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)

MOTION TO RECUSE/DISQUALIFY HEARING EXAMINER AND TO STAY PROCEEDING AND BRIEF IN SUPPORT

Protestants Oklahoma Farm Bureau Legal Foundation, Oklahoma Aggregates Association, Environmental Federation of Oklahoma, TXI and the Arbuckle-Simpson Aquifer Protection Federation of Oklahoma, Inc., (collectively "Protestants" hereinafter), hereby move to recuse the Honorable Emily Meazzell as the presiding hearing examiner in this matter. In support hereof, Protestants present the following:

1. 82 O.S. § 1020.6 requires that the Arbuckle-Simpson Maximum Annual Yield ("A-S M.A.Y.") hearing be conducted as an individual evidentiary proceeding under the Oklahoma Administrative Procedures Code ("APA", 75 O.S. § 308a, *et. seq.*). Further, per § 1020.6, the Oklahoma Water Resources Board ("OWRB") was required to present evidence in support of the determinations upon which its tentative M.A.Y. order was based.

2. At the A-S M.A.Y. hearing, through its attorney Mr. Jerry Barnett, the OWRB participated as a party to the proceeding, calling witnesses, cross-examining witnesses, calling rebuttal witnesses and presenting evidence. The witnesses called and presented by the OWRB's counsel included Ms. Julie Cunningham, Mr. Scott Christenson and Ms. Noel Osborn.

3 Although it had the opportunity to do so, the OWRB declined to file any post-hearing briefs. More specifically, the OWRB declined to file a brief in response to the Protestants' post-hearing briefs, and the OWRB declined the opportunity through May 31, 2012

to submit post-hearing evidence (which would have required a showing of why such evidence was not submitted at the hearing).

4. Subsequent to the M.A.Y. hearing, counsel for Protestants made an Open Records Act request to the OWRB for all records relating to the A-S M.A.Y. that were generated after the M.A.Y. hearing. Some responsive documents were produced to Protestants' counsel on November 2, 2012. However, the OWRB withheld responsive documents on the basis of claimed privilege.

5. From the documents received in response to the Open Records Act request, Protestants have now learned that there have been post-hearing *ex parte* communications between the hearing examiner and witnesses who testified at the M.A.Y. hearing regarding the evidence and issues raised in the brief filed by various protestants on May 31, 2012, as well as post-hearing *ex parte* communications between the OWRB's counsel and the hearing examiner regarding such evidence and issues. See Affidavit of L. Mark Walker attached hereto as Attachment 1 which is submitted pursuant to 75 O.S. § 316. The exact scope of the communications is unknown because the OWRB has refused to produce all communications with the hearing examiner claiming privilege, and because the Open Records Act request does not encompass oral communications that are not documented in writing.

6. 75 O.S. § 313 of the APA provides that hearing examiners (i.e. persons assigned to render decisions in individual proceedings) shall not communicate, directly or indirectly, with any person or party regarding any issue of fact, and shall not communicate with any party or its representative regarding any issue of law. The post-hearing documents produced in response to the Open Records Act request indicate that this prohibition was violated.

In light of the foregoing, the hearing examiner should recuse or be disqualified from this matter. The taint of post-hearing *ex parte* evidentiary communications with witnesses and counsel cannot be undone, and the appearance of impropriety requires recusal/disqualification. *Cherokee Data Computer Parts & Serv., Inc. v. Oklahoma Dept. of Labor*, 2005 OK CIV APP 81, ¶¶ 15–16, 122 P.3d 56, 60 (rule requiring recusal of judges when circumstances and conditions might cast doubt and question as to the impartiality of any judgment applies equally to administrative boards acting in an adjudicatory capacity); *Johnson v. Bd. of Governors of Registered Dentists of State of Okl.*, 1996 OK 41, 913 P.2d 1339, 1347-48 (applying rule to administrative officer). Further, the integrity of the record and the administrative process requires recusal/disqualification. Protestants also ask that this proceeding be stayed until the OWRB has provided all of the documents sought by the Open Records Act request and until the motion to recuse/disqualify has been finally resolved.

Respectfully submitted,

L. Mark Walker, OBA #10508
Scott A. Butcher, OBA #22513

-Of the Firm-

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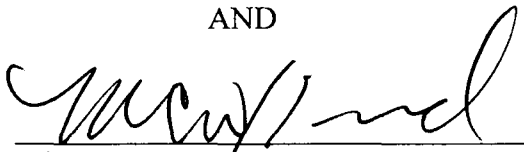

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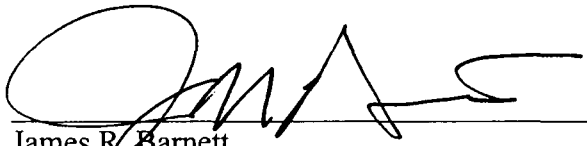

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ATTORNEYS FOR ARBUCKLE-SIMPSON AQUIFER PROTECTION FEDERATION OF OKLAHOMA, INC.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on the 8th day of November, 2012, he emailed a copy of the above and foregoing to the email addresses shown on Exhibit A, attached hereto and made a part hereof. The undersigned further certifies that on the 8th day of November, 2012, he mailed a copy of foregoing to the parties named on Exhibit B, attached hereto and made a part hereof.

L. Mark Walker

EXHIBIT A

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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	)))))

AFFIDAVIT OF L. MARK WALKER

I, L. Mark Walker, of lawful age and upon my oath and upon my personal knowledge, do state as follows:

1. At the Arbuckle-Simpson Maximum Annual Yield ("A-S M.A.Y.") hearing, appearing as counsel for the Oklahoma Water Resources Board ("OWRB"), Mr. Jerry Barnett called witnesses, rebuttal witnesses and presented evidence on behalf of the OWRB. Mr. Barnett called Ms. Julie Cunningham as the OWRB's first witness, and called Mr. Scott Christenson and Noel Osborn as OWRB rebuttal witnesses.

2. On August 30, 2012, myself and Mike Wofford submitted an Open Records Act request to the OWRB seeking all documents relating to the A-S M.A.Y. proceeding generated after May 17, 2012 (i.e. the last day of the hearing). A copy of this request is attached hereto as Exhibit A.

3. On November 2, 2012, the OWRB produced certain records in response to the Open Records Act request, but withheld others on the basis of claimed privilege. The November 2, 2012 transmittal letter from Dean Couch to myself is attached hereto as Exhibit B.

4. From the documents received on November 2, 2012, it is now apparent that direct and/or indirect post-hearing *ex parte* communications have occurred between the hearing examiner and witnesses who testified at the hearing and between the hearing examiner and the OWRB's counsel regarding the evidence and the issues raised in the post-hearing brief which I

Attachment 1

filed on behalf of various protestants on May 31, 2012. An example of such *ex parte* communications is reflected in the documents attached hereto as Exhibit C. Other documents which show or suggest additional *ex parte* communications are attached hereto as Exhibit D. The full extent of the *ex parte* communications is not currently known because the OWRB refused under claims of privilege to produce all of the documents responsive to the Open Records Act Request, and because the Open Records Act request does not encompass oral *ex parte* communications that may have occurred which were not memorialized in writing.

Further affiant sayeth not.

L. Mark Walker

Subscribed and sworn to before me this 8th day of November, 2012.

Notary Public

My Commission Expires:

PHOEBE A. JOHNSON
Notary Public
State of Oklahoma
Commission # 00011243 Expires 07/31/16

(SEAL)

VIA HAND DELIVERY

August 30, 2012

Oklahoma Water Resources Board
3800 North Classen Blvd.
Oklahoma City, OK 73118
405-530-8800
405-530-8900 (fax)

Re: OPEN RECORDS ACT REQUEST – In the Matter of Determining the Maximum Annual Yield for the Arbuckle-Simpson Groundwater Basin

Dear Sir or Madam:

Pursuant to the Oklahoma Open Records Act, 51 O.S. §§ 24A.1-24A.24, ("Act") please promptly provide copies of all records relating in any way to the determination of the Maximum Annual Yield for the Arbuckle-Simpson Groundwater Basin ("Determination") created by, received by, or otherwise coming into the custody, control or possession of the Oklahoma Water Resources Board ("OWRB"), its members, or its staff on or after May 17, 2012. This request specifically includes, but is not limited to, records relating to meetings and/or other communication with the Hearing Examiner or any other legal or natural persons. This request also specifically includes records relating to internal meetings and other communication between and among OWRB members, OWRB staff, and/or other OWRB agents or representatives as well as any memoranda or notes made, finalized, revised, or added to any OWRB file on or after May 17, 2012 regardless of the date of the initial draft.

With respect to this request, the term "record" is used in the broadest sense consistent with the Act, including any and all recorded information within the scope of 51 O.S. § 24A.3(1), regardless of physical form or characteristic. If your office is aware of any records subject to this request over which it does not have custody or access, please provide prompt notice of where such records may be obtained.

If any portion of this request is denied, the undersigned request a detailed index or similar written statement individually describing each record withheld and all reasons for its being withheld. Such descriptions should include a citation to specific legal authority for the withholding the record described. To expedite this request, the undersigned would be willing to discuss specific instances of withholding in advance of a final response from your office. Pursuant to 51 O.S. § 24A.5(2), any reasonably segregable portion of a record containing exempt material shall be provided after deletion of the exempt portions.

The undersigned promise to pay all reasonable copying costs that are chargeable under the Act upon presentation of an invoice with the records requested. Though this request is made

Exhibit A

jointly by all of the undersigned, the requested copies and/or any index of exempt materials should be delivered to the address provided below for L. Mark Walker. If, at any point, the copying costs of are expected to exceed $500.00, please use the email address or phone number provided below to contact L. Mark Walker immediately to discuss arrangements. Any other questions regarding this request should similarly be directed to L. Mark Walker.

Sincerely,

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EXECUTIVE DIRECTOR

MARY FALLIN
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STATE OF OKLAHOMA
WATER RESOURCES BOARD
www.owrb.ok.gov

November 2, 2012

L. Mark Walker
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Re: Open Records Act Request – Arbuckle-Simpson Maximum Annual Yield Proceeding

Dear Mark:

This will reply to your letters dated August 30, 2012 and October 22, 2012 in which you made a request that the Oklahoma Water Resources Board ("OWRB") provide, under the Oklahoma Open Records Act ("Act"), "...copies of all records relating in any way to the determination of the Maximum Annual Yield ["MAY"] for the Arbuckle-Simpson Groundwater Basin...created by, received by, or otherwise coming into the custody, control or possession of the [OWRB], its members, or its staff on or after May 17, 2012."

Our staff has searched our agency's records and, subject to the exemptions from the Act discussed below, copied such records to CDs which are responsive to your request. We will send an invoice later for the cost of this copying.

While we have endeavored to be fully and openly responsive to your request, there are a limited number of records that will be kept confidential as allowed and authorized by the following provisions of law:

A. 51 O.S. § 24A.5(1): "The Oklahoma Open Records Act, Sections 24A.1 through 24A.28 of [Oklahoma Statutes Title 51], does not apply to records specifically required by law to be kept confidential including:
   a. records protected by a state evidentiary privilege such as the attorney-client privilege [and] the work product immunity from discovery..."; and
B. 51 O.S. § 24A.9: "Prior to taking action, including making a recommendation or issuing a report, a public official may keep confidential his or her personal notes and personally created materials...."

Exhibit B

State of Oklahoma
OWRB
WATER RESOURCES BOARD
the water agency

3800 N. CLASSEN BO[illegible], OKLAHOMA 73118
TELEPHON[illegible]0-8900

OCWP

Please let me know if I can be of further assistance.

Sincerely,

Dean A. Couch
General Counsel

Enclosures

From: Meazell, Emily
To: Couch, Dean;
Subject: Re: USGS - evidence evaluation
Date: Friday, September 28, 2012 12:47:51 PM

Thank you very much!

On Fri, Sep 28, 2012 at 1:46 PM, Couch, Dean <DACOUCH@owrb.ok.gov> wrote:
> Emily,
>
> Finally, some rain here (central Oklahoma) the last couple days. I hope the
> semester at WFU has started off OK for you and your family.
>
>
>
> Attached is a scanned copy of a memorandum provided to Jerry from Scott
> Christenson and Noel Osborn of the USGS containing references to reports in
> the record about five items subject of Mr. Walker's post-hearing brief.
> Hope this helps. Jerry is out of town until October 9, but if you have
> questions about the material he sent to you last week or so, or other
> matters involving review of the administrative record, please let me or
> Julie Cunningham know.
>
>
>
> Dean

--
Emily Hammond Meazell
Associate Professor
Wake Forest University School of Law
336-758-5834
meazeleh@wfu.edu
http://ssrn.com/author=649887

Exhibit C

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Water Resources Discipline
Oklahoma Water Science Center
202 Northwest 66th Building 7
Oklahoma City, Oklahoma 73116

September 27, 2012

Memorandum

To: Jerry Barnet, Oklahoma Water Resources Board

From: Scott Christenson, Hydrologist, Scientist Emeritus, retired and Noel Osborn, Hydrologist, Oklahoma Water Science Center

Subject: Technical comments regarding the Arbuckle-Simpson Hydrology Study

The following comments are in response to your request regarding questions about the Arbuckle-Simpson Hydrology Study.

1. Natural flow

   Natural flow for purposes of the Arbuckle-Simpson Hydrology Study was defined as follows: "The approach taken for this study was to interpret "natural flow" as observed streamflow conditions for water years 2004 through 2008" (USGS Scientific Investigations Report 2011-5029 (SIR 2011-5029) "OWRB exhibit 1", page 81).

2. Model Calibration to streamflow

   The process used to calibrate the model is documented in SIR 2011-5029 pages 62-79. As described in SIR 2011-5029, the USGS Arbuckle-Simpson groundwater-flow model was calibrated to 5-year average streamflow (that is, the total amount of water in the stream) and base flow (the groundwater component of streamflow) for the streamflow gages at Blue River near Connerville and Pennington Creek near Reagan. The model was calibrated to average flows to insure that the amount of flow (both streamflow and base flow) computed by the model is equal to the actual observed flows. From SIR 2011-5029, table 22, page 83:

	Blue River		Pennington Creek	
	Observed	Modeled	Observed	Modeled
5-Year Average Streamflow	92.92	92.98	42.97	42.69
5-Year Average Base Flow	61.28	61.34	32.47	32.19

All numbers in cubic feet per second

Monthly gaged and simulated streamflows are shown on figure 36 for the Blue River streamgage and figure 37 for the Pennington Creek gage (page 72). Regarding the model calibration to streamflow, Dr. Blaine Reely stated "It's almost a perfect calibration, or match. It's an amazing calibration" (Arbuckle-Simpson Hearing CD, Part 12, 14:50).

3. Streamflow depletion

   The effect of equally distributed groundwater withdrawals on streamflow was evaluated in terms of depletion of streamflow, base flow, and 75-percent exceedance (SIR 2011-5029 pages 80-89). Graphs and tables showing the depletion of streamflow, base flow, and 75-percent exceedance simulated with groundwater withdrawals distributed as an equal proportionate share were generated (SIR 2011-5029 pages 83-87). Table 22 (page 83) shows the depletion of the 5-year average streamflow and of the 5-year average base flow. The 75-percent exceedance and depletion of 75-percent exceedance of streamflow are shown on table 23 (page 87).

4. Storage coefficient

   As stated in SIR 2011-5029 (page 44),"Aquifer tests provide descriptions that apply at the scale of feet to hundreds of feet, and other techniques, such as the regional methods described in this report, provide descriptions of hydraulic properties that are applicable on the scale of miles." As described on pages 46-48, multiple regional methods were used to determine a storage coefficient of 0.008 for the Arbuckle-Simpson aquifer, including the subsurface drainage basins of Blue River and Byrds Mill Spring, which encompass an area of over 130 square miles. The regional methods were considered to be more representative of the Arbuckle-Simpson aquifer than a single aquifer test.

   The Arbuckle-Simpson Aquifer Hydrology Study emphasized recharge and flow in streams and springs, not storage coefficient. As stated in SIR 2011-5029 (page 81), long-term stream and springs 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.*

5. Data availability and review

   Data and methodology used in the Arbuckle-Simpson Hydrology Study were fully documented, archived and made available for public review and scrutiny. The data used for the Arbuckle-Simpson Hydrology Study are available on the USGS and OWRB web sites: http://ok.water.usgs.gov/ and http://www.owrb.ok.gov/maps/index.php.

   The USGS Arbuckle-Simpson groundwater flow model and report (SIR 2011-5029) were subjected to rigorous USGS report and technical review processes before being approved.

   Model data sets used by the MODFLOW model are available on-line. All USGS data and groundwater model files are archived in perpetuity.

The methods used for the Arbuckle-Simpson Hydrology Study are described in many documents included as exhibits by the protestants, including (to name only a few): Christenson and others (2011; protestants' exhibit 5), Christenson and others (2009; OWRB exhibit 3), Faith and others (2010; protestants' exhibit 8), and Puckette and others (2009; protestants' exhibit 8).

References:

Christenson, Scott, Hunt, A.G., and Parkhurst, D.L., 2009, Geochemical investigation of the Arbuckle-Simpson aquifer, south-central Oklahoma, 2004–06: U.S. Geological Survey Scientific Investigations Report 2009–5036, 51 p.

Christenson, Scott, Osborn, N.I., Neel, C.R., Faith, J.R., Blome, C.D., Puckette, James, and Pantea, M.P., 2011, Hydrogeology and simulation of groundwater flow in the Arbuckle-Simpson aquifer, south-central Oklahoma: U.S. Geological Survey Scientific Investigations Report 2011–5029, 104 p.

Faith, J.R., Blome, C.D., Pantea, M.P., Puckette, J.O., Halihan, Todd, Osborn, Noel, Christenson, Scott, and Pack, Skip, 2010, Three-dimensional geologic model of the Arbuckle-Simpson aquifer, south-central Oklahoma: U.S. Geological Survey Open-File Report 2010–1123, 26 p.

Puckette, Jim, Halihan, Todd, and Faith, Jason, 2009, Characterization of the Arbuckle-Simpson aquifer—Final report submitted to the Oklahoma Water Resources Board, Stillwater, Oklahoma State University School of Geology, 53 p.

From: Meazell, Emily
To: Couch, Dean;
Subject: Re: Draft Proposed Findings, Conclusions and Final Order
Date: Wednesday, September 12, 2012 2:59:57 PM

Hi Dean,

I hope you're well! Just checking in... how are things coming along on this?

Thanks!
Best,
Emily

On Thu, Aug 16, 2012 at 10:02 AM, Couch, Dean <DACOUCH@owrb.ok.gov> wrote:
> Emily,
>
> So sorry. Hopefully, the attached will help. Staff has begun it review of
> the brief and evaluation of the evidence, but it appears that they need
> until sometime in the middle of next week to go through the record to get
> specific citations. Their initial reaction is positive that information is
> in the record to address the factual issues raised. Rowdy is scheduled to
> return today and he should be able to assist staff in the effort as well.
> Seems that extreme drought conditions keeps our folks running to address
> complaints more than usual. Thanks for your patience.
>
> Dean
>
>
>
> From: Meazell, Emily [mailto:meazeleh@wfu.edu]
> Sent: Thursday, August 16, 2012 8:25 AM
>
>
> To: Couch, Dean
> Subject: Re: Draft Proposed Findings, Conclusions and Final Order
>
>
>
> Hi Dean,
>
> Any luck coming up with a word processor version of the tentative order?

Exhibit D

>
> Thanks!
> Emily
>
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> From: Meazell, Emily [mailto:meazeleh@wfu.edu]
> Sent: Tuesday, August 14, 2012 10:26 AM
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> Dean
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>
> From: Meazell, Emily [mailto:meazeleh@wfu.edu]
> Sent: Monday, August 13, 2012 7:48 PM
>
>

> To: Couch, Dean
> Subject: Re: Draft Proposed Findings, Conclusions and Final Order
>
>
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> Hi Dean,
>
> How about sometime in the morning? Maybe around 10 CDT?
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> Best,
> Emily
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> Emily,
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> Great to hear from you, mild weather and all. When would be the best time
> for you to touch base tomorrow?
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> Dean
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>
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> From: Meazell, Emily [mailto:meazeleh@wfu.edu]
> Sent: Friday, August 10, 2012 7:16 PM
> To: Couch, Dean
> Subject: Re: Draft Proposed Findings, Conclusions and Final Order
>
>
>
> Hi Dean,
>
> Wow--the heat sounds just... oppressive. I confess I've been enjoying the
> mild weather and getting rain every few days. :) Not to rub it in...
>
> And your timing is great; I'm planning to finish up the proposed order and
> get it to you next week. It may be helpful to talk on the phone as well,
> maybe on Tuesday?
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> Have a great weekend!
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> Best,

> Emily
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> Emily,
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> How lucky you missed being in Oklahoma as OKC tied the all time highest
> temperature recorded, 113 (!) last week, following the hottest average temp
> for July statewide ever recorded. And I checked the web and it looks like
> you guys are 'sweltering' at 82 today. Your forecast also says "rain" - is
> that something that falls from the sky??? Give me a hint.
>
>
>
> And yes, I write to ask about the draft proposed order for the MAY. I
> cannot imagine how busy and crazy it must be, with moving, new house, new
> job, getting ready for classes. A couple of our Board members have asked
> and Anissa is getting calls wondering when we will be presenting something
> to the Board. Anissa thought you previously mentioned your goal was no
> later than the end of August. If you are feeling just a tad overwhelmed,
> Rowdy and I could cobble together an initial rough draft and send it to you
> as a starting place, if that would be helpful. Let me know if there is
> anything else we can do from this end.
>
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>
> Dean
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>
>
> --
> Emily Hammond Meazell
> Associate Professor
> Wake Forest University School of Law
> 336-758-5834
> meazeleh@wfu.edu
> http://ssrn.com/author=649887
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>

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--
Emily Hammond Meazell
Associate Professor
Wake Forest University School of Law
336-758-5834
meazeleh@wfu.edu
http://ssrn.com/author=649887

From: Couch, Dean
To: Smithee, Derek;
cc: Cunningham, Julie; Fabian, Bob;
Subject: Arbuckle-Simpson evidence review
Date: Thursday, August 16, 2012 9:44:44 AM
Attachments: Arb-SimpTOProtestantsPostHearingBrief5-31-12.pdf.html

---

Bo,
Attached is a pdf copy of Mark Walker's post-hearing brief. Emily Meazell asked for staff's review and evaluation of the evidence that is in the record (we can't add to the record at this point unless Emily re-opens the record and allows all parties to review and respond to anything we might add).

Fabian and Chris Neel will prepare a sort of "comment/ response" summary to address each factual issue point by point (Emily noted that she can handle policy/ legal conclusion issues). Please review and note any comments you have relating to the points raised by Mark on matters that you dealt with in the attached. Let Fabian and me know if you would like to sit down and discuss. I told Emily we would try to get something to her by mid next week if possible.
DC

From:	Fabian, Bob
To:	"Noel I Osborn";
cc:	Couch, Dean; Cunningham, Julie; Neel, Chris; "Stanley T Paxton"; "Scott Christenson (schris@usgs.gov)";
Subject:	FW: Emily Meazell - assistance
Date:	Wednesday, August 15, 2012 2:48:00 PM
Attachments:	Arb-SimpTOProtestantsPostHearingBrief5-31-12.pdf.html ArbSimp Tentative Order, Signed 3-13-12.pdf.html

Noel,

Please see Dean's email below. We need to visit about the review of the evidence and testimony addressing any questions Ms. Meazell needs.

Bob Fabian

Robert S. Fabian
Technical Program Manager
Oklahoma Water Resources Board
3800 N. Classen Blvd.
Oklahoma City, OK
405-530-8800
rsfabian@owrb.ok.gov
www.owrb.ok.gov

From: Couch, Dean
Sent: Tuesday, August 14, 2012 4:22 PM
To: Fabian, Bob; Neel, Chris
Cc: Cunningham, Julie; Barnett, Jerry; Strong, J.D.
Subject: Emily Meazell - assistance

Trebor, Chris,
I talked to Emily Meazell this morning about the draft Proposed Final Order and her plans to get it out by the end of this week. She was a little hesitant at first, but we agreed that a hearing examiner for the OWRB can utilize the assistance of agency staff in preparing a proposed final order. We also agreed that in providing that assistance to the hearing examiner, staff can review evidence submitted in the record then use staff expertise to explain the evidence to the hearing examiner, but the hearing examiner cannot rely on matters outside the record, so staff cannot rely on matters outside the record. Clear as mud?

That said, Emily indicated that she was having problems finding evidence in the record to address some of the issues raised in the Protestants' brief filed by Mark Walker of Crowe and Dunlevy (attached). Also attached FYI is a signed copy of the Tentative Order approved March 13. Two or three issues she specifically mentioned that she had not been able to clarify from the record: (1) amount of water in storage mentioned as 9 MAF in one place, but 11 MAF in another, (2) why Scott Christenson used the model he did rather than a model by Poeter (sp?), and (3) why the eastern portion was primarily studied.

I told Emily that we would take a shot at putting together a list of issues raised in the attached brief, then address those one by one with references to evidence in the record (e.g. exhibit number and page, or testimony presented at the hearing) and with staff 'expertise' to explain where necessary.

We might need to get together in the next couple days to see where we are on this. I told her we would try to get the list and responses ASAP. Let me know how I can help.

DC

From: Smithee, Derek
To: Couch, Dean;
Subject: RE: Arbuckle-Simpson hearing examiner request
Date: Friday, September 28, 2012 11:32:44 AM

So you want more than I already provided or what I already provided "reprovided"? The notes you mentioned in Mark's post hearing brief are just highlights over the text with maybe a couple words in the margin. And these were all captured in what I put together.
I'm headed out around 1:00 today and gone next Monday and Tuesday to the Lake Texoma Advisory Committee meeting. Will be in all day the 3rd, 4th and 5th. Out all week the 8th.....
Let me know what I need to do and I'll do it!
Derek

From: Couch, Dean
Sent: Friday, September 28, 2012 9:28 AM
To: Smithee, Derek
Cc: Cunningham, Julie; Barnett, Jerry
Subject: Arbuckle-Simpson hearing examiner request

Bo,
Yesterday, Noel provided me with a copy of a memo containing information to address the hearing examiner's request to point out where in the administrative record there is evidence to address the issues pointed out in the post-hearing brief filed by Mark Walker. You had provided an e-mail to me a few weeks ago to explain points about the instream flow analysis made for the Arbuckle-Simpson. However, Professor Meazell needs more specific information to show where in the record the issues raised by Mark Walker are addressed. You had mentioned that you may have jotted some notes down when you reviewed Mr. Walker's brief. Rowdy may have already hit you up about this before he left, but perhaps you could provide that info to me and I will forward it to Professor Meazell. Rowdy is not scheduled back until October 9 and I would like to get something out to her on the instream flow issues before then. Thanks.
DC

From: Barnett, Jerry
To: "meazeleh@wfu.edu";
cc: Couch, Dean;
Subject: Followup on evidentiary issues
Date: Friday, September 14, 2012 11:08:26 AM
Attachments: Evidentiary issues - Answers 9-14-2012.docx.html

---

Hello Professor Meazell,

I am sorry it has taken so long to get this to you. I am afraid one of the primary culprits for the delay has been my own self-inflicted down time which I suspect you have heard about from Dean. I am mending remarkably well but I don't need to be trying (again) to act like a 25-year-old any time soon. ☺

What I have compiled in the attachment (with our technical staff's assistance) focuses on answering the three questions that Dean relayed to us from his conversation with you back on August 14. I wanted to send you this first, to see if the form and content are helpful or if you would prefer something more or even something else.

I also wanted to ask, for my own benefit, if you could identify specifically the additional evidentiary issues, from Mark Walker's post-hearing brief or otherwise, for which you would like us to find answers in the record. I know that Dean volunteered that we would work on a listing of those issues and furnishing pertinent responses from the record, but in all candor I am dense and struggling with this. I have noted many issues raised in Mr. Walker's brief, but it seems to me that many of them are legally argumentative, or factual issues which are not particularly material or necessary for the Board to decide. If it is not too presumptuous of me, I thought it would save us and you time and effort if you could direct me to the issues you want us to work on, and we will get those items addressed in a second installment. Please let me know what I need to do and we will do our best to move forward. You can email me back, or call me (405-530-8803), as is most convenient for you.

I hope you are well-settled in and enjoying this new chapter in your life.

Thank you for your patience, and have a good weekend,

Rowdy

From:	Smithee, Derek
To:	Barnett, Jerry; Couch, Dean;
Subject:	Derek Smithee Arbuckle-Simpson response to the Walker Post Hearing Brief
Date:	Monday, August 20, 2012 11:06:18 AM
Attachments:	Derek Smithee Arbuckle-Simpson response to the Walker Post Hearing Brief.docx.html

---

fyi

Derek Smithee's response to the

Arbuckle/Simpson Maximum Annual Yield Post-Hearing Brief of Protestants' Attorney Mark Walker dated May 31, 2012

What follows are my brief "responses" to Mark Walker's Post-Hearing Brief in opposition to the Arbuckle/Simpson Tentative Maximum Annual Yield/Equal Proportionate Share dated May 31, 2012.

Issue #1 – On page #5 it states that "Mr. Smithee then hand selected the committee which later came up with the definition of "natural flow" that now forms the basis for the Tentative MAY ..."

Response: Members of this group WERE hand selected – but not by Mr. Smithee but rather through a formal solicitation and informal discussion both within and without the OWRB. Contrary to the assertion, it was not formed with the intent to predetermine or bias the result. In fact numerous prospective members were solicited that declined – among them several landowners. The nature of this committee required not only the willingness to serve, but also a background and training in this matter.

The attendance sheet is attached from the first meeting held at the Chickasaw National Recreation Area.

Issue #2 – On page #6 it states that "Although the Smithee committee considered "water supply" as one of the possible ways in which to define natural flow, inexplicably and arbitrarily it chose to reject water supply as the criteria to measure reduction in natural flow....and why the tentative MAY condemns the use of groundwater for water supply in preference to fish population. See also page #10 "the specific fish were selected because they were the "most sensitive" to reductions in stream flow."

Response: S.B. 288 did not charge the ad hoc committee with ONLY protecting water supply, but with protecting the natural flows. Clearly there are many uses of stream water other than water supply, including those outlined in the Walker brief. As the workgroup discussions evolved, it became clear through discussions with water supply experts at the ODEQ and municipality's, that water supply needs were clearly LESS sensitive to flow reductions than other uses like ecological integrity and recreation. In as much as unlimited funds were not available to study impacts to each and every purpose to which stream water can be used, the committee chose to study what they believed to be the most sensitive. Clearly protecting a less sensitive water supply use at the expense of ecological integrity (or other uses), was not the intent of the Bill.

OS 60:60 does not , as Mr. Walker infers, define "natural flow" as the flow necessary for human use. In fact it is silent in that regard ,and rather establishes requirements for impoundments to not affect natural flows.

Issue #3 – On page #11 it states that "the underlying intent of his committee was to help set a MAY that would protect fish population – not fish habitat – it was improper for the committee to ultimately base its recommendations strictly on a fish habitat study..."

Response: It is common practice in studies of this type to measure incremental changes in fish habitat resulting from changes in flow and infer corresponding changes in fish community structure and aquatic ecosystem integrity. While it is true that specie responses to these flow and habitat changes vary, and may even be increased (i.e. Prey becomes easier to capture when confined to small pools thus benefitting predators while harming prey) – the charge was to avoid or limit EITHER positive or negative impacts . The corollary of one species benefitting from decreased flow is that another species suffered from decreased flows. In the end, the committee "blended" all habitat studies to determine when threshold impacts (whether positive or negative) occurred and thus altering the aquatic community structure that occurs with any change in "natural flows". Inferring fish and community impacts to habitat alteration is commonplace even though empirically quantifying them is difficult. The studies clearly establish the relationship between fish populations and the WUA, or more commonly, habitat.

Actually measuring fishery impacts DIRECTLY is possible, but would have been prohibitively expensive and require the artificial modification of spring/stream flow over many miles of streams overlying the Arbuckle/Simpson aquifer. Clearly an indirect measure of habitat change is advantageous over a direct measure which would necessitate drying out a stream and totally collapsing an entire aquatic ecosystem.

Issue #4 – On page 15 it states "for some unexplained reason, the committee chose to advise the computer modeler, Mr. Christianson, to model the results of a 25% reduction in the 75th Percentile Flow – not the Baseline Low Flow upon which the committee based its recommendation."

Response: No statutory or regulatory definition for "Baseline Flow" exists and S.B. 288 is clearly drafted to require consideration of more than water supply. A model cannot be run on a concept or definition, but rather requires the use of an empirical value. Recognizing these issues, the Committee agreed that the 75th percentile flow was an accurate approximation of baseline flow and utilized that term when communicating to the modeling team. Although they may not be technical or statutory equivalents, for the purpose of fulfilling our mandate they are functionally equivalent.

Feel free to contact me if you have any questions.

Derek

August 17, 2012

From: Meazell, Emily
To: Couch, Dean;
Subject: Re: Draft Proposed Findings, Conclusions and Final Order
Date: Thursday, August 16, 2012 8:25:30 AM

Hi Dean,

Any luck coming up with a word processor version of the tentative order?

Thanks!
Emily

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How lucky you missed being in Oklahoma as OKC tied the all time highest temperature recorded, 113 (!) last week, following the hottest average temp for July statewide ever recorded. And I checked the web and it looks like you guys are 'sweltering' at 82 today. Your forecast also says "rain" - is that something that falls from the sky??? Give me a hint.

And yes, I write to ask about the draft proposed order for the MAY. I cannot imagine how busy and crazy it must be, with

moving, new house, new job, getting ready for classes. A couple of our Board members have asked and Anissa is getting calls wondering when we will be presenting something to the Board. Anissa thought you previously mentioned your goal was no later than the end of August. If you are feeling just a tad overwhelmed, Rowdy and I could cobble together an initial rough draft and send it to you as a starting place, if that would be helpful. Let me know if there is anything else we can do from this end.

Dean

--
Emily Hammond Meazell
Associate Professor
Wake Forest University School of Law
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Mark Walker

From: Couch, Dean
Sent: Thursday, September 13, 2012 2:36 PM
To: 'Meazell, Emily'
Cc: Strong, J.D.; Barnett, Jerry; Cunningham, Julie; Fabian, Bob; Smithee, Derek
Subject: RE: Draft Proposed Findings, Conclusions and Final Order

Emily,
So sorry for not getting back to you before now. Jerry Barnett, who attended the hearing with other OWRB staff, is coordinating the evaluation of the evidence and will be putting together the review of the record as requested, working with primary staff involved. Hopefully, his summary will be forwarded shortly. Thanks for your patience.

BTW, we are getting our first significant rains since the summer began. I suppose we'll get as much in this event as Wake Forest has received during the previous week or two. Must be rough in NC!
Dean

-----Original Message-----
From: Meazell, Emily [mailto:meazeleh@wfu.edu]
Sent: Wednesday, September 12, 2012 3:00 PM
To: Couch, Dean
Subject: Re: Draft Proposed Findings, Conclusions and Final Order

Hi Dean,

I hope you're well! Just checking in... how are things coming along on this?

Thanks!
Best,
Emily

On Thu, Aug 16, 2012 at 10:02 AM, Couch, Dean <DACOUCH@owrb.ok.gov> wrote:
> Emily,
>
> So sorry. Hopefully, the attached will help. Staff has begun it
> review of the brief and evaluation of the evidence, but it appears
> that they need until sometime in the middle of next week to go through
> the record to get specific citations. Their initial reaction is
> positive that information is in the record to address the factual
> issues raised. Rowdy is scheduled to return today and he should be able to assist staff in the effort as well.
> Seems that extreme drought conditions keeps our folks running to
> address complaints more than usual. Thanks for your patience.
>
> Dean
>
>
>
> From: Meazell, Emily [mailto:meazeleh@wfu.edu]
> Sent: Thursday, August 16, 2012 8:25 AM
>
>
> To: Couch, Dean
> Subject: Re: Draft Proposed Findings, Conclusions and Final Order
>
>
>
> Hi Dean,
>
> Any luck coming up with a word processor version of the tentative order?
>

Comments to Arbuckle-Simpson Post-Hearing Brief (May 31, 2012)

Noel's notes

III B. Amount of Water in Storage

- The purpose of the Arbuckle-Simpson Hydrology Study was to provide the Oklahoma Water Resources Board with the scientific information needed to determine the volume of water that could be withdrawn from the aquifer while protecting springs and streams (SIR p. 5).
- In light of SB 288, the total volume of water in storage is not critical to the determination of the MAY of the Arbuckle-Simpson groundwater basin. For this reason, determination of water in storage was not a primary objective of the Arbuckle-Simpson Hydrology Study (SIR p. 5).
- Amount of water in storage in a groundwater can be calculated with the following equation:
  Storage = basin area x saturated thickness x storage coefficient.
- The basin area was unknown at the time of the study because OWRB had not yet delineated the basin boundaries.
- The SIR calculated the volume of water in storage for only the model domain. Table 15 (p. 58) reports 7,111,000 acre-ft volume of water in storage for the model domain (387.1 mi^2). The storage of the model domain is smaller than the entire basin, because the area of the model domain (387.1 mi^2) is smaller than the basin area determined by OWRB (612.5 mi^2).
- Using a groundwater basin area of 612.5 mi^2 (or 392,000 acres); an average saturated thickness of 3,500 ft, and an average storage coefficient of 0.008, OWRB staff calculated the volume of water in storage as 10,976,000 acre-ft. Rounded to 6 significant figures, the volume of water in storage is about 11,000,000 acre-ft (11 million acre-ft).
- Note that Circular 91 calculated the amount of water in storage to be about 9 million acre-ft as of September 30, 1979, based on a basin area of about 500 mi^2, an average saturated thickness of 3,500 ft, and an average storage coefficient of 0.008 (p.43).

III D. Criteria for streamflow reduction

The approach taken for this study was to interpret "natural flow" as observed streamflow conditions for water years 2004 through 2008 and to execute simulations of groundwater withdrawals distributed uniformly across the aquifer for those water years. Results of the simulations were then compared to observed conditions. Three simulations of distributed withdrawals were tested, allocating groundwater withdrawals at 0.125, 0.250, and 0.392 (acre-ft/acre)/year (SIR p. 81).

The effect of equally distributed groundwater withdrawals on streamflow was evaluated in terms of depletion of streamflow, base flow, and 75-percent exceedance (SIR p. 80-89). These terms are discussed below.

Streamflow consists of two components: base flow and runoff. "Base flow", as defined in the SIR (p. 29) is "the flow in a stream channel that represents groundwater discharge and not runoff from storms". The SIR uses the term "25th percentile" to represent the measured streamflow for water years 2004 through 2008 that was exceeded 75 percent of the time. The term "25th

percentile" (or "75-percent exceedance") as used in the SIR has essentially the same meaning as the "25th Quartile" and "low flow" as used in the IFA.

Graphs and tables showing the depletion of streamflow, base flow, and 75-percent exceedance simulated with groundwater withdrawals distributed as an equal proportionate share (EPS) were generated (SIR p. 83-87). From information provided in these graphs and tables, one could determine that an EPS resulting in 25 percent depletion of streamflow, base flow, and 75-percent exceedance would be about 0.18, 0.12, and 0.09 acre-ft/acre, respectively.

Base-flow depletion is greater, expressed as a fraction, than streamflow depletion in the three simulations of distributed withdrawals. The process of simulating the eastern Arbuckle-Simpson aquifer assumed that only base flow is depleted by groundwater withdrawals, and therefore, the fractional depletion is greater for base flow than streamflow (SIR p. 82).

The 5-year average streamflows include large flows during and after major storms. However, aquatic habitat and the aesthetic beauty of the springs and streams of the eastern Arbuckle-Simpson aquifer are sensitive to low flows. Exceedance statistics were calculated for total streamflows at the Blue River near Connerville, Oklahoma, and the Pennington Creek near Reagan, Oklahoma, streamgages to assess the effects of groundwater withdrawals on low flows. The exceedance statistics were calculated by ranking the daily total streamflows from the 5-water-year MODFLOW simulations and calculating percentiles. The 25th percentile represents the streamflow that was exceeded 75 percent of the time and was considered to be a measure of low flow of the two streams (SIR p 82).

Streamflow depletions calculated on the basis of the 25th percentile of daily streamflow (table 23) are larger (more depletion) than depletions calculated on average streamflows (table 22), even though both depletions are calculated from the same MODFLOW model simulations. This difference is because the average streamflows include high flows but streamflows based on the 25th percentile (75-percent exceedance) do not (SIR p. 82-86).

V. Emphasis on eastern portion of the aquifer

As stated in the SIR (p. 5): "The hydrogeologic study and groundwater-flow model were focused on the eastern Arbuckle-Simpson aquifer because (1) the data needed to build the model are sparse in the western and central Arbuckle-Simpson aquifer, (2) the eastern Arbuckle-Simpson aquifer is the largest part of the aquifer by area and volume, (3) most of the current (2011) groundwater withdrawals from the aquifer are from the eastern Arbuckle-Simpson aquifer, and (4) the largest (by flow) streams and springs sourced from the aquifer are on the eastern Arbuckle-Simpson aquifer. Although the study emphasized the eastern Arbuckle-Simpson aquifer, understanding of the eastern part of the aquifer requires studying the entire aquifer, especially with respect to the geology."

Most of the reported groundwater use is from the eastern part of the Arbuckle-Simpson aquifer; as of 2008 there were no permitted users in the western part of the aquifer and only two from the central part of the aquifer (SIR p. 50).

As Scott Christenson testified at the hearing (Hearing CD, Part 7), there were neither sufficient hydrogeologic data nor the resources to model the western and central portions in the manner that the eastern portion was modeled.

1. The Arbuckle-Simpson Hydrology Study investigated the entire aquifer:

- The study area for the Arbuckle-Simpson Hydrology Study encompassed the entire aquifer (FR p. 5-6; SIR p.2-4).
- The SIR was only one component of the Arbuckle-Simpson Hydrology Study. A multidisciplinary team of researchers studied the aquifer and produced more than 30 reports (FR Appendix A).
- The SIR described the hydrogeologic setting of the entire aquifer in terms of geology (p. 6-19), climate (p. 25-26), streamflow (p. 26-31), springs (p. 31-32), groundwater withdrawals (p. 50-53); and geochemistry (p. 32).

2. Monitoring was conducted on surface water, groundwater, and climatic variables throughout the entire aquifer:
   - A USGS stream gage was installed on Honey Creek at Turner Falls, in the western portion of the aquifer (SIR p. 29).
   - OWRB conducted periodic stream monitoring at 12 stream stations including sites on Honey Creek in the western portion and Oil Creek and Mill Creek on the central portion (FR p. 19).
   - OWRB conducted 3 aquifer-wide synoptic measurements on about 90 site of streamflow during base flow conditions (FR p. 20-21; Noel Osborn's testimony Hearing CD Part 13.)
   - Water samples were collected from 24 wells and 6 springs for a geochemistry study. Samples included 3 wells and 2 springs on the western portion and 4 wells in the central portion (Geochemistry p.12, fig. 7).
   - Historic water-level data from the western and central portions were reviewed and analyzed. Data from the 1970s are reported in Cir. 91, including potentiometric surface (water-level) maps in the western and central portions (Noel Osborn testimony, CD Part 13).
   - Climatic monitoring included analysis of data from Mesonet and Climate Survey stations in the region; 300-year reconstruction of precipitation and streamflow from tree rings sampled from trees across the region; and analysis of runoff from NEXRAD radar data across the entire study area.

3. Geologic characterization

   The geology of the Arbuckle-Simpson aquifer is described in the SIR (p. 6-21). The geology of all portions of the Arbuckle-Simpson aquifer is characterized by great thicknesses of mostly carbonate sedimentary rocks, uplifts, folded structures, and large fault displacements (p. 6).

   Three general differences in the geology are observed from west to east:

   a. Most rock units are thicker in the west and thinner in the east.
      Thickness of the Arbuckle Group ranges from as much as 6,700 ft in the western portion, 4,000 ft in the central portion, to about 3,000 ft in the eastern portion (p. 12). The Simpson Group is as much as 2,300 ft thick in the western portion of the aquifer, but generally is less than 1,000 ft thick in the eastern portion (p. 13).
   b. Limestone is the dominant carbonate in the western portion, but a transition to dolostone exists in the central and eastern portions; and
   c. Structural deformation is greatest in the western portion of the aquifer and less pronounced in the central and eastern portions (p. 14).

As Noel Osborn testified (Hearing CD Part 13), the changes in geology from west to east are gradational.

As shown on SIR figures 4 (p. 10) and 7 (p. 16-17), all three portions of the aquifer contain major, high-angle regional fault zones and other structural features such as synclines and anticlines. The eastern portion of the aquifer consists of several structural features, including the Belton and Clarita anticlines, the Sulphur syncline, and the Lawrence uplift.

Information obtained from surface mapping and subsurface geophysical data indicate the eastern Arbuckle-Simpson aquifer is highly faulted. Several prominent faults have been mapped at the surface, as seen on the geologic map (fig. 3), but many more have been identified through geophysical methods, including seismic, electric resistivity imaging, ground-penetrating radar, and helicopter electromagnetic surveys. Numerous faults are observed in the deeper part of the Arbuckle-Simpson aquifer along a seismic-reflection line, with a fault density of about 2.53 faults per mile (fig. 8). Several of these steeply dipping faults penetrate the granitic basement, which is estimated at a depth of 3,500 ft along the seismic line (SIR p. 18-20).

4. Aquifer characteristics
Kyle Murray speculated that the higher degree of faulting and fracturing in the western aquifer would result in a larger density of karst features, higher permeability, and thus higher recharge rates (Hearing CD Part 4). However, there is no evidence indicating higher permeability or recharge in the western portion of the aquifer.

Scott Christenson noted that a simple MODFLOW model of the western portion, using water-level data from Cir 91 and recharge calculated from the Honey Creek gage, resulted a smaller transmissivity in the western portion than in the eastern portion. Furthermore, age-dating as part of the geochemical investigation (Geochemistry report) indicated that groundwater in all three portions have similar travel times (Hearing CD, Part 7).

Rocks northeast of the Washita Valley fault zone represent deposition on the stable continental shelf and are in the central and eastern Arbuckle-Simpson aquifer. Arbuckle Group carbonates on the shelf were subjected to prolonged periods of exposure that resulted in extensive dolomitization. Arbuckle Group carbonates in the rapidly subsiding aulacogen (mostly in the western portion) were not subjected to prolonged exposure during times of low sea levels and were not dolomitized as extensively as the carbonates on the shelf (SIR p. 9).

The dolostone (which is dominant in the central and eastern portions) probably results from exposure of the carbonates to meteoric waters. Several unconformities in the Arbuckle Group indicate the carbonates were exposed to weathering numerous times, allowing karst development. Paleokarst features, such as dissolution in cavities, collapse breccias, fractures enlarged by dissolution, and locally extensive vuggy porosity, have been recognized in surface exposures and cores in the Arbuckle Group. The fracturing and brecciation interconnect much of the dissolution porosity, producing enhanced permeability. A test well drilled as part of this study (on the eastern portion) contains voids with red-clay and calcite fillings, which are indicative of carbonate dissolution and karst features at depth (SIR p. 12-13).

5. Rate of recharge
   Recharge was calculated for the Honey Creek watershed, the primary watershed on the western portion of the aquifer (SIR table 9, p. 43).

   The primary method used to determine recharge for the Arbuckle-Simpson aquifer for this study was a recession-curve-displacement method, used to analyze daily stream discharge data for streamgages on the Arbuckle-Simpson aquifer. Three streamgages (Blue River, Pennington Creek, and Honey Creek) were installed at the beginning of the Arbuckle-Simpson Hydrology Study at locations that were optimal for recharge calculations. The gages were placed at the point where the stream flows off the aquifer outcrop and on to geologic units of lower permeability, and, therefore, the base flow discharging to the stream was exclusively from the Arbuckle-Simpson aquifer and the watershed contributing to the stream upstream from the streamgage included the maximum possible area of the aquifer (SIR p. 41).

   Recharge was not calculated for the central portion because, as Scott Christenson testified (Hearing CD Part 7), the central portion of the aquifer did not have a suitable stream configuration to gage and make the same type of analysis that was done on Blue River, Pennington Creek, and Honey Creek.

   Table 9 (SIR p. 43) lists the calculated recharge for the three watersheds. Recharge calculated from the Honey Creek, Blue River, and Pennington Creek streamgages for water years 2005-2008 indicates very similar recharge rates for the three watersheds.

6. Regarding the statement on page 27 of the Protestant's brief:
   "The eastern portion is predominated by 5 major streams which traverse major portions of that outcrop. However, the western portion only has one major stream (Honey Creek) which traverses a much more limited portion of that outcrop. Similarly, the central portion only has one major stream (Oil Creek) which traverses a somewhat limited portion of that outcrop (with the exception of Mill Creek which barely traverses the southern tip of the central outcrop). Because of the number of streams associated with the eastern part, it is expected that groundwater pumping would have a greater impact on the springs and streams. This is not true with regard to the central and western parts."

   The eastern portion of the aquifer is larger in area than the western and central portions, and thus more springs and streams emanate from the eastern portion than the western and central portions. However, as seen on figure 16 in the SIR, there are many springs on the western and central portions. Although the volume of water discharging from the western and central portions of the aquifer is less than the eastern portion, the effect of groundwater pumping on streams and streams is expected to be about the same.

References:

SIR: OWRB Ex. 1 Christenson, Scott, Osborn, N.I., Neel, C.R., Faith, J.R., Blome, C.D., Puckette, James, and Pantea, M.P., 2011, Hydrogeology and simulation of groundwater flow in the Arbuckle-Simpson aquifer, south-central Oklahoma: U.S. Geological Survey Scientific Investigations Report 2011–5029, 104 p.

IFA: OWRB Ex. 2 Seilheimer, T.S., and Fisher, W.L., 2008, Instream flow assessment of streams draining the Arbuckle-Simpson aquifer: Final report submitted to the Oklahoma Water Resources Board, 49 p.

Geochem: OWRB Ex 3 Christenson, Scott, Hunt, A.G., and Parkhurst, D.L., 2009, Geochemical investigation of the Arbuckle-Simpson aquifer, south-central Oklahoma, 2004–06: U.S. Geological Survey Scientific Investigations Report 2009–5036, 51 p.

FR: Ex ?? Osborn, N.I., 2009, Arbuckle-Simpson Hydrology Study Final Report to the U.S. Bureau of Reclamation: Oklahoma Water Resources Board, 42 p.
http://www.owrb.ok.gov/studies/groundwater/arbuckle_simpson/pdf/09_report_burec.pdf

Cir 91: Ex ?? Fairchild, R.W., Hanson, R.L., and Davis, R.E., 1990, Hydrology of the Arbuckle Mountains area, south-central Oklahoma: Oklahoma Geological Survey Circular 91, 112 p., 2 pls., scale 1:100,000.

Arbuckle-Simpson MAY Hearing CDs

Part 4

54:00 Kyle Murray

01:06:06 Kyle Murray/ Jason

Part 5

Kyle Murray/ Walker

05:21 Kyle Murray/Fahmy

15:49 Kyle Murray/Woodcock

17:05 Kyle/ Jason

Part 6

Scott Christenson/ Walker

Storage Coefficient

Part 7

Scott Christenson/ Walker

36:36 decision to focus model on eastern portion

Simplistic model on western portion

Recharge rate for western portion

43:41 Scott/ Fahmy

58:40 Scott/ Protestant

Calibration of recharge south of Sulphur fault

Geology can make a difference on recharge rate

Recharge rate on w. part is very similar to e. area

Part 8

Eileen Poeter/ Walker

15:56 model concerns

Slides (protestant exhibit 10)

Part 9

Eileen Poeter/ Jason

Model of Sc in upper layer will make a difference in los flows

49:30 Sc not important if basin decision on average base flow, but is for low flow

Model of east portion not appropriate for western portion; recharge rate had to be adjusted in E. area

Part 12

Blaine Reely

(Ranches exhibit 2-slides)

2 calibration pts

Manipulated recharge rates

15:20 "amazing calibration, or match"; unusually good (see SIR figs 36-37)

Part 13

Scott

26:12 Noel/Rowdy

Scope of study, differences between west and east; focus on east

51:00 Noel/Mark Walker

"natural flow"—impact on water users, recreation, other criteria; calc. 75% exceedance

01:09:58 Noel/Barnett

01:16:27 Poeter