of augmentation water into the stream would only be the starting point for the calculations one would make using the RRCA Groundwater Model. The model calculations would provide an estimate of how that additional water would be affected as it moves through the stream network from the point where the augmentation water is added.

Q: And is the RRCA Groundwater Model is capable of making these calculations?

A: Yes. The RRCA Groundwater model is a tool that was designed to compute stream base flows and changes in stream base flows that occur within the model's stream network. And so the calculation of gains and losses and changes in gains and losses to these stream flows within the modeled stream network are one of the fundamental components of the RRCA Groundwater Model.

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 21, 2013.