BEFORE THE OKLAHOMA WATER RESOURCES BOARD
STATE OF OKLAHOMA

IN THE MATTER of Determining the Maximum Annual Yield for the Arbuckle-Simpson Groundwater Basin underlying parts of Murray, Pontotoc, Johnston, Garvin, Coal and Carter Counties	))))

FINDINGS OF FACT, CONCLUSIONS OF LAW, AND BOARD ORDER

Background

This proceeding took place pursuant to the Oklahoma Groundwater Law, 82 O.S. § 1020.1 et seq., which authorizes the Oklahoma Water Resources Board (OWRB or "the Agency" or "the Board") to complete an administrative proceeding to determine the maximum annual yield (MAY) of fresh groundwater that may be used from, and allocated to each acre of land over, a groundwater basin. The Groundwater Law further provides that, once the Agency has set a tentative MAY determination it shall call, give notice of, and hold a public hearing at a centrally located place within the area of the basin.

On March 13, 2012, the Agency issued a tentative determination of the MAY of fresh groundwater that may be used from the Arbuckle-Simpson Groundwater Basin ("Arbuckle-Simpson" or "A-S Aquifer") underlying portions of Murray, Pontotoc, Johnston, Garvin, Coal and Carter Counties. Thereafter, the Hearing Examiner, Emily Hammond Meazell, held a pre-hearing conference on May 9, 2012 in Ada, Oklahoma, at which numerous individuals and entities appeared as parties in opposition to, in support of, and interested in the Tentative MAY. The Hearing Examiner conducted a full hearing on May 15-16, 2012, in Sulphur, Oklahoma, during which all parties had the opportunity to present evidence and comments.

The hearing was divided into two phases. In the first phase, the Hearing Examiner took evidence for purposes of compiling a record on the Tentative MAY; in the second phase, those present had the opportunity to provide comments and other information associated with various MAY-related rulemaking matters that the Board expects to pursue at a later date.[1] Appearing at the hearing for both phases were numerous individuals as well as various groups and entities who took part in the evidentiary portion of the hearing. The latter include: (1) the OWRB;[2] (2) Protestants Oklahoma Farm Bureau Legal Foundation, Pontotoc County Farm Bureau, Oklahoma Independent Petroleum Association, Environmental Federation of Oklahoma,

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[1] These include a potential phase-in period and well-spacing rules. This Proposed Order relates only to the MAY. However, all other materials and comments may be considered by the OWRB in connection with future rulemakings.

[2] OWRB exhibits are labeled "OWRB Exh. __."

Oklahoma Aggregates Association and Oklahoma Cattlemen's Association;[3] (3) Protestants Oklahoma Aggregates Association and TXI, a business corporation operating a facility in the central aquifer;[4] (4) Protestants Arbuckle-Simpson Aquifer Protection Federation of Oklahoma, Inc., Charles Roos, Paul Warren, Bill Clark, John Sparks, and Floyd Bergen;[5] (5) Citizens for the Protection of the Arbuckle-Simpson Aquifer ("CPASA"), which supports the Tentative MAY;[6] (6) the U.S. Fish & Wildlife Service ("FWS");[7] and (7) the National Park Service ("NPS").[8] In addition, the City of Ada appeared through its City Attorney to submit evidence regarding the rulemaking portion of the hearing.[9] The various Protestants supported and joined in each others' presentations of evidence and legal arguments, and they are referred to collectively as "Protestants."

At the conclusion of the hearing, the Hearing Examiner issued an order setting forth a timeframe during which the parties had the opportunity to file post-hearing briefs, responses, and comments. All the named parties listed above submitted post-hearing materials, as did many individuals.

Having considered the entire record, the Board makes the following Findings of Fact and Conclusions of Law, and directs that a MAY be established for the Arbuckle-Simpson as set forth below.

I. FINDINGS OF FACT

A. Notice of Hearing and Pre-Hearing Conference

1. After the Board adopted the Tentative MAY, Agency staff prepared a notice of the hearing and pre-hearing conference and caused the notice to be published in Johnston County, Garvin County, Murray County, Coal County, Carter County, and Pontotoc County as indicated by the Affidavits of Publication in OWRB Exh. 12. No parties objected to the notices.

B. Evidentiary Motions; Record

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[3] These Protestants were represented by the law firm Crowe & Dunlevy; their exhibits are labeled "Prot. Exh. ___."

[4] Oklahoma Aggregates Association, along with TXI, was also represented separately by the law firm Doerner, Saunders Daniel & Anderson, LLP; their exhibits are labeled "OKAA Exh. __."

[5] These Protestants were represented by a separate attorney of Doerner, Saunders, Daniel & Anderson, LLP; their exhibits are labeled 'Ranchers Exh. ___."

[6] CPASA was represented by The Aamodt Law Firm; its exhibits are labeled "CPASA Exh. ___."

[7] FWS exhibits are labeled "FWS Exh. ___."

[8] NPS exhibits are labeled "NPS Exh. ___."

[9] For further details on the City's post-hearing motion to admit evidence, see *infra* Finding of Fact No. 4.

2. Prior to the Hearing, CPASA filed a Motion to Include Certain Documents in the Administrative Record. The Hearing Examiner granted the motion to the extent each document met the applicable criteria set forth in 785 O.A.C. § 4-7-7.

3. Prior to the Hearing, Protestants filed a Motion in Limine, requesting that the Hearing Examiner limit matters to be heard to evidence and legal argument of parties and providing for cross-examination of any person or entity that proposed to enter any evidence into the record. The Hearing Examiner granted the motion to the extent that only parties were allowed to present evidence, conduct cross examinations, and the like. The motion was denied to the extent that others would be excluded from making statements in support or opposition to the MAY, which was permitted following the evidentiary portion of the Hearing.

4. Following the Hearing, the City of Ada moved to present an affidavit from the City Manager with respect to the rulemaking portion of the Hearing. As the City explained, its attorney was unable to be present for the second day of the hearing. The City stated that it had no notice the Hearing would go a second day; however, the Hearing Examiner conveyed to all present at the pre-hearing conference that a second day was a possibility. In any event, the City's affidavit is relevant to the rulemaking, not the MAY determination, and as such, it need not be subject to cross-examination. Furthermore, the Hearing Examiner did not rely on the affidavit in preparing the proposed findings of fact and conclusions of law set forth herein.[10] Thus, the Motion to Admit Evidence is denied to the extent it is offered in connection with the MAY; and it is denied as moot to the extent it is offered in connection with the future rulemakings because no such motion is necessary to offer comment on rulemakings. To be clear, the Board accepts the Affidavit for purposes of considering future rulemakings, but it has not relied on the Affidavit for purposes of this Order.

5. During the time that the Hearing Examiner had the MAY determination under consideration, she received, unsolicited, a memorandum drafted by one of the witnesses in the matter, Scott Christensen that had been provided to Board staff. Having determined that the memorandum did not add new material to the record, the Hearing Examiner disregarded the memorandum in preparing a proposed order.

6. A proposed order was provided to the parties on December 27, 2012. Thereafter, various Protestants challenged, among other things, the Christensen memorandum and sought a Writ of Mandamus in the Supreme Court of Oklahoma. Pursuant to the Court's mandate in *Arbuckle-Simpson Aquifer Protection Fed'n of Okla. v. OWRB*, 2013 OK 29, the Hearing Examiner placed the Christensen memorandum in the record and issued an order providing the parties an opportunity to provide responses to the material in the memorandum.

7. Protestants and CPASA filed responses to the Christensen memorandum. These same parties also filed various motions following the Court's remand. In an Order on

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[10] The Board is entitled to consider any legal arguments that the parties presented in the post-hearing briefs, and it did so with respect to *all* briefs filed, including the City of Ada's. However, the Board did not consider evidence relevant to the MAY that was not presented at the hearing and therefore not subject to cross examination.

Evidentiary Matters Following Remand, which is issued contemporaneously with notice of this Proposed Order, the Hearing Examiner ruled on the various motions and detailed her conclusion that the Christensen memorandum added no new evidence to the record. Thus, the Christensen memorandum has not been relied upon in preparing this Order.

8. In summary, although the Hearing consisted of two phases, the Board bases the Findings of Fact, Conclusions of Law, and MAY set forth herein on the record compiled during the evidentiary portion of the Hearing.

C. Arbuckle-Simpson Hydrology Study

9. To develop a MAY for the A-S Aquifer, the Agency collaborated with the Bureau of Reclamation, the U.S. Geological Survey (USGS), Oklahoma State University (OSU), and University of Oklahoma (OU), to manage a comprehensive, multi-year study of the A-S Aquifer that is known as the Arbuckle-Simpson Hydrology Study. The purpose of the Study was to provide the scientific information necessary to inform the Agency's consideration of an appropriate MAY.

10. Thus, the Hydrology Study comprises numerous hydrologic surveys and investigations that are part of the record. These include but are not limited to: Scott Christenson et al., *Geochemical Investigation of the Arbuckle-Simpson Aquifer, South-Central Oklahoma, 2004-06,* USGS Sci. Invs. Report 2009-5036; Scott Christenson et al., *Hydrogeology and simulation of groundwater flow in the Arbuckle-Simpson aquifer, south-central Oklahoma*, Sci. Invs. Report 2011-5029 [hereinafter USGS Report]; Noel I. Osborn, *Arbuckle-Simpson Hydrology Study/Final Report to the U.S. Bureau of Reclamation* (Dec. 2009); Jim Puckette, *Report for the Arbuckle-Simpson Study: Analysis of Bit Cuttings, Wire-Line Logs and Flow Test from a Deep Test Well in the Arbuckle-Simpson Aquifer, Johnston County, Oklahoma* (Oct. 2009); Jim Puckette et al., *Characterization of the Arbuckle-Simpson Aquifer* (Oct. 2009); Kayyun Rahi & Todd Halihan, *Estimating Selected Hydraulic Parameters of the Arbuckle-Simpson Aquifer from the Analysis of Naturally-Induced Stresses* (Oct. 2009); Titus S. Seilheimer & William L. Fisher, *Instream Flow Assessment of Streams Draining the Arbuckle-Simpson Aquifer* (June 2008); Ellen C. Tejan & C. Stephen Haase, *Indicators of Hydrologic Alteration (IHA) Analysis of Selected Streams of the Arbuckle-Simpson Aquifer, South Central Oklahoma* (May 2008); Aondover Tarhule, *Hydroclimatic Reconstruction of the Arbuckle-Simpson Aquifer Using Tree Rings* (Aug. 2009); and Roger A. Young et al., *Analysis of Seismic Reflection Data from the Hunton Anticline* (Mar. 2009).

11. The USGS Report, which describes the hydrogeology and simulation of groundwater flow of the A-S Aquifer, provided a focal point for the Hearing. However, the Board emphasizes that in developing this Order, it relied on the entire record.

12. **Aquifer Characteristics.** The evidence shows, and the Board finds, that the Arbuckle-Simpson Aquifer (the "A-S Aquifer" or the "Aquifer"), found in parts of Murray, Pontotoc, Johnston, Garvin, Coal, and Carter Counties, is a distinct body of groundwater overlain by contiguous land that has substantially the same geological and hydrological characteristics. The Aquifer is contained within three major rock units of Upper Cambrian and Middle

Ordovician age, including the (1) Timbered Hills Group, (2) Arbuckle Group, and (3) Simpson Group. (USGS Report at 6.) As a bedrock aquifer, the A-S is distinguished from an alluvium or alluvium-and-terrace aquifer by its highly fractured, folded, and faulted characteristics, which makes a study of its geology more complex. (*See* USGS Report at 3; CPASA Exh. 12 at 5.)

13. The Aquifer is comprised of three major areas. These areas are depicted in Figure 2 of the USGS Report and are designated as the "Eastern Arbuckle-Simpson Aquifer," the "Central Arbuckle-Simpson Aquifer," and the "Western Arbuckle-Simpson Aquifer."[11] Most delineated areas shown on the map are outcrop areas where the actual rock formations that constitute the aquifer form the land surface. However, an area in the northwestern portion of the Eastern Arbuckle-Simpson Aquifer dips below the surface and is referenced as the Arbuckle-Simpson subcrop. (USGS Report Figs. 10-12.) This subcrop aquifer area is confined above by younger rocks of various ages. Where the subcrop dips beneath rocks of lower permeability, the aquifer is confined, and wells that penetrate below the confining layer may be artesian. The Vendome Well, located in the Chickasaw National Recreation Area, is such a well.

14. **Aquifer Areas Comprising A-S Aquifer.** Although designated with three aquifer names for purposes of describing the general geographic areas where major rock units are found, the evidence supports, and the Board finds, that the three areas contain a distinct body of water overlain by contiguous land that has substantially the same—albeit not identical—geological and hydrological characteristics. (USGS Report at 6.) For example, the record shows that all three areas of the Aquifer consist of a series of northwest-southeast-trending structural features that are separated by Paleozoic faults and fault zones. (USGS Report at 14.) Further, contiguous, regional exposures of the Timbered Hills, Arbuckle, and Simpson Group rock units comprise all three areas of the Aquifer outcrop. (CPASA Exh. 18 at 8.) The entire outcrop lies in an uplifted area known as the Arbuckle Mountains, which consist of folded and faulted igneous and metamorphic rocks of Proterozoic and Cambrian ages and Paleozoic sedimentary rocks ranging in age from Cambrian through Late Pennsylvanian. (USGS Report at 6.) Thus, the Agency included all of these aquifer areas, and the overlying land area, in its determinations providing the basis for the MAY. A map of these areas is attached as Appendix 1.

15. Protestants contend that the Agency improperly treated the three areas as a single aquifer in developing the proposed MAY. Specifically, they presented evidence showing that the Central and Western portions of the aquifer exhibit more folding and faulting than the Eastern portion.[12] In his testimony, Dr. Kyle Murray, a hydrologist with the Oklahoma

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[11] In previous reports and other documents, these three areas were often referred to as the Hunton Anticline, the Tishomingo Anticline, and the Arbuckle anticline, respectively.

[12] Protestants also offered evidence showing that at times in the past, the Board has developed MAYs that divide aquifers into sub-basins. (*See, e.g.*, OKAA Exh. 1 (listing MAYs for various Oklahoma groundwater basins).) However, there was no showing as to why those aquifers were treated in that manner, such that they could be thought similar to, or different from, the A-S Aquifer.

Geological Survey,[13] noted these differences; although he has not conducted research to test his hypothesis, he offered the opinion that the Central and Western portions may behave differently than the Eastern portion. Indeed, he had previously developed a proposal to undertake further study of the Central and Western portions. (*See also* OKAA Exh. 2 (Kyle E. Murray, Ph.D., Project Proposal: Augmented Hydrologic Assessment of the Arbuckle-Simpson Groundwater Basin, at 7 (Apr. 2012).) Dr. Eileen Poeter offered similar testimony.

16. The USGS Report, which was one of the sources upon which the Agency relied, also acknowledged these differences. (*See* USGS Report at 97.) However, the USGS focused its hydrogeologic study and groundwater-flow model on the Eastern portion of the aquifer because (1) the necessary data for building the model were sparse in the Western and Central portions; (2) the eastern portion is the largest part of the aquifer by area and volume; (3) as of 2011, most of the groundwater withdrawals from the aquifer were from the Eastern portion; and (4) the largest streams and springs (by flow) sourced from the aquifer are from the Eastern portion. (*Id.* at 5.) Furthermore, the USGS Report explains that an understanding of the entire aquifer, especially with respect to geology, was necessary for studying the Eastern portion. *Id.* The USGS Report evidences consideration of the full aquifer system throughout, even though the model itself was constructed for only the Eastern portion.

17. In addition, in developing the MAY, the Agency conducted and considered numerous other studies that ranged across the entire A-S Aquifer. As Noel Osborn, a scientist at USGS who was previously at OWRB, testified, these included a tree-ring analysis to assess climatic assumptions, synoptic streamflow measurements, a geochemistry study, examinations of springs, wells, and sinkholes, and extensive literature reviews. (Osborn Test. (13) 00:43:00 – :46:28.) Other studies included geophysical studies to characterize the geology of the aquifer.

18. The Board finds that substantial evidence supports its decision to treat the Western, Central, and Eastern portions of the A-S Aquifer as a single groundwater basin for purposes of establishing this MAY.

19. **Well Yields.** Wells completed in the A-S Aquifer commonly yield between 200 and 500 gpm. (USGS Report at 96.)

20. **Water Quality.** The quality of groundwater in the A-S Aquifer is described in the USGS Report at 32-33. Overall, freshwater in the A-S Aquifer has low dissolved solids concentrations. One study, for example, documented a median dissolved solids concentration of 347 mg/L, with an interquartile range of 331 to 384 mg/L. (*See* USGS Report at 32.) Thus, the evidence shows that the overall quality of the groundwater is considered good. No evidence in opposition to this finding was presented.

21. **Total Land Over Basin.** The total land area overlying the aquifer areas (including the narrow "connecting" areas between the three larger aquifer areas) is

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[13] At the hearing, Protestants presented evidence tending to show that Dr. Murray had been asked not to testify. The Board finds no cause to address this matter; the fact is that Dr. Murray did testify pursuant to a subpoena, and, like all the experts who testified, he was a credible witness.

approximately 612.5 square miles, or 392,019 acres. The evidence showed that the Aquifer surface outcrop encompasses approximately 520 square miles, but during the course of the hydrologic investigation, areas of fresh groundwater from the Aquifer were identified beyond the outcrop that were contiguous to the surface outcrop. (CPASA Exh. 18 at 5.) For these reasons, the Board finds that the total land area overlying the A-S Groundwater Basin is approximately 612.5 square miles.[14] No evidence in opposition to this finding was presented.

22. **Amount of Water in Storage.** The Board finds that the amount of water in storage is estimated at about 11,000,000 acre-feet; this number is based in part on an average saturated thickness of 3,400 feet.[15] (*See* USGS Report at 70.)

23. At the hearing and in their briefs, Protestants noted that OWRB Planning and Management Division Chief Julie Cunningham used a different amount of storage, 9,408,461 acre-feet, in a PowerPoint presentation to the Board on February 13, 2012. (*See* OWRB Exh. 4.) This amount was based on an average saturated thickness of 3,000 feet; and Ms. Cunningham explained that agency staff met with USGS staff following the February 13 presentation and made this revision to better reflect the scientific data. (Cunningham Test. (1) at 00:35:01-:47.) While Protestants complain about the change, they submitted no evidence contrary to the 11,000,000 acre-feet finding. The Board finds that the agency adequately explained the change, and moreover, the change is supported by substantial evidence.

24. **Rate of Recharge.** The 5-year average rate of recharge (volume of water that percolates into the geological formation from precipitation), from 2004 through 2008, is estimated at 5.58 inches per year. *See* USGS Report at 71 (Table 19.) Using this recharge rate and with the total land area overlying the aquifer of approximately 392,000 acres, the total amount of recharge for the aquifer areas is calculated at approximately 182,300 acre-feet of water per year. Accordingly, over a 20–year period, the cumulative total amount of recharge to the aquifer would be approximately 3,645,800 acre-feet.

25. **Total Discharge.** To calculate the total amount of discharge from the basin attributable to withdrawals, the Board assumes that holders of "prior rights" will pump their full (100%) authorized annual volume of groundwater. "Prior rights" are rights to use groundwater established under state laws as those laws existed prior to July 1, 1973, with such rights being recognized in final orders of the OWRB determining prior rights to use groundwater. For the Arbuckle-Simpson aquifer, prior rights authorize withdrawal of a cumulative total of 5,432 acre-feet per year. Therefore, the cumulative total discharge attributable to the assumed full exercise

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[14] The Board recognizes that site-specific information such as the lithology from a well drilled on a particular tract of land located near or on the boundaries shown in the map attached as Appendix 1 may show that a particular tract or acre of land overlie or do not overlie the aquifer material, but such site-specific information may be presented in an individual proceeding conducted to consider a particular application for permit to use groundwater with determinations as to inclusion or exclusion of acres of land made on that site-specific scale.

[15] The average saturated thickness of the Arbuckle-Timbered Hills hydrostratigraphic unit in the model domain was 3,366 feet (USGS Report at 70), and the storage coefficient was input as 0.008 (USGS Report at 70); these values were input for the model's transient calibration (*id.*).

of prior rights over a 20-year period is 108,640 acre-feet. No evidence was presented to the contrary.[16]

26. **Transmissibility.**[17] The evidence shows, and the Board finds, that Aquifer has an average transmissivity of 11,000 feet squared per day based on an average hydraulic conductivity of 3.3 feet per day (*see* USGS Report at 64) and average saturated thickness of 3,400 feet (*see id.*).[18]

27. **Potential for Pollution from Natural Sources.** The evidence shows, and the Board finds, that the possibility of pollution from natural sources is negligible. Study information does show that water of lower quality may be found in differing aquifer formations located below and to the west of the known sub-crop area within the Eastern Aquifer area and that water from the differing aquifer formation is known to surface in springs within the Chickasaw National Recreation Area (CNRA) (sometimes referred to as "bromide" water or "mineral" water). Induced infiltration of poorer quality water, possibly from formations outside the outcrop area of the Arbuckle Group and Simpson Formation, could occur in areas where there is heavy pumping of water. The mineral springs located in the CNRA and Sulphur area is evidence of the mixing of these poorer quality waters with the fresh waters of the Arbuckle-Simpson aquifer. However, the water quality concerns cannot be quantified with reasonable certainty and are not expected to significantly alter the amount of water available from the basin for the typical purposes for which groundwater in the basin is used.

28. **Natural Flow, Habitat, and Modeled Flow.** Senate Bill 288 imposes a moratorium on issuing temporary permits to withdraw groundwater from a sensitive sole source groundwater basin until such time as the OWRB conducts and completes a hydrologic survey and approves a maximum annual yield that will ensure that any permit for any removal of water from a sensitive sole source groundwater basin or subbasin pursuant to a permit "*will not reduce the natural flow of water* from basin area springs or streams." *See* § 1020.9A(B)(2)(emphasis added).

29. For reasons discussed under Conclusions of Law 9 - 15, the Board construes the phrase "natural flow" to refer to the essential component of the natural habitat of area streams. Accordingly, to develop the MAY the Board undertook an analysis of the effect of groundwater withdrawals on the area's flowing streams' ability to provide habitat.

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[16] A full water budget was completed as part of the USGS study; further details are presented at Table 20 of the USGS Report.

[17] The Groundwater Law uses the term "transmissibility," which the Board treats as synonymous with the term "transmissivity," which is the more modem term preferred by geologists and hydrologists. Transmissivity is " the rate at which water . . . is transmitted through a unit width of the aquifer under a unit hydraulic gradient." (USGS Report at 42.)

[18] Note that the USGS Report discusses a value for transmissivity of 12,000 ft^2/day, which is from a site-specific aquifer test (*see infra* Finding of Fact No. 37). The average value found above may be obtained by multiplying the hydraulic conductivity by the average saturated thickness of the Aquifer.

30. To operationalize its interpretation of the statutory mandate, the Board convened a Surface Water Technical Advisory Group.[19] The Group identified representative species—two species of minnows and two species of darters found in the Blue River and Pennington Creek—to consider what level of withdrawals would accommodate an acceptable maintenance of the species' habitat.

31. The Blue River and Pennington Creek carry water discharged from the Eastern Aquifer area and each stream has significant water-flow records from USGS gauges; these records were used in the in-stream flow assessments. Mill Creek also carries water discharged from the Eastern Aquifer area and some water discharged from the Central Aquifer area, Oil Creek carries water discharged from the Central Aquifer Area, and Honey Creek (on which Turner Falls is located) carries water discharged from the Western Aquifer area. Thus, the Board determined that the species of minnows and darters and effects of flow reduction on such species in Mill Creek, Oil Creek and Honey Creek would be substantially similar to those assessed for the Blue River and Pennington Creek, and accordingly, a reduction in base flow of those streams of not more than 25% should also be acceptable.

32. Protestants challenge the following components of the Instream Flow Assessment. First, they object to the selection of indicator fish species, which was based on those most sensitive to reductions in stream flow. Second, they argue that the Instream Flow Assessment improperly measured impacts on fish habitat, rather than on fish populations themselves. They emphasize Mr. Smithee's testimony that he could not predict precisely what reductions in fish populations might occur when fish habitats were reduced. Finally, Protestants point out that although the Working Group determined that a 25% reduction in baseline low flow would be the maximum allowable reduction, it asked the USGS to consider a different flow regime in its modeling efforts, without offering any explanation for the change.

33. The Board finds that the selection of indicator fish species was reasonable and is supported by the record. The Instream Flow Asssessment explains the rationale for the selected species, as did Mr. Derek Smithee, OWRB Water Quality Programs Division Chief, when he testified at the Hearing. (OWRB Exh. 2 at 5; Smithee Test. (10) at 00:17:50 - :18:35.) Protestants did not provide any evidence to the contrary; their argument is purely one of policy and does not raise issues of fact.

34. Second, the Instream Flow Assessment makes a reasonable connection between protection of fish populations and availability of fish habitat. For example, it cites studies in Texas showing reductions in various fish populations due to aquifer withdrawals that have reduced stream flows. (OWRB Exh. 2 at 3.) It also logically connects population reductions to loss of habitat; for example, it notes that "species in groundwater dependent sites like Spring

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[19] In addition to Board staff, the Group consisted of, among others, Phil Moershel, OWRB; Jennifer Back, National Park Service; Collin Balcombe, Bureau of Reclamation; Hayley Dikeman, Fish & Wildlife Service; Bill Clark, landowner; Noel Osborn, USGS; Titus Seilheimer, Oklahoma State University; and Bill Fisher, Oklahoma State University and USGS. (Prot. Exh. 1; *see* Smithee Test. (10) 00:07:30-:08:23 (describing some fluidity of work group members).)

Creek could experience lower survival under reduced flows because there is no adjacent refuge. . . causing species to move downstream . . . where the habitat might be less suitable and predation risk greater." (*Id.* at 18.)

35. The Board finds there is substantial evidence to support the conclusion that its reliance on the fish habitat, as established by the Instream Flow Assessment, was reasonably related to protecting fish populations.

36. Protestants' final argument relates to the Working Group's instructions to the USGS. The Working Group was to transmit a maximum allowable flow reduction to the USGS for modeling purposes. Although the Working Group determined that a 25% reduction in baseline low flow (which is the lowest annual average at that location) would be the maximum allowable reduction, it asked the USGS to consider whether the impact of pumping would reduce the 75% exceedence of total flow by 10-25%. (Prot. Exh. 13; Smithee Test. (10) at 00:28:30 - :34:01.) Indeed, the USGS modeled the 5-year average streamflow, the 5-year average base flow, the 75-percent exceedence, and depletion of the 75-percent exceedence.

37. The record offers no rationale for this change. There is no indication how a conversion from the 75-percent exeedence to baseline low flow would work, how it would impact fish habitat, or how using the baseline low flow instead of the 75-percent exceedence would have impacted the model results—nor is there any explanation to show that the difference would be immaterial.

38. Even without relying on the 25% baseline low reduction, however, the Board concludes that the modeling approach—which examined the impact of pumping at different EPSs on different types of flow—is reasonable given the language of Senate Bill 288. As described in more detail in the Conclusions of Law below, nothing in the statute *requires* the linkage of "natural flow" to fish population or habitat. Natural flow could just as reasonably be interpreted as relating to the 75-percent exceedence: this approach accounts for the relationship of pumping to streamflow as contemplated by the statute; and it tolerates some but not too much reduction in streamflow, which harmonizes the "will not reduce" language with the overall Groundwater Law's policy of permitting groundwater use.

39. **Groundwater Model.** As already noted, the Board collaborated with USGS to describe the hydrogeology and simulate the groundwater flow in the A-S Aquifer. Understanding the relationship between groundwater withdrawals, groundwater flow, and natural stream flow was important particularly because Senate Bill 288 provides that for sensitive sole source groundwater basins, the Board in developing a MAY is to ensure that removals of groundwater will not interfere with the natural flow of streams or springs. At the Hearing, Protestants challenged a number of details related to the groundwater model. Thus, the Board makes the following findings relevant to the reasonableness of its reliance on the model in developing the MAY.

40. **Storage Coefficient.**[20] The USGS report describes a number of sources from which it developed the storage coefficient that was used for the model. First, it conducted a two-well aquifer test. Transmissivity computed from the analytical solution used to evaluate the results was 12,000 ft^2/day. (USGS Report at 44.) The test was not of a sufficient duration to confidently determine a storage coefficient, though a previous study had arrived at 0.008, and the best fit between the data and analytical solution was 0.011. (*Id.* at 46.)

41. Thus, the USGS used multiple regional methods to determine storage coefficient, as set forth in the USGS Report at 46-48, to arrive at a storage coefficient of 0.008. Other studies produced comparable results. (*See id.* at 48-49.) The Board finds that the methodology used to determine the overall storage coefficient was reasonable.

42. At the hearing, Protestants questioned the model's use of the 0.008 storage coefficient for the entirety of the aquifer. It is undisputed that the A-S Aquifer is comprised of an unconfined zone, a semi-confined zone, and a confined zone. Protestants presented the testimony of Dr. Eileen Poeter, who stated that, because unconfined zones can dampen the impact of groundwater pumping on surface water, the model should have taken that difference into account. She testified that when a modeler treats an unconfined zone as a confined zone, two corrections ought to be made. First, the zone should be assigned an unconfined storage coefficient; and second, the storage coefficient for the unconfined zone should be divided by the thickness of the unconfined zone rather than the thickness of the entire aquifer.

43. With respect to the first concern, Mr. Christenson testified that the A-S Aquifer's unconfined zone actually behaves the way one would expect a confined zone to behave. This testimony is supported by and consistent with the USGS Report. (Christenson Test. (6) at 00:21:50 – 22:46.)

44. With respect to the second concern, this dispute could be characterized in two ways. First, as a classic dispute between experts, the weight to accord each expert's viewpoint is within the agency's discretion. Here, both experts had high credibility. Both are experts in modeling methods; furthermore, the USGS Study underwent a peer review that did not identify any modeling issues. (*See* Christensen Test. (13) at 00:06:00 – 00:06:20 (noting USGS peer review team did not raise issues with methodology.)

45. Second, even assuming Dr. Poeter were correct that a better technique might have been used, it is unclear what impact such an approach would have made on the outcome. Dr. Poeter testified that she re-ran the model using a higher storage coefficient for the unconfined zone from a single well, Well No. 85182. She explained that the model predicted a much lower impact on stream flow when that adjustment was made. However, she also acknowledged that other parameters would have needed to be adjusted in the model if the storage coefficient were changed so that the model could be recalibrated. (Poeter Test. (9) 00:11:15-:12:00.)

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[20] "The storage coefficient of a hydrostratigraphic unit is the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head, and is dimensionless." (USGS Report at 42.)

46. At the most, this evidence suggests that a different modeling approach *might* have made a difference. Even if a different approach would have been reasonable, other record evidence supports the reasonableness of relying on the USGS model. To understand why, it is necessary to return to Senate Bill 288's directive to consider natural flow. First, in light of that directive, the Board accords great weight to the model's calibration to observed streamflows. Second, the focus on natural flow means that for purposes of this study, recharge rate was more important than storage coefficient. (Christenson test. (6) 00:15:08-:16:01; 00:21:25-:21:30.) As explained by the USGS Report, long-term stream and spring flows are derived from recharge, not storage:

> Stream and spring flows are maintained in the long term (during time periods of years) by water entering the aquifer as recharge (during short time spans, on the order of days to weeks, stream and spring flows are maintained by water from storage), and, therefore, groundwater withdrawals could not exceed recharge. In fact, for longer time scales (years to decades) withdrawals must be less than recharge because if withdrawals equal or exceed recharge then stream and spring flow eventually would be reduced to zero. (USGS Report at 81.)

47. Finally, even assuming that Dr. Poeter's approach would have resulted in greater flows at the modeled EPSs, the Board notes that, after the modeling was complete, it selected a number for the MAY *higher than* might have been indicated by the model. Thus, to the extent Mr. Christenson's approach incorporated conservative assumptions (in the sense that it could lead to lesser stream flows), the Board's ultimate selection of the MAY incorporated a more liberal assumption (in the sense that it permits higher withdrawals). The Board therefore concludes that it was reasonable to rely on the model as one of the considerations for setting the MAY; and even if a different modeling approach with respect to the storage coefficient could have been used, the failure to do so was harmless.

48. **Model Calibration.** The process used to calibrate the model is documented in the USGS Report at pages 62-69. The model was calibrated in two steps, consisting of steady-state and transient calibrations. (USGS Report at 62.) The model was calibrated to 5-year average streamflow and base flow for the streamflow gages at Blue River near Connerville and Pennington Creek near Reagan. The model was calibrated to average flows to ensure that the amount of flow (both streamflow and base flow) computed by the model represented actual observed flows.

49. The calibrated steady-state model simulation reproduced the major features of previously mapped potentiometric surfaces. (USGS Report at 66-67.) Under steady-state conditions, the water budget for the Eastern A-S is 158.11 cfs of recharge and 158.11 cfs of discharge to drains. (*Id.* at 67.) Other model parameters from the steady-state calibration, including transmissivity, are presented in Table 17.

50. The model was also calibrated to transient conditions for the five-year time period of water years 2004 to 2008 (between October 1, 2003 and September 30, 2008). Details are set forth in the USGS Report at 70-72. The average saturated thickness of the Arbuckle-Timbered Hills hydrostratigraphic input in the model domain was 3,366 feet.[21] (*Id.* at 70.) Area-weighted annual recharge rates applied to the model domain averaged 5.58 inches per year for the five-year period studied. (*Id.* at 71.)

51. As described above, the transient model was calibrated to streamflows in Blue River and Pennington Creek. The calibration resulted in very close observed and modeled values. (See USGS Report Table 22 (presenting observed and modeled values).)

52. Although the transient model calibration was based primarily on streamflows in Blue River and Pennington Creek, the model can also reproduce head response in observation wells. Daily head observations were compared to simulated median monthly head observations; comparisons are depicted in Figure 38. As the USGS Report explains, differences in observed and simulated water levels were considered acceptable given the study objective's emphasis on streamflow. (USGS Report at 72.)

53. Dr. Blaine T. Reely testified for the Protestants that the transient model did not appear to have been calibrated to the potentiometric data for the same calibration period. (*See* Ranchers' Exh. 3 at 2.) In his testimony, Dr. Reely emphasized the differences between observed and simulated water levels. However, he also noted the close match between observed and modeled streamflow values: "It's an amazing calibration. It's almost a perfect calibration, or match . . . ." (Reely Test. (12) 00:14:58-:15:07.)

54. The Board finds that its reliance on the USGS Report with respect to the transient model calibration is reasonable. Again, Senate Bill 288 emphasizes the connection of groundwater to the natural flow of streams and springs. Thus, it is reasonable to calibrate the transient model to streamflows. Further, the USGS Report explicitly considered head response in observation wells and determined again that the difference in observed and simulated levels was acceptable given the study objectives.

55. **Determination of MAY.** Having duly considered the entire record, the Board finds that the maximum amount that can be withdrawn from the Aquifer each year is 78,404 acre-feet. The Board also finds that this amount will not reduce the natural flow of springs and streams within the Aquifer basin. This MAY is equivalent to an equal proportionate share of 0.2 acre-feet per acre of land overlying the basin per year.

56. Protestants challenge the Board's designation of the .2 acre-feet/acre EPS, arguing it deviates from the study results. Protestants' argument seems to be premised on the belief that the groundwater model would produce a single "answer" as to the appropriate MAY. But as is evident from the testimony at the Hearing and the above Findings of Fact, the Board's decision rests on *all* the evidence in the record. Further, the statutory mandate contemplates that the

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[21] This number was rounded up to 3,400 feet and was used in calculating the amount of water in storage.

Board will apply its expertise and scientific judgment in developing a MAY. During her testimony, for example, Ms. Cunningham provided a reasonable explanation for the ultimate decision: it draws on all factors; it accounts for model variability, conservative assumptions, the recharge rate, and concerns about reasonable use. (Cunningham Test. (1) 1:03:00-:06:00; OWRB Exh. 4 at 14; *see also* Smithee Test. (10) 00:34:16 – :34:36 ("Science doesn't *give* us the answer. Science *informs* our answer.").)) These criteria are reasonable and well within the agency's authority. Indeed, they rest on the reasonable acknowledgment that the agency is operating within both scientific uncertainty and policy constraints imposed by the Groundwater Law and Senate Bill 288.

CONCLUSIONS OF LAW

A. Agency Authority

1. The Board is given authority by the Oklahoma Groundwater Law, 82 O.S. §§ 1020.4, 1020.5 and 1020.6 to make hydrologic surveys and investigations, enter orders to make tentative determinations, hold hearings on the tentative determinations, and make final determinations of the maximum annual yields of each groundwater basin and subbasin. The Board is also given authority to cooperate with state and federal agencies engaged in similar surveys and investigations and may accept and use the findings of such agencies. *Id.* § 1020.4(C).

B. Personal Jurisdiction; Notice; Procedural Due Process

2. The Board finds that the requirements of jurisdiction, notice, and procedural due process were met in connection with this proceeding. *See* 82 O.S. §§ 1020.4 - .6, 1020.9A & B; *see also* U.S. Const. amend. XIV.

C. Statutory Framework

3. According to 82 O.S. § 1020.5, after completing hydrologic surveys, the Board is to make a tentative determination of the maximum annual yield of groundwater to be produced from a basin or subbasin based upon the following:

a. total land area overlying the basin or subbasin;
b. amount of water in storage in the basin or subbasin;
c. rate of recharge to and total discharge from the basin or subbasin;
d. transmissibility of the basin or subbasin; and
e. possibility of pollution of the basin or subbasin from natural sources.

4. Section 1020.5 also provides that the maximum annual yield shall be based on a minimum basin life of 20 years from the effective date of the final order determining the maximum annual yield. This approach is known as a mining policy. *See Okla. Water Resources Bd. v. Tex. Cnty. Irr. & Water Resoures Ass'n*, 1984 OK 96, 711 P.2d 38, 41 (Okla. 1984) (describing groundwater policy as one of "use regulation and management").

5. Senate Bill 288 amended the Oklahoma Groundwater Law and required additional determinations relating to the maximum annual yield of any "sensitive sole source groundwater basin or subbasin." Section 1020.9A imposes a moratorium on the issuance of "temporary" permits that allow for municipal use of groundwater from a sensitive sole source groundwater basin or subbasin outside of any county that overlies in whole or in part such basin or subbasin.[22]

6. Section 1020.9A defines "sensitive sole source groundwater basin" as "a major groundwater basin or subbasin all or a portion of which has been designated as a Sole Source Aquifer' by the United States Environmental Protection Agency . . . and any portion of any contiguous aquifer located within five (5) miles of the known areal extent of the surface outcrop of the sensitive sole source groundwater basin." 82 O.S. § 1020.9A. In 1989, the EPA designated a portion of the Arbuckle-Simpson Aquifer as a Sole Source Aquifer. 54 Fed. Reg. 39,230.

7. Senate Bill 288 places a limitation on the maximum annual yield for sensitive sole source groundwater basins: the MAY must ensure that any permit for any removal of water from a sensitive sole source groundwater basin or subbasin pursuant to a permit "*will not reduce the natural flow of water* from basin area springs or streams." See § 1020.9A(B)(2)(emphasis added).

8. The Oklahoma Supreme Court upheld the constitutionality of Senate Bill 288 in *Jacobs Ranch, LLC v. Smith*, 2006 OK 34, 184 P.3d 842 (Okla. 2006).

D. Agency Interpretation of "Will Not Reduce Natural Flow"

9. As noted above, Senate Bill 288 requires that the MAY is set so that it "*will not reduce the natural flow of water* from basin area springs or streams." See § 1020.9A(B)(2) (emphasis added). The Bill does not define "will not reduce" or "natural flow." Several principles guide the Board's construction of that term. First, Senate Bill 288 did not expressly alter the pre-existing Groundwater Law; therefore, the terms of each should be harmonized to the extent possible. Second, Senate Bill 288 contemplates the interconnectedness of groundwater

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[22] Section 1020.11(B) defines "temporary permit" as an authorization for the same purposes as a "regular" permit but granted by the OWRB prior to completion of a hydrologic survey and determination of the maximum annual yield of groundwater from the basin or subbasin from which the groundwater will be withdrawn. Pursuant to the provisions of § 1020.11(B), the temporary permits allocate and authorize the withdrawal of two acre-feet of groundwater per acre of land per year, subject to limited circumstances where deviations can be authorized. Temporary permits establish no permanent right to the allocation amount provided, although the law provides for an "automatic" annual revalidation process. By contrast, § 1020.11(A) defines "regular permits" as authorizations to put groundwater to beneficial use and is issued after completion of the hydrologic survey and determination of the maximum annual yield. Regular permits allocate equal proportionate shares of the maximum annual yield of the basin or subbasin. *Id.* § 1020.11(B). As described in more detail below, the Board directs the Agency to initiate a rulemaking proceeding for the purpose of timely transitioning from the moratorium on temporary permits to the issuance of regular permits.

and surfacewater, in that it recognizes that groundwater withdrawals could reduce flows in springs or streams. Finally, as an administrative agency exercising authority delegated by the state legislature, the Board is required to bring its expertise and reasoned judgment to bear on interpretations of its statutory mandate.

10. The plain language "will not reduce" could be read to mean that groundwater pumping may not in any way impact the amount of flow in basin springs or streams. This interpretation, however, would so restrict the possible use of the A-S Aquifer that it could not be harmonized with the pre-existing Groundwater Law, which contemplates mining over a 20-year timeframe. Moreover, such a strained interpretation would be inconsistent with the declared policy of the Groundwater Law to utilize groundwater resources of the state and to provide reasonable regulations for the allocation for reasonable use of groundwater, as expressed in a later-enacted provision of the Oklahoma Groundwater Law. *See* 82 O.S. § 1020.2(A). Thus, the Board concludes that "will not reduce" should not be read literally.

11. "Natural flow" is also subject to multiple interpretations. For example, both Derek Smithee and Jennifer Back, a hydrologist for the National Park Service, testified that they could define natural flow as that which is unaltered by human activities. Again, this definition would likely preclude or restrain groundwater withdrawals so severely that it would be inconsistent with the overall policy of the Groundwater Law of utilizing water resources.

12. To accommodate the policies expressed in the Groundwater Law—including a general policy of use but an interest in protecting streams and springs in sensitive sole source groundwater basins—the Board construes the phrase "natural flow" to refer to the essential component of the natural habitat of area streams. Protecting the flow of springs is an integral component of the primary intent to protect area stream flows. Accordingly, an analysis of the effect of potential pumping of groundwater on the habitat of the area's flowing streams is a reasonable approach; it is based on the Board's long experience implementing Oklahoma's Groundwater Law as well as its expertise with respect to the State's waters.

13. Protestants argue that the Board should have taken account of the use of the term "natural flow" in a different statute—60 O.S. § 60, which concerns the rights and obligations of riparian owners with respect to water in streams. The provision states that "[w]ater running in a definite stream, formed by nature over or under the surface, may be used by the owner of the land riparian to the stream for domestic uses . . . . but he may not prevent the natural flow of the stream." As argued by Petititioners, *Franco-American Charolaise, Ltd. v. OWRB*, 1990 OK 44, 855 P.2d 568, interpreted "natural flow" in this context to refer to reasonable use by people, not fish.

14. This argument is unpersuasive for several reasons. First, it takes 60 O.S. § 60 out of context; statutory language need not be given the same meaning when used in entirely different provisions. The very different context in which the term is used in 60 O.S. § 60 is highlighted by the *Franco-American* case upon which Protestants rely. The provision was discussed in *Franco-American* as it related to old common-law doctrines that are no longer recognized in the State. Specifically, the "natural flow" doctrine for *surface water* was held to have been replaced by the reasonable use doctrine. 855 P.2d at 575-76. But this reading only

supports the Board's approach of refusing to read the "will not reduce" language as barring withdrawals from the A-S Aquifer; instead, the Board's interpretation is consistent with the policy that water in Oklahoma may be put to reasonable use.

15. Protestants point to no alternative interpretations of "natural flow" that are meaningful in the context of Senate Bill 288. The argument is correct, so far as it goes, that the sole source groundwater basin designation is concerned with protecting drinking water supplies—a designation consistent with the purpose of the SDWA's Sole Source Aquifer designation. But their argument does not reach Senate Bill 288's concern that too many groundwater withdrawals could interfere with the surface waters in the basin area. The Board's interpretation of "natural flow" does not prioritize fish over people; rather, it develops a reasonable proxy for determining how much of an impact to basin springs and streams should be tolerated under the Maximum Annual Yield framework.[23]

16. Finally, Protestants argue that the Board may not adopt an interpretation of "natural flow" via this adjudication; rather, they contend that the Board should have adopted this interpretation via rulemaking. Protestants correctly cite the definition of "rule" from the Administrative Procedures Act, 75 O.S. § 250.3, but they do not account for agencies' authority more broadly. It is well established that agencies may adopt interpretations of their statutory mandates as necessary to carry out adjudications. *See SEC v. Chenery Corp.*, 332 U.S. 194, 203 (1947). Further, the Groundwater Law *requires* that MAYs be conducted according to adjudicatory procedures. *See* 82 O.S. § 1020.6.

E. Other Statutory Factors

17. Senate Bill 288 also includes a separately stated condition and limitation on the issuance of any kind of permits (not just regular permits after the maximum annual yield is determined) to use groundwater from a sensitive sole source groundwater basin. The separately stated condition should be read in conjunction with Section 1020.9A relating to maximum annual yield determinations for sensitive sole source groundwater basins. The separately stated condition is found in § 1020.9, which was amended by Senate Bill 288 to provide that before issuing a (i.e. any kind of) permit, the OWRB must determine whether the proposed use "is likely to degrade or interfere" with basin area springs and streams. The "degrade or interfere" language appears to contemplate some use of groundwater to be authorized by permits, but imposes the limitation that such use cannot "degrade or interfere" with the flow of springs or streams.[24] Interpreting the contemporaneous "natural flow" limitation as indicating legislative intent that the maximum annual yield must prohibit any groundwater withdrawals, would be

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[23] As explained in Finding of Fact No. 25, however, even without use of this proxy, the Board's choice of flow regimes for modeling are reasonable interpretations of the term "natural flow."

[24] This additional language supports the Board's determination that the "natural flow" language should not be read to prohibit withdrawals altogether; such an interpretation would be inconsistent with the "degrade or interfere" language, which appears to contemplate at least some pumping.

inconsistent with a reasonable interpretation of the permit specific "degrade or interfere" language that appears to authorize some pumping.

18. To harmonize this language with the "natural flow" language discussed above, the Board concludes that the restriction on maximum annual yield determination to avoid reducing the natural flow of area springs and streams applies on a macro basin-wide scale, and requires a general analysis of the general effects of pumping groundwater on the average flow of area springs and streams. By contrast, the "degrade or interfere" limitation language applies on a micro site-specific basis and lends itself to an analysis of evidence of potential impacts of specific pumping rates of specific wells on specific springs and streams. Thus, as described in more detail below, the Board directs the Agency to initiate rulemaking proceedings to determine how such evidence should be handled in individual permitting proceedings.

F. Constitutional Arguments

19. In their post-hearing brief, Protestants also argue that the proposed MAY violates the Constitution's prohibition on takings without just compensation. The only authority Protestants cite for this proposition is *Franco-American*. Again, that case is inapposite. It held that restrictions on riparian owners' *domestic use* amounted to taking. The Board's groundwater permitting authority does not extend to domestic use, and so the MAY does not relate to such uses. It is well established that states may impose reasonable restrictions on water use; the State Legislature has done so here in the context of the Groundwater Law and Senate Bill 288. *See Jacobs Ranch, LLC v. Smith*, 148 P.3d at 849-50. Furthermore, the Oklahoma Supreme Court has already upheld the constitutionality of Senate Bill 288 against a takings challenge; because that statute provides the basis of the Board's authority, Protestants' argument amounts to an attempt to revisit an issue that the Court has already decided. *See id.* at 855-56 (rejecting takings challenge).

20. Other Protestants appear to argue that the MAY violates their due process rights. As to procedural due process, Protestants provide no evidence suggesting any violations. As to substantive due process, Protestants fail to explain why there is a fundamental right or suspect classification that would result in strict scrutiny.[25] Rather, Protestants' argument is simply that the MAY should be rejected as arbitrary and capricious, which is a standard of administrative, not constitutional law. As is evident from the above discussion, the Board concludes that it has drawn reasonable connection between the facts found and the ultimate decision; thus, it does not violate the arbitrary-and-capricious standard.

ORDER AND DIRECTIVES

IT IS THEREFORE ORDERED by the Oklahoma Water Resources Board that:

1. The Arbuckle-Simpson aquifer underlying areas in Murray, Pontotoc, Johnston, Garvin, Coal and Carter Counties in the south central part of the state shall be and the same is

[25] Like the takings challenge, this argument has already been considered and rejected by the Oklahoma Supreme Court. *See Jacobs Ranch*, 148 P.2d at 856-57.

hereby designated the Arbuckle-Simpson Groundwater Basin, with outcrop and subcrop boundaries generally depicted on the map set forth as Appendix 1;

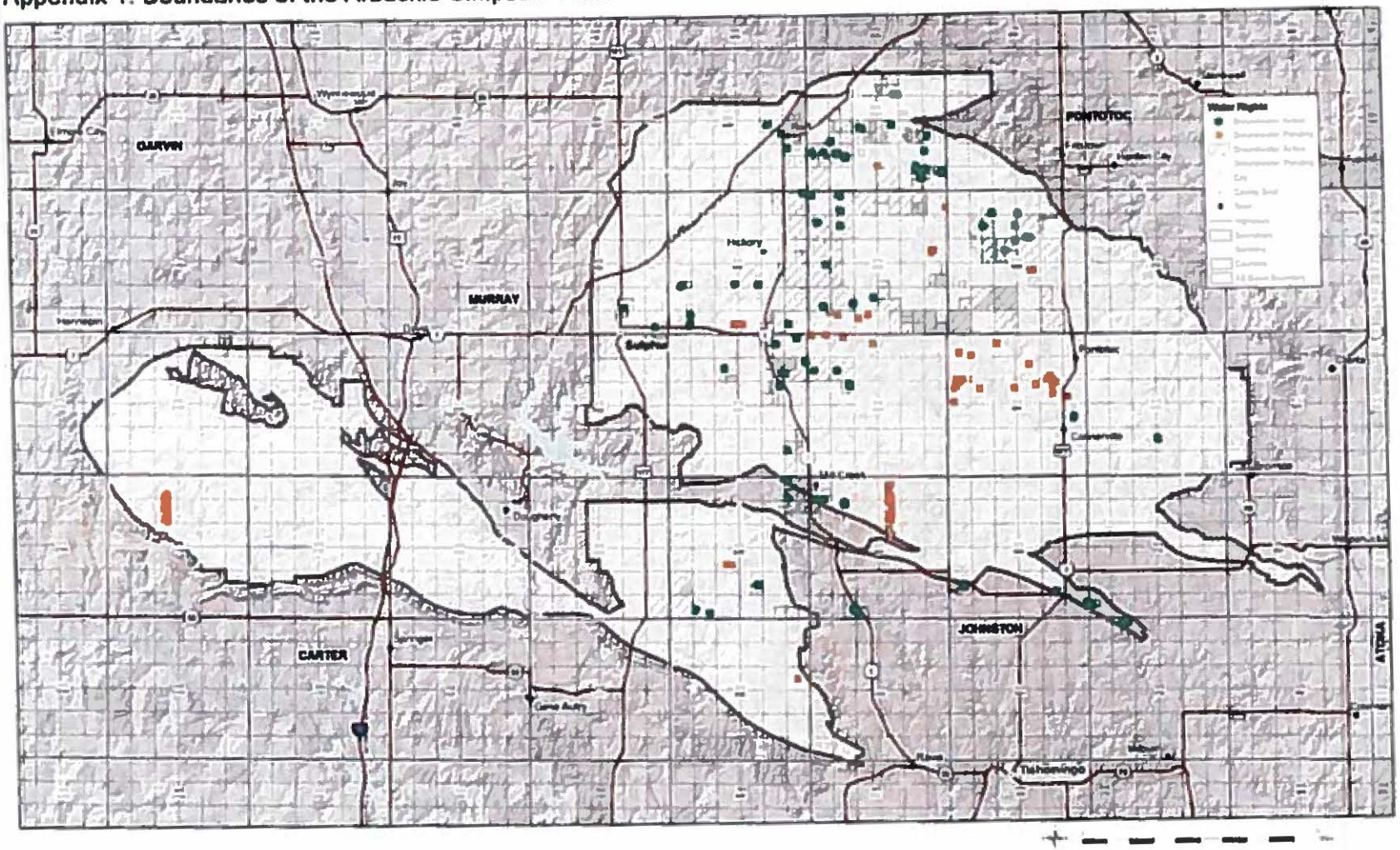
2. The basin is hereby declared to be a major groundwater basin under the provisions of the Oklahoma Groundwater Law;
3. The basin is also declared to be a sensitive sole source groundwater basin under the provisions of the Oklahoma Groundwater Law as amended by Senate Bill 288 enacted in 2003;
4. The determination of the maximum annual yield of the basin is 78,404 acre-feet;
5. The equal proportionate part of the yield to be allocated to each acre of land overlying the basin, based on the maximum annual yield and total overlying land area, is determined to be 0.20 acre-foot per acre per year (equivalent to two-and-four-tenths inches (2.4") per acre per year); and
6. The Agency is directed to initiate rulemaking proceedings for two purposes. First, the Agency is directed to initiate a rulemaking proceeding to establish a time period for reasonable implementation of this order as it relates to when existing valid temporary permits to withdraw groundwater from the Arbuckle-Simpson Groundwater Basin must be replaced by regular permits. Second, the Agency is directed to initiate rulemaking proceedings concerning a potential modification of the well spacing provisions set forth in the current rules relating distances of proposed wells to other wells, adoption of an established spacing distance between new proposed wells and springs and streams in the Arbuckle-Simpson Groundwater Basin, and a methodology for assessing and determining the effects of proposed pumping of specifically proposed wells on specific springs and streams.

IT IS SO ORDERED by the Oklahoma Water Resources Board in regular and open meeting this ____ day of _____, 2013.

OKLAHOMA WATER RESOURCES BOARD

ATTEST:

Rudolf J. Herrmann 10-23-2013 Linda P. Lambert

Rudolf J. Herrmann, Chairman Date Linda P. Lambert, Secretary

Appendix 1. Boundaries of the Arbuckle-Simpson Groundwater Basin.