

**SECOND AMENDED APPLICATION BY THE CITY OF OKLAHOMA CITY
TO THE OKLAHOMA WATER RESOURCES BOARD
FOR A PERMIT TO USE SURFACE WATER
(Amended Application No. 2007-0017)**

1. APPLICANT'S NAME AND ADDRESS.

The City of Oklahoma City ("Oklahoma City")
Attention: Utilities Director
420 West Main Street, Suite 500
Oklahoma City, Oklahoma 73102
Phone: (405) 297-2422
Fax: (405) 297-3813

For technical issues, please contact Chris Browning at the above contact information.

For legal and procedural issues, please contact:

Brian M. Nazareus
Special Counsel for the City of Oklahoma City
Ryley Carlock and Applewhite
Denver, Colorado 80203
Phone: (303) 813-6702
Fax: (303) 595-3159
Email: bnazareus@rcalaw.com

2. INTRODUCTION.

This application is the second amendment of Oklahoma City's pending permit application with the OWRB, No. 2007-017, which was originally filed with the Oklahoma Water Resources Board ("OWRB") on March 13, 2007 and amended on March 8, 2010. This application is filed in accordance with the August 2016 Water Settlement Agreement ("Settlement Agreement") between the State of Oklahoma, the Choctaw Nation of Oklahoma, the Chickasaw Nation, and the City of Oklahoma City ("Settlement Agreement Parties"). This application is intended to constitute the "Amended Permit Application" required by Section 6.1 of the Settlement Agreement, which Settlement Agreement was approved by the Settlement Act (Public Law 114-332) and is now pending the Settlement Agreement Parties conformance in accord with Section 4 of the Settlement Agreement. The City's proposed use shall conform with all requirements specified in the Settlement Agreement. The form of this application is pursuant to consultation with OWRB staff under OAC § 785:20-3-1(f).

Subject to the terms of Section 13.1.4 of the Settlement Agreement, by filing this Amended Permit Application Oklahoma City is not waiving the priority date and

appropriate amounts of its pending permit application in the event that the conditions precedent to the enforceability of the Settlement Agreement are not satisfied or the Settlement Agreement Parties are unable to resolve disputes, if any, about whether the final permit issued to Oklahoma City by the OWRB conforms with the terms and conditions of Section 6.1 of the Settlement Agreement.

No permit issued to the City pursuant to this application shall have any force and effect and the City shall exercise no rights thereunder prior to the Enforceability Date of the Settlement Agreement.

3. TYPE OF SURFACE WATER PERMIT REQUESTED. Regular Permit (authorizing diversion and use of water on a year-round basis, in accordance with the terms of Section 6.1 of the Settlement Agreement)

4. PURPOSES FOR WHICH WATER WILL BE USED.

- a. The purposes for which water will be beneficially used shall be municipal use by Oklahoma City and Oklahoma City's current and future wholesale and retail water customers and other public water supply entities in Oklahoma in accordance with the Settlement Agreement.
- b. The total amount of water requested is 115,000 acre feet per year, subject to the Sardis Lake Release Restrictions, the Bypass Requirement and the Diversion Rate contained in Section 6.1 of the Settlement Agreement.

5. DIVERSION(S) OF WATER. Location, Source, and Method of Diversion:

- a. Location. Subject to the Sardis Lake Release Restrictions and the Bypass Requirement contained in Section 6.1 of the Settlement Agreement, Oklahoma City will divert up to 115,000 acre feet of water per year pursuant to the Diversion Rate from the Kiamichi River in the general vicinity of Moyers Crossing, Pushmataha County, as illustrated in Attachments A [Map of Southeast Supply System with Point of Diversion (Moyers Crossing)] and B [Map of Point of Diversion (Moyers Crossing)]. As depicted on Attachment B, the legal descriptions for each potential point of diversion are:
 - i. N/2 of Section 33, Township 2 South, Range 16 East;
 - ii. SW/4 of Section 33, Township 2 South, Range 16 East;
 - iii. E/2 of Section 32, Township 2 South, Range 16 East;
 - iv. E/2 of Section 5, Township 3 South, Range 16 East; and
 - v. All of Section 4, Township 3 South, Range 16 East.

b. Sources of water.

- i. Stream water from the Kiamichi River; and

- ii. Water released from storage in Sardis Lake, which will be delivered to the point of diversion described in subparagraph 5.a. above. Sardis Lake is located on Jackfork Creek. It was constructed in 1982. It contains 297,200 acre-feet of conservation storage capacity, with an average depth of 17 feet and a surface area of 13,589 acres. Of the total conservation storage capacity, Oklahoma City shall have the right to storage of up to 142,676 acre-feet for lake level maintenance (recreation, fish and wildlife), and 116, 616 acre-feet for releases for municipal supply. All use by Oklahoma City of Sardis Lake storage shall be in accord with the Sardis Lake Release Restrictions contained in Section 6.1 of the Settlement Agreement and the Amended Storage Contract Transfer Agreement.
- iii. The maintenance of lake levels in accord with subparagraph ii above and the Settlement Agreement shall constitute a lake level management plan pursuant to OAC § 785:20-5-5(b)(3)(iv).
- c. Method of Diversion. Pumping facilities the design and configuration of which are yet to be determined.
- d. Additional information. The exercise of the City Permit when issued shall be in accord with the terms of the Settlement Agreement and the Amended Storage Contract Transfer Agreement. Oklahoma City does not currently own or lease the land on which the point of diversion described in subparagraph 5.a. above will be located. Water lines associated with the project will cross public right-of-ways and other landowners' properties. Oklahoma City has easements for a portion of the water line system as follows:
 - i. Atoka Reservoir to Stanley Draper Reservoir: Existing easements are shown in tabular format in Attachment C.
 - ii. McGee Creek Reservoir to Atoka Reservoir: Existing easements are shown in tabular format in Attachment D.
 - iii. Kiamichi River (Moyers Crossing) to McGee Creek Reservoir: No easements currently exist for this pipeline but easements will be acquired where necessary.

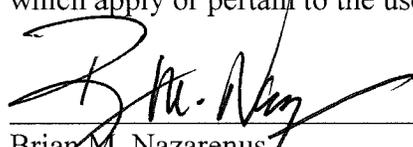
6. JUSTIFICATION OF PRESENT AND FUTURE NEED. Attached please find:

- a. Map of Oklahoma City's current service areas. Attachment E.
- b. Map of Oklahoma City's present and potential future service areas. Attachment F.
- c. Regional Raw Water Supply Study, Camp Dresser McKee, March 2009. Attachment G.

- d. Future Population of Oklahoma City and Other Municipalities Interested in Water Supply from Sardis Lake, BBC Research and Consulting, November 20, 2013. Attachment H.
- e. Oklahoma City Schedule of Beneficial Use, Exhibit 14 of Settlement Agreement. Attachment I.

7. SIGNATURES

Upon my oath or affirmation, I swear or affirm (1) that all information submitted to the Oklahoma Water Resources Board in connection with this application is true and accurate to the best of my knowledge; and (2) that I or the person or entity I represent will comply with all applicable laws and regulation contained in Chapter 20 of Oklahoma Water Resources Board rules and all other applicable regulations of the State of Oklahoma or its agencies, and any lawful conditions imposed by Oklahoma Water Resources Board, which apply or pertain to the use of fresh stream water.



Brian M. Nazareus
Special Counsel for the City of Oklahoma City
Oklahoma Bar Association Number: 30814

NOTARY

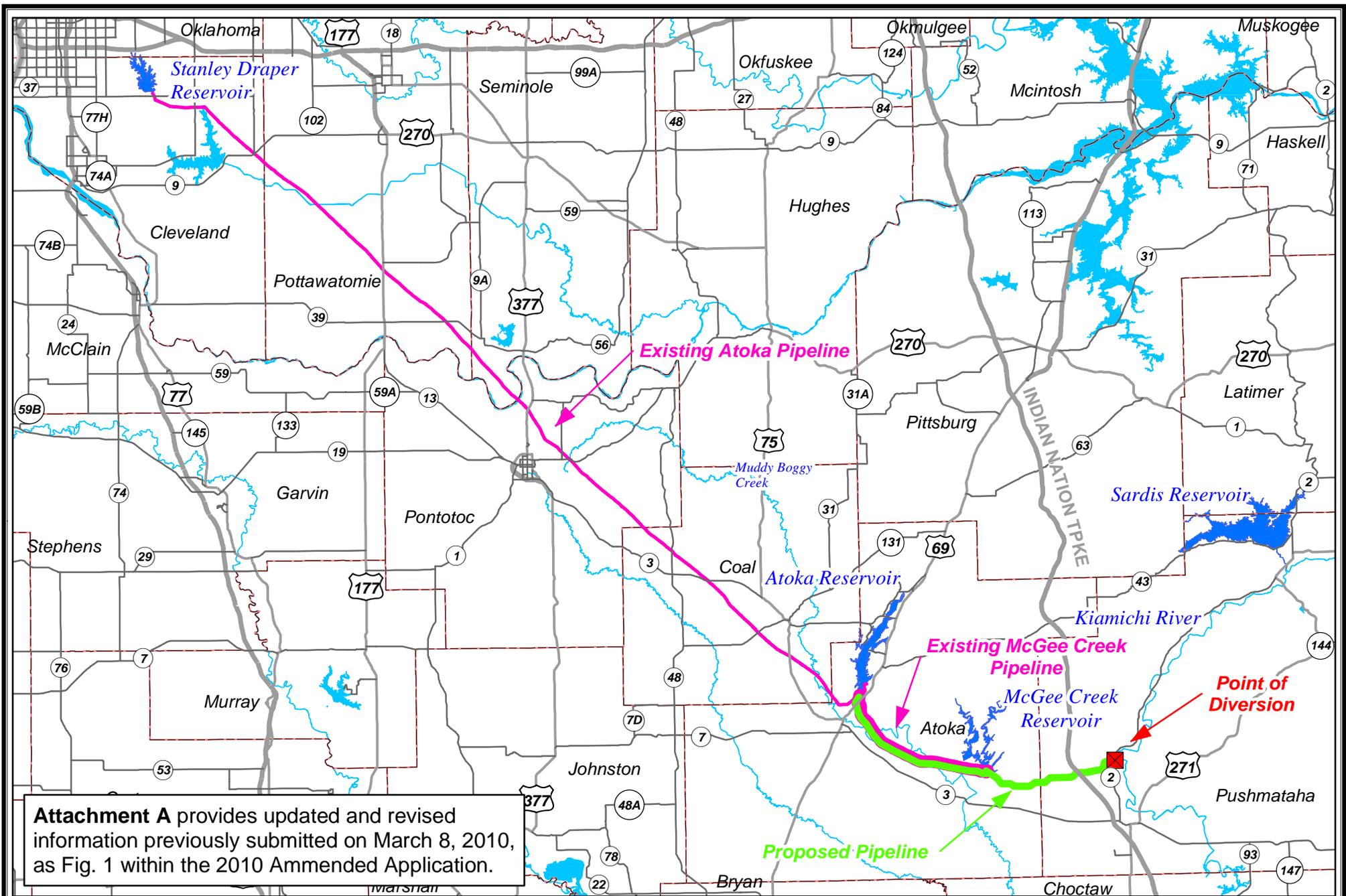
STATE OF Colorado)
) ss.
COUNTY OF Denver)

The forgoing instrument was acknowledged before me this 9th day of January 2017.

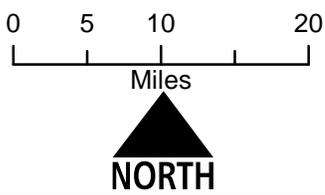


Notary Public
My commission expires: 01.25.2020
(SEAL)

TERESA JOHNSON
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20164002959
MY COMMISSION EXPIRES JAN. 25, 2020

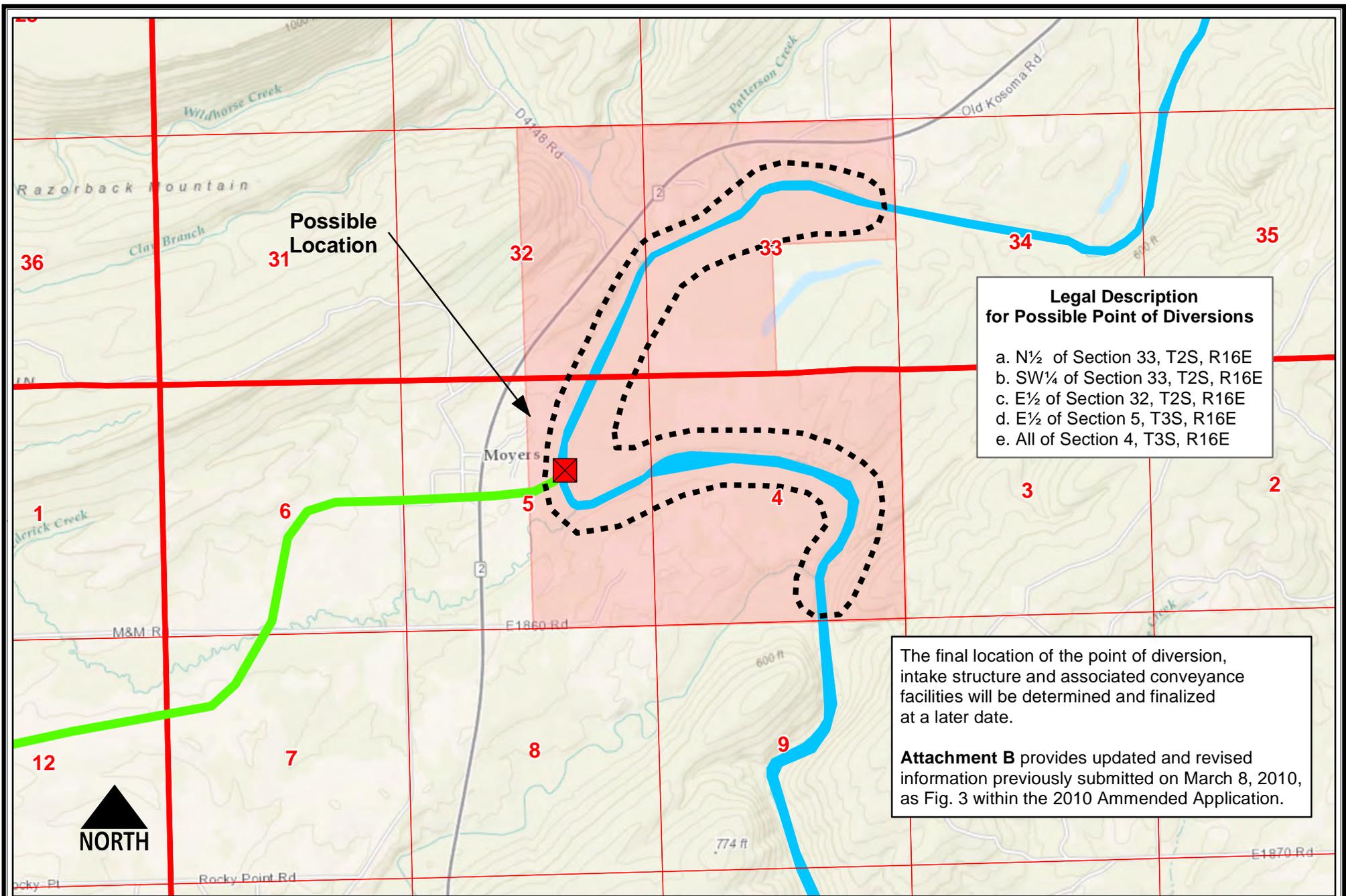


Attachment A provides updated and revised information previously submitted on March 8, 2010, as Fig. 1 within the 2010 Ammended Application.



Attachment A
Southeast Supply System with Point of Diversion
(Moyers Crossing)





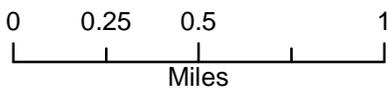
Possible Location

Legal Description for Possible Point of Diversions

- a. N½ of Section 33, T2S, R16E
- b. SW¼ of Section 33, T2S, R16E
- c. E½ of Section 32, T2S, R16E
- d. E½ of Section 5, T3S, R16E
- e. All of Section 4, T3S, R16E

The final location of the point of diversion, intake structure and associated conveyance facilities will be determined and finalized at a later date.

Attachment B provides updated and revised information previously submitted on March 8, 2010, as Fig. 3 within the 2010 Ammended Application.



Attachment B
Point of Diversion (Moyers Crossing)
T2S and T3S, R16E, Pushmataha County, OK



Attachment C

Atoka Pipeline Easements - Atoka Reservoir to McGee Creek Reservoir

Easement Number	County	Recorded	Acres	Execution	Grantor	Grantee	Duration
4086	Atoka	Book 210, Page 303	7.55	11/6/1958	O E Chitwood and Josephine Chitwood	City of Oklahoma City	Permanent
4114	Atoka	Book 210, Page 450	3.00	12/3/1958	Dora E Karlan	City of Oklahoma City	Permanent
4135	Atoka	Book 211, Page 63	7.58	12/18/1958	Earl R Taber	City of Oklahoma City	Permanent
4147	Atoka	Book 211, Page 162	10.06	12/31/1958	Adell Brooks	City of Oklahoma City	Permanent
4965	Atoka	Book 223, Page 231	5.15	1/25/1961	Kittie D Rogers	City of Oklahoma City	Permanent
4966	Atoka	Book 223, Page 230	3.85	1/25/1961	Jimmie Hugh Rogers and Dwight C Rogers, Jr	City of Oklahoma City	Permanent
4968	Atoka	Book 223, Page 342	0.39	2/8/1961	Mary Lou Rogers	City of Oklahoma City	Permanent
4980A	Atoka	Book 223, Page 420	3.04	2/16/1961	Carl L Scheirman	City of Oklahoma City	Permanent
4	Cleveland		2.27	10/20/2011	Absentee Shawnee	City of Oklahoma City	
5	Cleveland		2.22	10/20/2011	Absentee Shawnee	City of Oklahoma City	
6	Cleveland		0.01	10/20/2011	Absentee Shawnee	City of Oklahoma City	
7	Cleveland		2.10	10/20/2011	Absentee Shawnee	City of Oklahoma City	
8	Cleveland		4.19	10/20/2011	Absentee Shawnee	City of Oklahoma City	
9	Cleveland		2.19	10/20/2011	Absentee Shawnee	City of Oklahoma City	
10	Cleveland		3.32	10/20/2011	Absentee Shawnee	City of Oklahoma City	
11	Cleveland		2.48	10/20/2011	Absentee Shawnee	City of Oklahoma City	
12	Cleveland		0.82	10/20/2011	Absentee Shawnee	City of Oklahoma City	
13	Cleveland		3.65	10/20/2011	Absentee Shawnee	City of Oklahoma City	
14	Cleveland		4.11	10/20/2011	Absentee Shawnee	City of Oklahoma City	
15	Cleveland		3.12	10/20/2011	Absentee Shawnee	City of Oklahoma City	
16	Cleveland		3.91	10/20/2011	Absentee Shawnee	City of Oklahoma City	
4572	Cleveland	Book 333, Page 415	4.29	1/21/1960	Everett R and Lucille G Cooper	City of Oklahoma City	Permanent
4573	Cleveland	Book 333, Page 413	3.83	1/21/1960	Fred Reynolds	City of Oklahoma City	Permanent
4574	Cleveland	Book 333, Page 411	0.55	1/21/1960	Fred Reynolds	City of Oklahoma City	Permanent
4575	Cleveland	Book 333, Page 416	1.00	1/21/1960	Fred Reynolds	City of Oklahoma City	Permanent
4576	Cleveland	Book 333, Page 414	1.46	1/21/1960	Wellings P Sturgis	City of Oklahoma City	Permanent
4577	Cleveland	Book 333, Page 412	1.39	1/21/1960	Elmer and Doxie Stuart	City of Oklahoma City	Permanent
4587	Cleveland	Book 334, Page 244	2.24	2/3/1960	Clarence Teas	City of Oklahoma City	Permanent
4588	Cleveland	Book 334, Page 243	1.88	2/3/1960	Joe Decker	City of Oklahoma City	Permanent
4589	Cleveland	Book 334, Page 242	4.43	2/3/1960	L R Mitchell	City of Oklahoma City	Permanent
4590	Cleveland	Book 334, Page 241	2.09	2/3/1960	Willis J and Chloe E Wright	City of Oklahoma City	Permanent
4591	Cleveland	Book 334, Page 240	5.22	2/3/1960	Alvan E and Mildred L Essary	City of Oklahoma City	Permanent
4592	Cleveland	Book 334, Page 239	4.30	2/3/1960	Sarkeys J Sarkeys	City of Oklahoma City	Permanent
4593	Cleveland	Book 334, Page 238	0.66	2/3/1960	Jonnie A Quiett	City of Oklahoma City	Permanent
4594	Cleveland	Book 334, Page 237	3.01	2/3/1960	T E Kirkham	City of Oklahoma City	Permanent
4600	Cleveland	Book 334, Page 356	4.68	2/10/1960	J H Leavitt and M E Hastings	City of Oklahoma City	Permanent
4601	Cleveland	Book 334, Page 357	3.72	2/10/1960	Juanita M and D F Almack, Olin F McBride	City of Oklahoma City	Permanent
4602	Cleveland	Book 334, Page 358	2.96	2/10/1960	Dennis and Juanita Almack, Olin F McBride	City of Oklahoma City	Permanent
4603	Cleveland	Book 334, Page 359	6.65	2/10/1960	Kenneth and Catherine Ayers	City of Oklahoma City	Permanent
4615	Cleveland	Book 335, Page 68	3.03	2/19/1960	John W and Ruby H Martin	City of Oklahoma City	Permanent
4616	Cleveland	Book 335, Page 44	1.53	2/19/1960	Jack W Shadrick	City of Oklahoma City	Permanent
4617	Cleveland	Book 335, Page 67	3.00	2/19/1960	A J Spaulding	City of Oklahoma City	Permanent
4618	Cleveland	Book 335, Page 152	0.86	2/24/1960	Marie and Robert Barbour, Roberta Ballinger	City of Oklahoma City	Permanent
4618	Cleveland	Book 335, Page 152	3.05	2/24/1960	Marie and Robert Barbour, Roberta Ballinger	City of Oklahoma City	Permanent
4623	Cleveland	Book 335, Page 325	1.72	3/4/1960	Commissioners of the Land Office	City of Oklahoma City	Permanent
4624	Cleveland	Book 335, Page 327	9.03	3/4/1960	Commissioners of the Land Office	City of Oklahoma City	Permanent
4706	Cleveland	Book 339, Page 264	7.13	5/13/1960	V E Peery	City of Oklahoma City	Permanent
4707	Cleveland	Book 339, Page 263	5.55	5/13/1960	V E Peery	City of Oklahoma City	Permanent
4708	Cleveland	Book 339, Page 495	6.06	5/20/1960	Berger Bengston	City of Oklahoma City	Permanent
5116	Cleveland	Book 356, Page 94	0.01	6/2/1961	Lucinda Ellis Snake	City of Oklahoma City	Permanent
5117	Cleveland	Book 356, Page 95	3.02	6/2/1961	Theodore and Stella Webb	City of Oklahoma City	Permanent
5148	Cleveland	Book 357, Page 62	2.44	6/30/1961	Leon Woodrow, Mabel Knight, Thomas Woodrow	City of Oklahoma City	Permanent
5149	Cleveland	Book 357, Page 65	0.00	6/30/1961	A E and Hylida Marie Meadows	City of Oklahoma City	Permanent
5205	Cleveland	Book 358, Page 31	0.13	7/26/1961	Martha M and Charlie Brendle	City of Oklahoma City	Permanent
5205	Cleveland	Book 358, Page 31	1.32	7/26/1961	Martha M and Charlie Brendle	City of Oklahoma City	Permanent
5206	Cleveland	Book 358, Page 30	1.51	7/26/1961	Luella Humphreys	City of Oklahoma City	Permanent
5207	Cleveland	Book 358, Page 29	12.02	7/26/1961	Martha M Brendle	City of Oklahoma City	Permanent
31789A	Cleveland	Book 5028, Page 97-111	3.07	7/16/2012	USA-BOR	City of Oklahoma City	Permanent
31789A	Cleveland	Book 5028, Page 97-111	1.61	7/16/2012	USA-BOR	City of Oklahoma City	Permanent
4595A	Cleveland	Book 356, Page 93	6.17	6/2/1961	George B and Elsa S Turner	City of Oklahoma City	Permanent

Attachment C

Atoka Pipeline Easements - Atoka Reservoir to McGee Creek Reservoir

Easement Number	County	Recorded	Acres	Execution	Grantor	Grantee	Duration
4604A	Cleveland	Book 356, Page 183	0.85	6/9/1961	Robert and Daniel Niece, Goldie and Wm Barrows	City of Oklahoma City	Permanent
	Cleveland	Book 5572, Pages 1144-1145	5.04	7/20/2016	Kelly W. Jackson	City of Oklahoma City	
4084	Coal	Book 254, Page 38	3.59	11/6/1958	Arthur A Sparks	City of Oklahoma City	Permanent
4085	Coal	Book 254, Page 39	3.77	11/6/1958	Johnnie Kuhn	City of Oklahoma City	Permanent
4089	Coal	Book 254, Page 117	3.86	11/17/1958	Flora Brown	City of Oklahoma City	Permanent
4090	Coal	Book 254, Page 118	6.28	11/17/1958	Oliver Whitlock	City of Oklahoma City	Permanent
4091	Coal	Book 254, Page 119	1.96	11/17/1958	John Peters	City of Oklahoma City	Permanent
4092	Coal	Book 254, Page 120	2.54	11/17/1958	John H Peters	City of Oklahoma City	Permanent
4106	Coal	Book 254, Page 201	3.37	11/26/1958	Phoenix and Rosemary Taylor	City of Oklahoma City	Permanent
4107	Coal	Book 254, Page 200	3.91	11/26/1958	Rosa Corado	City of Oklahoma City	Permanent
4108	Coal	Book 254, Page 202	1.11	11/26/1958	E L Brown and Wildred Robena Brown	City of Oklahoma City	Permanent
4109	Coal	Book 254, Page 416	5.30	12/3/1958	Curtis Beratto	City of Oklahoma City	Permanent
4110	Coal	Book 254, Page 417	1.54	12/3/1958	John B Barritt and Nadine Barritt	City of Oklahoma City	Permanent
4111	Coal	Book 254, Page 415	1.01	12/3/1958	Hallie Andrews	City of Oklahoma City	Permanent
4112	Coal	Book 254, Page 419	5.64	12/3/1958	Kathryne Reager	City of Oklahoma City	Permanent
4113	Coal	Book 254, Page 418	6.31	12/3/1958	George H Jump	City of Oklahoma City	Permanent
4123	Coal	Book 255, Page 71	0.62	12/29/1958	Ola Latham	City of Oklahoma City	Permanent
4124	Coal	Book 255, Page 73	2.77	12/29/1958	Mattie Cogburn	City of Oklahoma City	Permanent
4125	Coal	Book 255, Page 72	5.65	12/29/1958	Margaret Brown	City of Oklahoma City	Permanent
4126	Coal	Book 255, Page 74	3.03	12/29/1958	Josephine Roberts	City of Oklahoma City	Permanent
4127	Coal	Book 254, Page 576	0.82	12/19/1958	Frank Crooms	City of Oklahoma City	Permanent
4128	Coal	Book 254, Pages 577	1.76	12/19/1958	Margaret Khair	City of Oklahoma City	Permanent
4129	Coal	Book 254, Page 577	2.15	12/19/1958	Haskell Donnelly	City of Oklahoma City	Permanent
4130	Coal	Book 254, Page 579	6.07	12/19/1958	James Collins and Mayrose Collins	City of Oklahoma City	Permanent
4136	Coal	Book 255, Page 192	2.77	1/9/1959	L R Blackmon	City of Oklahoma City	Permanent
4137	Coal	Book 255, Page 193	0.31	1/9/1959	Homer C Battles	City of Oklahoma City	Permanent
4138	Coal	Book 255, Page 195	0.41	1/9/1959	Wofford Battles	City of Oklahoma City	Permanent
4139	Coal	Book 255, Page 196	1.47	1/9/1959	Clark Cogburn	City of Oklahoma City	Permanent
4140	Coal	Book 255, Page 194	3.77	1/9/1959	Junius R Gardner	City of Oklahoma City	Permanent
4145	Coal	Book 255, Page 239	5.67	1/15/1959	Thurman and Dorothy Lovinggood	City of Oklahoma City	Permanent
4146	Coal	Book 255, Page 240	3.52	12/22/1958	Victor J Reed, Bishop of the Diocese of OKC	City of Oklahoma City	Permanent
4149	Coal	Book 255, Pages 536-539	6.59	2/4/1959	McNeil, Yarbough, Rice, Jackson	City of Oklahoma City	Permanent
4152	Coal	Book 255, Page 542	7.73	2/4/1959	Hubert C Wilson	City of Oklahoma City	Permanent
4153	Coal	Book 255, Page 543	7.27	2/4/1959	W H Gentry and Mollie Gentry	City of Oklahoma City	Permanent
4154	Coal	Book 255, Page 544	0.49	2/4/1959	May M Crane	City of Oklahoma City	Permanent
4155	Coal	Book 256, Page Page 310	4.57	3/11/1959	J O Ellis	City of Oklahoma City	Permanent
4155	Coal	Book 256, Page Page 310	2.96	3/11/1959	J O Ellis	City of Oklahoma City	Permanent
4156	Coal	Book 255, Page 546	4.49	2/4/1959	Quint G Scott	City of Oklahoma City	Permanent
4166	Coal	Book 256, Page 73	1.25	2/13/1959	Arthur Pope	City of Oklahoma City	Permanent
4167	Coal	Book 256, Page 71-72	4.71	2/15/1959	A R Boyd	City of Oklahoma City	Permanent
4168	Coal	Book 256, Page 70	0.63	2/13/1959	Rosa Wyrick	City of Oklahoma City	Permanent
4169	Coal	Book 256, Page 69	1.26	2/13/1959	Roy Holder	City of Oklahoma City	Permanent
4170	Coal	Book 256, Page 157	0.79	2/25/1959	Raymond Howell	City of Oklahoma City	Permanent
4171	Coal	Book 256, Page 68	7.00	2/13/1959	W M Emanuel	City of Oklahoma City	Permanent
4172	Coal	Book 256, Page 158	0.51	2/25/1959	Sherman Drennan	City of Oklahoma City	Permanent
4173	Coal	Book 256, Page 66-67	14.57	2/13/1959	W B Hocket	City of Oklahoma City	Permanent
4174	Coal	Book ?, Page 233	0.28	1/10/1959	Frates, Dunn, Chandler	City of Oklahoma City	Permanent
4175	Coal	Book 256, Page 230	1.18	3/5/1959	Robert Strang and Bessie Strang	City of Oklahoma City	Permanent
4176	Coal	Book 255, Page 231-232	3.94	2/10/1959	Pete and Nellye Parks	City of Oklahoma City	Permanent
4176	Coal	Book 271, Page 278	6.67	2/10/1959	Pete and Nellye Parks	City of Oklahoma City	Permanent
4189	Coal	Book 256, Page 388	9.38	2/19/1959	Mike, Regina, and Mary L Meyer	City of Oklahoma City	Permanent
4189	Coal	Book 256, Page 388	17.47	2/19/1959	Mike, Regina, and Mary L Meyer	City of Oklahoma City	Permanent
4189	Coal	Book 256, Page 388	4.44	2/19/1959	Mike, Regina, and Mary L Meyer	City of Oklahoma City	Permanent
4189	Coal	Book 256, Page 388	9.96	2/19/1959	Mike, Regina, and Mary L Meyer	City of Oklahoma City	Permanent
4189	Coal	Book 256, Page 388	21.04	2/19/1959	Mike, Regina, and Mary L Meyer	City of Oklahoma City	Permanent
4190	Coal	Book 256, Page 391	2.49	3/19/1959	Maybelle Mayer	City of Oklahoma City	Permanent
4206	Coal	Book 256, Page 515	7.38	4/1/1959	Pope, Rogers and Burns	City of Oklahoma City	Permanent
4291	Coal	Book 258, Page 87-88	2.48	4/23/1959	Mayer and Myers	City of Oklahoma City	Permanent
4321	Coal	Book 258, Page 482	2.87	6/18/1959	F C Beggin, Trustee of B W Fox, deceased	City of Oklahoma City	Permanent

Attachment C

Atoka Pipeline Easements - Atoka Reservoir to McGee Creek Reservoir

Easement Number	County	Recorded	Acres	Execution	Grantor	Grantee	Duration
4439	Coal	Book 260, Page 193	7.50	10/2/1959	Jack E Butler	City of Oklahoma City	Permanent
4496	Coal	Book 261, Page 66	4.66	11/25/1959	Leslie L Mowdy	City of Oklahoma City	Permanent
4641	Coal	Book 263, Page 176-178	2.98	2/12/1960	Knox,Mote,Hickman,Polk	City of Oklahoma City	Permanent
4821	Coal	Book 267, Page 496	3.12	10/5/1960	Byron Todd, guardian of estate of Oscar F Oldham	City of Oklahoma City	Permanent
4964	Coal	Book 269, Page 442	4.25	2/1/1961	Alex Sprouse	City of Oklahoma City	Permanent
4969	Coal	Book 269, Page 570	0.79	2/16/1961	Curtis Noel and Mable Noel	City of Oklahoma City	Permanent
4969	Coal	Book 269, Page 570	5.25	2/16/1961	Curtis Noel and Mable Noel	City of Oklahoma City	Permanent
5151	Coal	Book 227, Page 92	4.60	6/7/1961	Snyder Vogel, et al	City of Oklahoma City	Permanent
5284	Coal	Book 273, Page 215	3.02	10/2/1961	Ready, Sligar, Scrimmer, Easley	City of Oklahoma City	Permanent
5352	Coal	Book 275, Page 332	1.30	12/29/1961	L R Blackmon	City of Oklahoma City	Permanent
5449	Coal	Book 277, Page 391	0.89	3/29/1962	Mike,Regina,Mary L. Meyer	City of Oklahoma City	Permanent
4150A	Coal	Book 271, Page 276	2.90	5/24/1961	Arthur Pope	City of Oklahoma City	Permanent
4151A	Coal	Book 271, Page 277	8.23	5/24/1961	A D Cody, Trustee	City of Oklahoma City	Permanent
4157A	Coal	Book 271, Page 280	14.19	5/24/1961	James C Mathers	City of Oklahoma City	Permanent
4176A	Coal	Book 271, Page 278	2.04	2/10/1959	Pete and Nellye Parks	City of Oklahoma City	Permanent
4650A	Coal	Book 271, Page 279	5.73	5/24/1961	Mattie, H D and Bertie Bullard	City of Oklahoma City	Permanent
5094A	Coal	Book 271, Page 323	1.22	6/2/1961	Mattie Bullard, widow	City of Oklahoma City	Permanent
	Coal	Book 271, Page 320	0.21	6/2/1961	Kansas, Oklahoma & Gulf RR Co.	City of Oklahoma City	
4164	Pontotoc	Book 602, Page 399	1.92	2/25/1959	L O Kifer	City of Oklahoma City	Permanent
4177	Pontotoc	Book 602, Page 533	4.78	3/5/1959	W A Delaney, Jr and J B Sledge	City of Oklahoma City	Permanent
4178	Pontotoc	Book 602, Page 534	0.08	3/5/1959	Dora Jared	City of Oklahoma City	Permanent
4184	Pontotoc	Book 603, Page 153	2.26	3/11/1959	Gene Sutterfield	City of Oklahoma City	Permanent
4191	Pontotoc	Book 603, Page 363	13.79	3/19/1959	Clarence Miller	City of Oklahoma City	Permanent
4192	Pontotoc	Book 603, Page 364	6.78	3/19/1959	Regina Mayer and Mike Mayer Jr.	City of Oklahoma City	Permanent
4192	Pontotoc	Book 603, Page 364	17.44	3/19/1959	Regina Mayer and Mike Mayer Jr.	City of Oklahoma City	Permanent
4204	Pontotoc	Book 603, Page 489	8.23	3/25/1959	W A Dennis	City of Oklahoma City	Permanent
4259	Pontotoc	Book 604, Page 383	0.80	4/9/1959	L R Kifer	City of Oklahoma City	Permanent
4260	Pontotoc	Book 604, Page 381	10.85	4/9/1959	T R Granger	City of Oklahoma City	Permanent
4292	Pontotoc	Book 606, Page 455	0.01	5/20/1959	J Clyde Jones	City of Oklahoma City	Permanent
4295	Pontotoc	Book 606, Page 458	1.37	4/24/1959	Kenneth L Shaw	City of Oklahoma City	Permanent
4320	Pontotoc	Book 607, Page 419	4.34	6/11/1961	Eunice Lowe	City of Oklahoma City	Permanent
4322	Pontotoc	Book 608, Page 30	1.67	6/18/1959	Ivan E and Zoe C Fleming	City of Oklahoma City	Permanent
4323	Pontotoc	Book 608, Page 31	1.78	6/18/1959	Ivan E and Zoe C Fleming	City of Oklahoma City	Permanent
4324	Pontotoc	Book 608, Page 29	1.33	6/18/1959	Emmett R Randolph	City of Oklahoma City	Permanent
4328	Pontotoc	Book 608, Page 186	3.27	6/25/1959	C L McAnally	City of Oklahoma City	Permanent
4330	Pontotoc	Book 608, Page 183	1.75	6/25/1961	A F Massey	City of Oklahoma City	Permanent
4331	Pontotoc	Book 608, Page 184	0.83	6/25/1961	Glyn Massey	City of Oklahoma City	Permanent
4332	Pontotoc	Book 608, Page 185	0.31	6/25/1959	R.F. Sales	City of Oklahoma City	Permanent
4342	Pontotoc	Book 608, Page 413	1.07	7/8/1959	Drexel Sales	City of Oklahoma City	Permanent
4343	Pontotoc	Book 608, Page 414	1.50	7/8/1959	J T Teters	City of Oklahoma City	Permanent
4344	Pontotoc	Book 608, Page 415	0.58	7/8/1959	J T Teters	City of Oklahoma City	Permanent
4345	Pontotoc	Book 608, Page 416	3.93	7/8/1959	W E Burns	City of Oklahoma City	Permanent
4346	Pontotoc	Book 608, Page 417	1.14	7/8/1959	Clyde Jackson	City of Oklahoma City	Permanent
4362	Pontotoc	Book 609, Page 154	0.61	7/21/1959	Margarette Votaw Patteson	City of Oklahoma City	Permanent
4367	Pontotoc	Book 609, Page 285	3.53	7/2/1959	Ralph H Ramsey and Carl S Petty	City of Oklahoma City	Permanent
4368	Pontotoc	Book 609, Page 284	5.67	7/23/1959	Nash Wood	City of Oklahoma City	Permanent
4379	Pontotoc	Book 610, Page 149	0.76	8/5/1959	Raymond G and Emma Lou Fleming	City of Oklahoma City	Permanent
4380	Pontotoc	Book 610, Page 150	3.04	8/5/1959	Raymond G and Emma Lou Fleming	City of Oklahoma City	Permanent
4414	Pontotoc	Book 611, Page 167	3.48	8/26/1959	Ola Barker	City of Oklahoma City	Permanent
					Etta and Charlie Forrester, Mamie and Doyle Hall	City of Oklahoma City	Permanent
4444	Pontotoc	Book 613, Page 301	2.77	10/14/1959	Doyle Hall	City of Oklahoma City	Permanent
4445	Pontotoc	Book 613, Page 302	0.88	10/14/1959	Emmett Randolph	City of Oklahoma City	Permanent
4642	Pontotoc	Book 620, Page 253	0.79	3/23/1960	Turper M King and Carloss Wadlington	City of Oklahoma City	Permanent
4682	Pontotoc	Book 621, Page 360	1.79	4/20/1960	Multiple owners	City of Oklahoma City	Permanent
4688	Pontotoc	Book 622, Page 44	0.03	4/27/1960	Louise A Robertson	City of Oklahoma City	Permanent
4891	Pontotoc	Book 2291, Page 292	11.05	7/29/2008	M E Whelchel	City of Oklahoma City	Permanent
4891	Pontotoc	Book 2291, Page 288	0.66	5/30/2008	Danna Gail Glase	City of Oklahoma City	Permanent
5107	Pontotoc	Book 639, Page 351	1.20	5/24/1961	Agnes and JC Hynds, husband and wife	City of Oklahoma City	Permanent
5108	Pontotoc	Book 639, Page 355	0.25	5/24/1961	James L and Velma D Bolin, husband and wife	City of Oklahoma City	Permanent
5109	Pontotoc	Book 639, Page 357	0.32	5/24/1961	Kenneth L and Lottie Lour Shaw, husband and wife	City of Oklahoma City	Permanent
5110	Pontotoc	Book 639, Page 358	1.85	5/24/1961	Valeria Cornell and Heloise F Jennings	City of Oklahoma City	Permanent

Attachment C

Atoka Pipeline Easements - Atoka Reservoir to McGee Creek Reservoir

Easement Number	County	Recorded	Acres	Execution	Grantor	Grantee	Duration
5111	Pontotoc	Book 639, Page 359	4.32	5/24/1961	Heloise Jennings	City of Oklahoma City	Permanent
5112	Pontotoc	Book 639, Page 360	1.72	5/24/1961	Ada Norris Berry	City of Oklahoma City	Permanent
5120	Pontotoc	Book 640, Page 222	0.01	5/24/1961	E E Ballard and Merle Ballard, his wife	City of Oklahoma City	Permanent
5122	Pontotoc	Book 640, Page 225	0.02	6/9/1961	W A Dennis	City of Oklahoma City	Permanent
5123	Pontotoc	Book 640, Page 224	0.91	6/9/1961	Archie and Edna Cooper, husband and wife	City of Oklahoma City	Permanent
5172	Pontotoc	Book 641, Page 420	3.86	7/13/1961	Carl N Lucas and Bennie V Lucas, his wife	City of Oklahoma City	Permanent
5173	Pontotoc	Book 641, Page 421	4.46	7/13/1961	Frue S Logsdon	City of Oklahoma City	Permanent
5174	Pontotoc	Book 641, Page 422	0.43	7/13/1961	Frue S Logsdon	City of Oklahoma City	Permanent
5188	Pontotoc	Book 642, Page 162	6.10	7/26/1961	Eva M Granger	City of Oklahoma City	Permanent
5228	Pontotoc	Book ?, Page 451	4.18	7/21/1961	Eva M Granger	City of Oklahoma City	Permanent
5245	Pontotoc	Book 643, Page 71	2.44	8/17/1961	Dale L Roberts and Emma Roberts, husband and wife	City of Oklahoma City	Permanent
5246	Pontotoc	Book 643, Page 73	0.85	8/17/1961	William F and Owana Kidd, husband and wife	City of Oklahoma City	Permanent
5338	Pontotoc	Book 648, Page 527	2.70	12/14/1961	H B and Lillian Mount, husband and wife	City of Oklahoma City	Permanent
5448	Pontotoc	Book 654, Page 29	1.18	3/22/1962	Regina, Mike Meyer Jr.	City of Oklahoma City	Permanent
5471	Pontotoc	Book 655, Page 544	0.95	4/26/1962	Carl S Petty	City of Oklahoma City	Permanent
5472	Pontotoc	Book 655, Page 542	0.83	4/26/1962	Margaret Mayer	City of Oklahoma City	Permanent
5822	Pontotoc	Book 665, Page 243	1.25	12/6/1962	T W Taylor	City of Oklahoma City	5/18/2012
30160	Pontotoc	Book 2292, Page 5	5.15	6/6/2008	Bobby and Linda Place	City of Oklahoma City	Permanent
30161	Pontotoc	Book 2292, Page 8	0.61	6/6/2008	Bobby and Linda Place	City of Oklahoma City	Permanent
4160A	Pontotoc	Book 639, Page 347	0.41	5/24/1961	C Massey, Clarice and E C Wilds, G and Jack Conn	City of Oklahoma City	Permanent
4163A	Pontotoc	Book 639, Page 346	6.33	5/24/1961	W N Bennett and Alma Bennett, husband and wife	City of Oklahoma City	Permanent
4182A	Pontotoc	Book 659, Page 345	2.79	5/24/1961	Margaret Mayer	City of Oklahoma City	Permanent
4182A	Pontotoc	Book 639, Page 345	4.18	5/24/1961	Margaret Mayer	City of Oklahoma City	Permanent
4293A	Pontotoc	Book 639, Page 349	0.18	5/24/1961	Percy Howe	City of Oklahoma City	Permanent
4294A	Pontotoc	Book 639, Page 354	3.57	5/24/1961	Milton and Bertha Balthrop, husband and wife	City of Oklahoma City	Permanent
4319A	Pontotoc	Book 639, Page 356	2.55	5/24/1961	Alice Frye, a widow	City of Oklahoma City	Permanent
4324A	Pontotoc	Book ?, Page 133	1.99	6/5/1961	Emmett Randolph	City of Oklahoma City	Permanent
4324A	Pontotoc	Book ?, Page 133	1.02	6/5/1961	Emmett Randolph	City of Oklahoma City	Permanent
4329A	Pontotoc	Book 639, Page 353	1.95	5/24/1961	E Marion Fenton Jr. and Dorothea Fenton, his wife	City of Oklahoma City	Permanent
4341A	Pontotoc	Book 639, Page 350	0.53	5/24/1961	E E Ballard and Merle Ballard, his wife	City of Oklahoma City	Permanent
4341A	Pontotoc	Book 639, Page 350	2.66	5/24/1961	E E Ballard and Merle Ballard, his wife	City of Oklahoma City	Permanent
4341A	Pontotoc	Book 639, Page 350	3.84	5/24/1961	E E Ballard and Merle Ballard, his wife	City of Oklahoma City	Permanent
4345A	Pontotoc	Book 1860, Page 97	0.57	2/18/2004	Roger and Betty Burns	City of Oklahoma City	Permanent
4345A	Pontotoc	Book 1860, Page 99	0.71	2/18/2004	Roger and Betty Burns	City of Oklahoma City	Permanent
4365A	Pontotoc	Book 639, Page 348	3.72	5/24/1961	S J Sarkeya	City of Oklahoma City	Permanent
4366A	Pontotoc	Book 639, Page 352	1.64	5/24/1961	Jewell Ford Sweeney	City of Oklahoma City	Permanent
4368A	Pontotoc	Book 608, Page 416	0.61	8/11/2003	Tom and Minta Lee Palmer	City of Oklahoma City	Permanent
4368A	Pontotoc	Book 609, Page 284	0.49	8/11/2003	Tom and Minta Lee Palmer	City of Oklahoma City	Permanent
4697A	Pontotoc	Book 641, Page 132	7.83	6/30/1961	H B and Lillian Mount, husband and wife	City of Oklahoma City	Permanent
4892A	Pontotoc	Book 2292, Page 10	3.51	6/6/2008	Roy J and Doris M Doty, Trustees	City of Oklahoma City	Permanent
4893A	Pontotoc	Book 2292, Page 10	0.60	6/6/2008	Roy J and Doris M Doty, Trustees	City of Oklahoma City	Permanent
4894A	Pontotoc	Book 641, Page 128	2.13	5/16/1961	Malsie C Quincy and W W Quincy, husband and wife	City of Oklahoma City	Permanent
4895A	Pontotoc	Book 640, Page 130	2.22	4/11/1961	W.W. Quincy and Malsie Carney	City of Oklahoma City	Permanent
4896/30819	Pontotoc	Book 2421, Page 108	2.04	12/7/2009	BIA on behalf of Julia Tenequer	City of Oklahoma City	Permanent
4896/30820	Pontotoc	Book 2421, Page 108	0.81	12/7/2009	BIA on behalf of M G Bolen	City of Oklahoma City	Permanent
	Pontotoc		0.36	10/21/2008	Dept of Transportation	City of Oklahoma City	Permanent
	Pontotoc		0.37	10/21/2008	Dept of Transportation	City of Oklahoma City	Permanent
	Pontotoc			4/19/1961	OCA&A RR Co.	City of Oklahoma City	
	Pontotoc		0.13	5/1/1961	St Louis-San Francisco RR Co.	City of Oklahoma City	Permanent
17	Pottawatomie		3.89	10/20/2011	Fee Owners - Steven Reese	City of Oklahoma City	
18	Pottawatomie		0.76	10/20/2011	Absentee Shawnee	City of Oklahoma City	
19	Pottawatomie		3.61	10/20/2011	Absentee Shawnee	City of Oklahoma City	

Attachment C

Atoka Pipeline Easements - Atoka Reservoir to McGee Creek Reservoir

Easement Number	County	Recorded	Acres	Execution	Grantor	Grantee	Duration
20	Pottawatomie		3.28	10/20/2011	Absentee Shawnee	City of Oklahoma City	
21	Pottawatomie		0.86	10/20/2011	Absentee Shawnee	City of Oklahoma City	
28	Pottawatomie		1.79	10/20/2011	Citizen Pottawatomie	City of Oklahoma City	
29	Pottawatomie		2.74	10/20/2011	Citizen Pottawatomie	City of Oklahoma City	
4377	Pottawatomie	Book 166, Page 78	3.06	8/5/1959	A G Semtner	City of Oklahoma City	Permanent
4397	Pottawatomie	Book 166, Page 296	1.29	8/12/1959	F P Swan	City of Oklahoma City	Permanent
4398	Pottawatomie	Book 166, Page 301	3.98	8/12/1959	F P Swan	City of Oklahoma City	Permanent
4399	Pottawatomie	Book 166, Page 297	1.19	8/12/1959	K. F. Kuerstersteffen	City of Oklahoma City	Permanent
4400	Pottawatomie	Book 166, Page 298	2.80	8/12/1959	Fred Kuestersteffen	City of Oklahoma City	Permanent
4401	Pottawatomie	Book 166, Page 299	4.33	8/12/1959	Anna Lehman	City of Oklahoma City	Permanent
4402	Pottawatomie	Book 166, Page 300	0.65	8/12/1959	Anna Catherine Grove	City of Oklahoma City	Permanent
4409	Pottawatomie	Book 166, Page 740	1.39	8/20/1959	R L Smith	City of Oklahoma City	Permanent
4410	Pottawatomie	Book 166, Page 739	3.20	8/20/1959	William A Lehman	City of Oklahoma City	Permanent
4411	Pottawatomie	Book 167, Page 205	4.38	8/26/1959	Lovdie Stephens	City of Oklahoma City	Permanent
4412	Pottawatomie	Book 167, Page 206	9.27	8/26/1959	Alfred Martin	City of Oklahoma City	Permanent
4413	Pottawatomie	Book 167, Page 207	1.34	8/26/1959	J T Johnson, Jr	City of Oklahoma City	Permanent
4426	Pottawatomie	Book 168, Page 361	4.50	10/14/1959	Anna Catherine Grove	City of Oklahoma City	Permanent
4435	Pottawatomie	Book 169, Page 119	1.83	10/24/1959	H T Hopkins	City of Oklahoma City	Permanent
4436	Pottawatomie	Book 169, Page 120	4.08	10/24/1959	H T and Pearl Hopkins	City of Oklahoma City	Permanent
4437	Pottawatomie	Book 169, Page 122	4.06	10/24/1959	Joseph W and Iva Grove	City of Oklahoma City	Permanent
4456	Pottawatomie	Book 170, Page 685	2.31	10/22/1959	J J and Jennie Tooley	City of Oklahoma City	Permanent
4469	Pottawatomie	Book 172, Page 111	0.70	11/12/1959	V G Newell	City of Oklahoma City	Permanent
4470	Pottawatomie	Book 172, Page 112	0.59	11/12/1959	Dallva C Lemons	City of Oklahoma City	Permanent
4471	Pottawatomie	Book 172, Page 113	4.35	11/12/1959	J H Owen and Loretta Owen	City of Oklahoma City	Permanent
4472	Pottawatomie	Book 172, Page 114	3.28	11/12/1959	J H Owen	City of Oklahoma City	Permanent
4473	Pottawatomie	Book 172, Page 115	1.59	11/12/1959	Loyd Spaughy	City of Oklahoma City	Permanent
4489	Pottawatomie	Book 172, Page 469	4.53	11/19/1959	John B Brandenburg	City of Oklahoma City	Permanent
4493	Pottawatomie	Book 173, Page 42	3.66	11/25/1959	Edna E Smith	City of Oklahoma City	Permanent
4494	Pottawatomie	Book 180, Page 674	0.65	4/27/1960	Pearl Scott	City of Oklahoma City	Permanent
4495	Pottawatomie	Book 173, Page 44	3.43	11/25/1959	Pearl Scott	City of Oklahoma City	Permanent
4506	Pottawatomie	Book 173, Page 423	4.08	12/4/1959	A L Lowther	City of Oklahoma City	Permanent
4507	Pottawatomie	Book 173, Page 424	0.23	12/4/1959	James P and Helen C Alexander	City of Oklahoma City	Permanent
4508	Pottawatomie	Book 173, Page 425	3.88	12/4/1959	Toby Sing	City of Oklahoma City	Permanent
4509	Pottawatomie	Book 173, Page 426	9.45	12/4/1959	Wm C and Mary E Doss	City of Oklahoma City	Permanent
4510	Pottawatomie	Book 173, Page 651	3.52	12/10/1959	Globe Security Recovery Corp.	City of Oklahoma City	Permanent
4511	Pottawatomie	Book 173, Page 652	4.38	12/10/1959	Jim L and Zula M Villines	City of Oklahoma City	Permanent
4512	Pottawatomie	Book 173, Page 653	0.36	12/10/1959	Victor and Beatrice Flowers	City of Oklahoma City	Permanent
4527	Pottawatomie	Book 174, Page 85	4.02	12/17/1959	E F Motley	City of Oklahoma City	Permanent
4528	Pottawatomie	Book 174, Page 86	2.38	12/17/1959	E L Dowell	City of Oklahoma City	Permanent
4529	Pottawatomie	Book 174, Page 89	2.86	12/17/1959	White, Chilton, Border, and Haney	City of Oklahoma City	Permanent
4530	Pottawatomie	Book 174, Page 91	2.44	12/17/1959	T J Davis	City of Oklahoma City	Permanent
4531	Pottawatomie	Book 174, Page 87	3.59	12/15/1959	Joseph W Reid	City of Oklahoma City	Permanent
4533	Pottawatomie	Book 174, Page 92	1.63	12/17/1959	T J Davis	City of Oklahoma City	Permanent
4534	Pottawatomie	Book 174, Page 345	4.37	12/24/1959	Libbe L Phillips	City of Oklahoma City	Permanent
4541	Pottawatomie	Book 174, Page 536	4.38	12/31/1959	Kenneth Coleman	City of Oklahoma City	Permanent
4542	Pottawatomie	Book 174, Page 537	5.51	12/31/1959	Clara Bailey	City of Oklahoma City	Permanent
4543	Pottawatomie	Book 174, Page 538	4.73	12/21/1959	Troy Phillips	City of Oklahoma City	Permanent
4544	Pottawatomie	Book 174, Page 539	3.37	12/31/1959	Clara and J C Bailey	City of Oklahoma City	Permanent
4546	Pottawatomie	Book 175, Page 114	1.53	1/7/1960	C D Weiss	City of Oklahoma City	Permanent
4547	Pottawatomie	Book 175, Page 115	1.33	1/7/1960	Russell Johnson	City of Oklahoma City	Permanent
4548	Pottawatomie	Book 175, Page 116	3.63	1/7/1960	Thurman R Larman	City of Oklahoma City	Permanent
4579	Pottawatomie	Page 176, Page 230	2.71	1/29/1960	Earl W and Ollie N Hayden	City of Oklahoma City	Permanent
4580	Pottawatomie	Book 176, Page 231	1.29	1/29/1960	Earl W Hayden	City of Oklahoma City	Permanent
4581	Pottawatomie	Book 176, Page 232	3.15	1/29/1960	Earl W and Ollie N Hayden	City of Oklahoma City	Permanent
4582	Pottawatomie	Book 176, Page 233	0.94	1/29/1960	Ollie M Hayden	City of Oklahoma City	Permanent
4583	Pottawatomie	Book 176, Page 234	1.97	1/29/1960	Gertrude Sanders	City of Oklahoma City	Permanent
4584	Pottawatomie	Book 176, Page 235	3.79	1/29/1960	Thomas Floyd Smith and Ethel S Smith	City of Oklahoma City	Permanent
4585	Pottawatomie	Book 176, Page 236	4.13	1/29/1960	George S Frazier	City of Oklahoma City	Permanent
4599	Pottawatomie	Book 176, Page 757	3.03	2/10/1960	Pauline Hansen and Beatrice Riddle	City of Oklahoma City	Permanent
4605	Pottawatomie	Book 177, Page 354	2.55	2/17/1960	R S Tipton	City of Oklahoma City	Permanent
4606	Pottawatomie	Book 177, Page 355	2.42	2/17/1960	S A Fulton	City of Oklahoma City	Permanent
4625	Pottawatomie	Book 178, Page 399	1.08	3/9/1960	Kimber K Doyle	City of Oklahoma City	Permanent
4627	Pottawatomie	Book 178, Page 401	5.56	3/9/1960	Earl T Todd	City of Oklahoma City	Permanent
4637	Pottawatomie	Book 178, Page 626	0.53	3/16/1960	Ora Weathers	City of Oklahoma City	Permanent
4643	Pottawatomie	Book 179, Page 272	4.61	3/30/1960	J L Edwards	City of Oklahoma City	Permanent
4654	Pottawatomie	Book 179, Page 576	8.51	4/6/1960	Hansen, Henderson, Riddle, White	City of Oklahoma City	Permanent

Attachment C

Atoka Pipeline Easements - Atoka Reservoir to McGee Creek Reservoir

Easement Number	County	Recorded	Acres	Execution	Grantor	Grantee	Duration
4696	Pottawatomie	Book 181, Page 618	3.72	5/11/1960	B Lucille Penn, Helen M Welch, Dorothy Buck Crabb	City of Oklahoma City	Permanent
5073	Pottawatomie	Book 200, Page 390	1.80	5/24/1961	Bertie Ayres LeClaire	City of Oklahoma City	Permanent
5074	Pottawatomie	Book 200, Page 389	1.32	5/24/1961	J I and Georgia Greenlee	City of Oklahoma City	Permanent
5075	Pottawatomie	Book 200, Page 391	0.57	5/24/1961	J H and Jewell Winters	City of Oklahoma City	Permanent
5076	Pottawatomie	Book 200, Page 399	3.01	5/24/1961	Otis and Goldie Treat	City of Oklahoma City	Permanent
5077	Pottawatomie	Book 200, Page 406	3.97	5/24/1961	La Vaughn Bingaman and Buster M Porter	City of Oklahoma City	Permanent
5078	Pottawatomie	Book 200, Page 407	0.98	5/24/1961	Josephine Bourassa	City of Oklahoma City	Permanent
5079	Pottawatomie	Book 200, Page 411	7.37	5/24/1961	Leon James Weaver	City of Oklahoma City	Permanent
5080	Pottawatomie	Book 200, Page 412	3.86	5/24/1961	L R and Betty Hunter	City of Oklahoma City	Permanent
5090	Pottawatomie	Book 200, Page 762	1.42	6/2/1961	W T and Moselle Milam, E P and Lamorsh Hunter	City of Oklahoma City	Permanent
5092	Pottawatomie	Book 200, Page 761	2.12	6/2/1961	John G and Thecia P Faulkner	City of Oklahoma City	Permanent
5118	Pottawatomie	Book 201, Page 267	0.70	6/9/1961	Corff Construction Co	City of Oklahoma City	Permanent
5119	Pottawatomie	Book 201, Page 266	0.71	6/9/1961	John Sherman Phillips	City of Oklahoma City	Permanent
5128	Pottawatomie	Book 202, Page 32	0.65	6/23/1961	Ruby and Edwin L Lochmoeller	City of Oklahoma City	Permanent
5129	Pottawatomie	Book 202, Page 31	8.37	6/23/1961	E Lyle Johnson	City of Oklahoma City	Permanent
5130	Pottawatomie	Book 202, Page 30	3.19	6/23/1961	Merry Miller and E Lyle Johnson	City of Oklahoma City	Permanent
5131	Pottawatomie	Book 202, Page 29	1.36	6/23/1961	Wilkine, et al	City of Oklahoma City	Permanent
5147	Pottawatomie	Book 202, Page 426	1.75	6/30/1961	Fundis, Green, Berry	City of Oklahoma City	Permanent
5153	Pottawatomie	Book 203, Page 21	3.57	7/10/1961	Basil W Crossley	City of Oklahoma City	Permanent
5183	Pottawatomie	Book 204, Page 138	2.85	7/26/1961	Helen Berry Hamm	City of Oklahoma City	Permanent
5208	Pottawatomie	Book 204, Page 560	2.83	8/9/1961	John Atwater	City of Oklahoma City	Permanent
5209	Pottawatomie	Book 204, Page 561	2.17	8/9/1961	Alva H and Thomas David McKiddie	City of Oklahoma City	Permanent
5212	Pottawatomie	Book 204, Page 564	0.72	8/9/1961	J W Atwater	City of Oklahoma City	Permanent
5213	Pottawatomie	Book 204, Page 565	3.30	8/9/1961	Charles E and Mary C Fundis	City of Oklahoma City	Permanent
5336	Pottawatomie	Book 211, Page 551	2.03	12/13/1961	Thad K Holstein	City of Oklahoma City	Permanent
5391	Pottawatomie	Book 215, Page 748	0.63	3/2/1962	Arthur A Davis	City of Oklahoma City	Permanent
5391	Pottawatomie	Book 215, Page 748	0.36	3/2/1962	Arthur A Davis	City of Oklahoma City	Permanent
32120	Pottawatomie	Yes	1.75	7/18/2013	Fee Owners - Cary Mason	City of Oklahoma City	Permanent
32150	Pottawatomie	Yes	2.04	8/6/2013	Fee Owners - Phillip D. Jackson	City of Oklahoma City	Permanent
32397	Pottawatomie	Yes	4.16	1/17/2014	Fee Owners - Steven Reese	City of Oklahoma City	Permanent
5210,5211	Pottawatomie	Book 204, Pages 562 - 563	3.75	8/9/1961	Fundis, Green, Berry, and Atwater	City of Oklahoma City	Permanent
4436A	Pottawatomie	Book 200, Page 398	0.63	5/24/1961	Delbert Dowd	City of Oklahoma City	Permanent
4438A	Pottawatomie	Book 200, Page 392	3.34	5/24/1961	John and Amy Akerman	City of Oklahoma City	Permanent
4441A	Pottawatomie	Book 200, Page 393	4.14	5/24/1961	L C and Sybal Anderson	City of Oklahoma City	Permanent
4442A	Pottawatomie	Book 200, Page 395	2.84	5/24/1961	L C and Sybal Harrison	City of Oklahoma City	Permanent
4443A	Pottawatomie	Book 200, Page 396	2.04	5/24/1961	G C and Ellie Smith	City of Oklahoma City	Permanent
4454A	Pottawatomie	Book 200, Page 394	1.54	5/24/1961	Roy and Opal Shepherd	City of Oklahoma City	Permanent
4455A	Pottawatomie	Book 200, Page 397	1.28	5/24/1961	O H and Vesta Lee Hodges	City of Oklahoma City	Permanent
4473A	Pottawatomie	Book 200, Page 401	2.27	5/24/1961	Loyd and Willie Spaugy	City of Oklahoma City	Permanent
4532A	Pottawatomie	Book 200, Page 408	3.40	5/24/1961	Wiley L and Myrtle L McDonald	City of Oklahoma City	Permanent
4532A	Pottawatomie	Book 200, Page 408	3.29	5/24/1961	Wiley L and Myrtle L McDonald	City of Oklahoma City	Permanent
4539A	Pottawatomie	Book 200, Page 410	0.96	5/24/1961	Joe M and Miranda E Ashley	City of Oklahoma City	Permanent
4545A	Pottawatomie	Book 200, Page 409	0.81	5/24/1961	Everett and Delores Calder	City of Oklahoma City	Permanent
4550A	Pottawatomie	Book 200, Page 415	3.17	5/24/1961	Mary Barler	City of Oklahoma City	Permanent
4551A	Pottawatomie	Book 200, Page 416	2.28	5/24/1961	Melvin B and Freeda Stovall	City of Oklahoma City	Permanent
4552A	Pottawatomie	Book 200, Page 417	5.02	5/24/1961	James C and Betty Jo Stapp	City of Oklahoma City	Permanent
4586A	Pottawatomie	Book 200, Page 413	3.86	5/24/1961	Loyd V and Betty A Barnett	City of Oklahoma City	Permanent
4597A	Pottawatomie	Book 200, Page 419	0.95	5/24/1961	Thad K and Malina Holstein	City of Oklahoma City	Permanent
4598A	Pottawatomie	Book 200, Page 418	1.72	5/24/1961	Charles M and Cora E Austin	City of Oklahoma City	Permanent
4626A	Pottawatomie	Book 200, Page 402	2.99	5/24/1961	Doyle Family	City of Oklahoma City	Permanent
4347	Seminole	Book 964, Page 116	3.15	7/11/1959	H R Phillips	City of Oklahoma City	Permanent
4348	Seminole	Book 964, Page 117	4.42	7/8/1959	W S Damron	City of Oklahoma City	Permanent
4369	Seminole	Book 964, Page 511	3.60	7/21/1959	Jesse Isaacs	City of Oklahoma City	Permanent
4396	Seminole	Book 965, Page 372	1.03	8/5/1959	Maude Ragland	City of Oklahoma City	Permanent
4407	Seminole	Book 166, Page 742	2.97	8/20/1959	Miletus F Miller	City of Oklahoma City	Permanent
4407	Seminole	Book 166, Page 742	10.18	8/20/1959	Miletus F Miller	City of Oklahoma City	Permanent
4415	Seminole	Book 966, Page 534	3.59	8/22/1959	A W and Lula Mae Dye	City of Oklahoma City	Permanent
4420	Seminole	Book 967, Page 453	4.79	9/10/1959	Ben Ragland	City of Oklahoma City	Permanent
4420	Seminole	Book 967, Page 453	8.42	9/10/1958	Ben Ragland	City of Oklahoma City	Permanent
4421	Seminole	Book 967, Page 454	0.03	9/10/1959	Ben Ragland	City of Oklahoma City	Permanent
4422	Seminole	Book 967, Page 455	2.79	9/10/1959	Maud and Ben Ragland	City of Oklahoma City	Permanent
4423	Seminole	Book 967, Page 456	0.44	9/10/1959	Ben and Maud Ragland	City of Oklahoma City	Permanent
4424	Seminole	Book 967, Page 457	2.17	9/11/1959	G O Wallace	City of Oklahoma City	Permanent

Attachment C

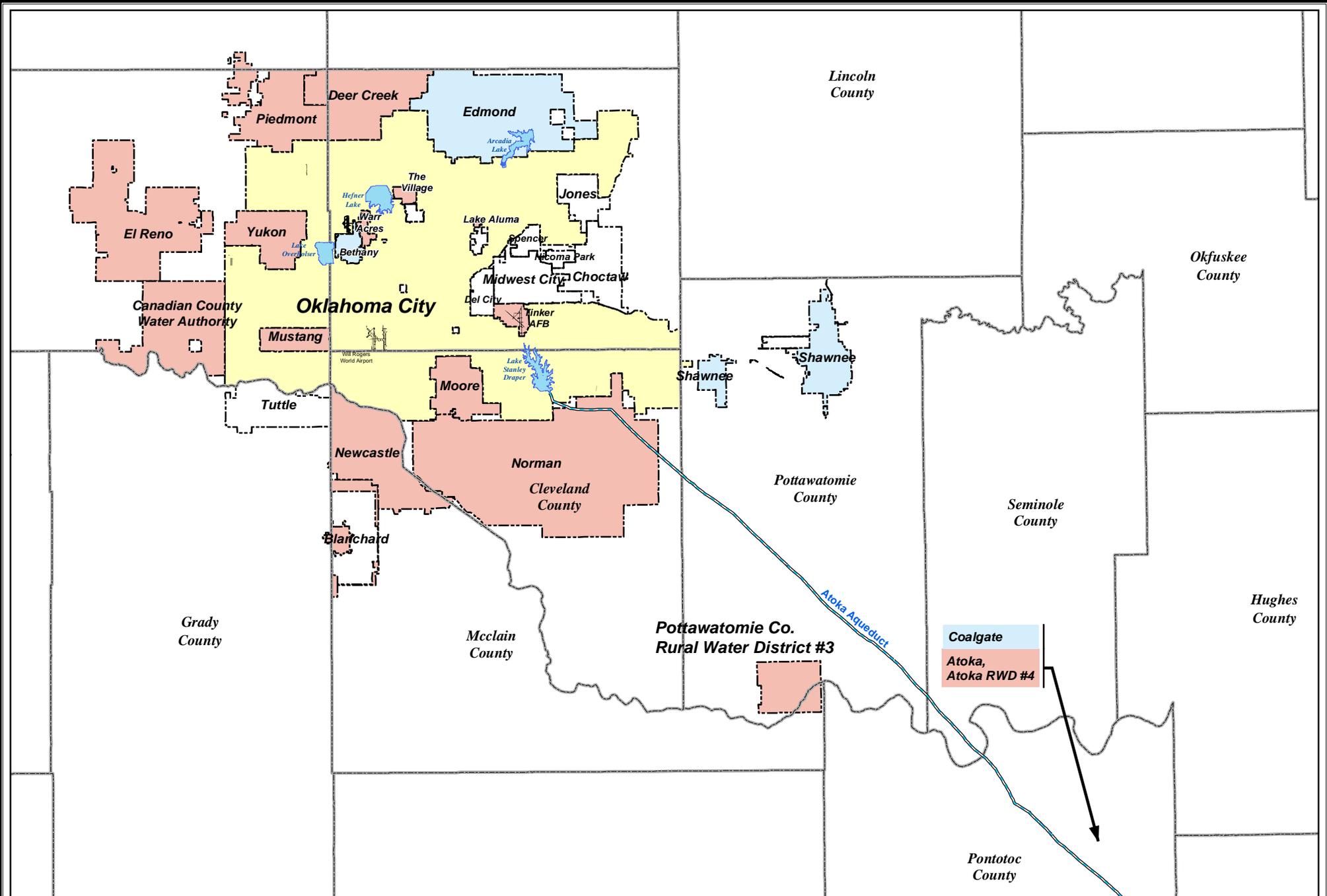
Atoka Pipeline Easements - Atoka Reservoir to McGee Creek Reservoir

Easement Number	County	Recorded	Acres	Execution	Grantor	Grantee	Duration
4425	Seminole	Book 967, Page 458	3.79	9/11/1959	Marvin and Geneve Wooten	City of Oklahoma City	Permanent
4433	Seminole	Book 968, Page 130	8.68	9/17/1959	Clarence Raper	City of Oklahoma City	Permanent
4433	Seminole	Book 968, Page 130	2.75	9/17/1959	Clarence Raper	City of Oklahoma City	Permanent
4458	Seminole	Book 970, Page 101	3.97	10/22/1958	Trustees of the Inc. Town of Konawa	City of Oklahoma City	Permanent
4553	Seminole	Book 974, Page 126	3.79	1/7/1960	Eulahmae Reed	City of Oklahoma City	Permanent
4651	Seminole	Book 918, Page 375	1.12	3/30/1960	John P Vance	City of Oklahoma City	Permanent
4651	Seminole	Book 978, Page 375	2.09	3/30/1960	John P Vance	City of Oklahoma City	Permanent
4652	Seminole	Book 978, Page 376	1.95	3/30/1960	John P Vance	City of Oklahoma City	Permanent
4653	Seminole	Book 978, Page 377	4.91	3/30/1960	John P Vance	City of Oklahoma City	Permanent
4967	Seminole	Book 993, Page 373	3.98	2/1/1961	C A Pierce	City of Oklahoma City	Permanent
5135	Seminole	Book 1001, Page 108	1.50	6/23/1961	Laura B Scott Fries and Gladys Miller	City of Oklahoma City	Permanent
5136	Seminole	Book 1001, Page 109	3.06	7/23/1961	John H and Dorothy Yvonne Walker	City of Oklahoma City	Permanent
4727/30898	Seminole	Book 3271, Page 123	3.92	4/19/2010	BIA on behalf of Tony Palmer	City of Oklahoma City	50 year
4897/30899	Seminole	Book 3271, Page 126	4.40	4/19/2010	BIA on Behalf of Wm and Genevieve McGeisey	City of Oklahoma City	50 year
3			0.85		Absentee Shawnee		
3			4.71		Absentee Shawnee		

Attachment D

McGee Creek Pipeline Easements

Tract No.	Section	Township	Range	Book	Page(s)	Date	Grantor	Grantee
300E	1	3S	13E	417	598-606	1/7/1982	Johnie Denton and Dorothy Sue Denton	USA-BOR
301E	12	3S	13E	424	730-739	3/10/1982	Kay Carter Fortson and Ben J. Fortson	USA-BOR
302E	4	3S	13E	424	61-72	4/26/1982	Leon E. Jones and Vondell Jones	USA-BOR
303E	3	3S	13E	428	424-247	9/13/1982	Notice of Pendency of Action	USA-BOR
304E	N/A	N/A	N/A	N/A	N/A	N/A	Not Closed	
305E	4	3S	13E	424	137-147	1/12/1982	Jeanne Paul Chodos	USA-BOR
306E	4	3S	13E	431	474-477	12/17/1982	Notice of Pendency of Action/ Condemnation Civil Number:82-536	USA-BOR
307E	4	3S	13E	418	52-61	1/18/1982	Lloyd C. Rawlins and Dora Rawlins	USA-BOR
308E	4	3S	13E	430	685-687	12/14/1982	Notice of Pendency of Action/ Condemnation Civil Number: 82-524-C	USA-BOR
309E	5	3S	13E	426	587-602	5/3/1982	Charles A. McCall, Louise M. McCall, Samuel M. Stephens, Betty Sue Stephens, William Porter Stephens, Mary Jo Adkins, Clyde J. Stephens, Jeanne Stephens,Rebekah Lou Mungle	USA-BOR
309E	6	3S	13E	426	587-602	5/3/1982	Charles A. McCall, Louise M. McCall, Samuel M. Stephens, Betty Sue Stephens, William Porter Stephens, Mary Jo Adkins, Clyde J. Stephens, Jeanne Stephens,Rebekah Lou Mungle	USA-BOR
310E	6	3S	13E	432	67-69	1/26/1983	Notice of Pendency of Action/ Condemnation Civil Number:23-50-C	USA-BOR
311E	6	3S	13E	432	532-537	9/24/1982	Notice of Pendency of Action/ Condemnation Civil Number:82-397-C	USA-BOR
312E	6	3S	13E	424	598-606	3/31/1982	Karl E. Goodson and Teresa Goodson	USA-BOR
313E	1	2S	12E	425	50-61	4/15/1982	Gladys Goodson Bryant	USA-BOR
314E	1	3S	12E	422	307-318	2/1/1982	Charles Roberson and Carolyn Roberson	USA-BOR
314E	36	2S	12E	422	307-318	2/1/1982	Charles Roberson and Carolyn Roberson	USA-BOR
315E	36	2S	12E	421	507-515	2/3/1982	Jesse Delbert Sheffield	USA-BOR
316E	35	2S	12E	430	676-680	12/14/1982	Notice of Pendency of Action/ Condemnation Civil Number:82-522-C	USA-BOR
317E	35	2S	12E	430	679-680	12/15/1982	Notice of Pendency of Action/ Condemnation Civil Number:82-526-C	USA-BOR
318E	35	2S	12E	424	696-705	3/3/1982	George W. Monks, Aline Monks, K. Hudson Jr., and Geneva L. Hudson	USA-BOR
319E	35	2S	12E	424	707-720	3/27/1982	John G. Moore and Opal Moore	USA-BOR
320E	35	2S	12E	431	478-481	1/5/1983	Notice of Pendency of Action/ Condemnation Civil Number:83-11-C	USA-BOR
321E	34	2S	12E	424	721-728	3/24/1982	Arthu Jay Allen and Pearl Allen	USA-BOR
322E	27	2S	12E	420	1-10	2/3/182	William R. Weaver, Kaethe M. Weaver, James F. Mason and Carol Mason	USA-BOR
323E	28	2S	12E	428	457-469	6/3/1982	H.M. Cochran and Leola Mae Cochran	USA-BOR
324E	28	2S	12E	431	43-50			
324E	28	2S	12E	523	358-360	9/16/1991	Notice of Pendency of Action/ Condemnation	USA-BOR
325E	29	2S	12E	424	678-685	3/9/1982	Elaine Chappela	USA-BOR
325E	29	2S	12E	505	777-780	3/1/1990	Elaine Chappela	USA-BOR
326E	N/A	N/A	N/A	N/A	N/A	N/A	Not Closed	N/A
327E	20	2S	12E	429	216-217	10/5/1982	Notice of Pendency of Action/ Condemnation Civil Number:8-412-C	USA-BOR
328E	18	2S	12E	424	52-60	4/17/1982	Mary Alice Weave and Morris A. Weaver	USA-BOR
329E	20	2S	12E	429	153-162	9/10/1982	William F. Rogers III and Sue Rogers	USA-BOR
329E	17	2S	12E	429	153-162	9/10/1982	William F. Rogers III and Sue Rogers	USA-BOR
329E	18	2S	12E	429	153-162	9/10/1982	William F. Rogers III and Sue Rogers	USA-BOR
329E	36	1S	11E	429	153-162	9/10/1982	William F. Rogers III and Sue Rogers	USA-BOR
330E	18	2S	12E	424	128-135	4/22/1982	Ollie M. Smith	USA-BOR
331E	18	2S	12E	424	687-695	3/26/1987	Edward Dean Allen	USA-BOR
332E	18	2S	12	424	119-126	5/3/1982	Jackie Uber and Iva L. Uber	USA-BOR
333E	7	2S	12E	424	148-157	7/25/1982	Jerome S. Smiser and Lucile Y. Smiser	USA-BOR
334E	7	2S	12E	424	41-50	4/27/1982	Emma Rogers Gregg and Thomas Edd Gregg	USA-BOR
335E	7	2S	11E	429	33-42	8/24/1982	Corinne Ray Holmes and Jack Holmes	USA-BOR
335E	7	2S	12E	429	33-42	8/24/1982	Corinne Ray Holmes and Jack Holmes	USA-BOR
336E	12	2S	11E	432	539-541	9/15/1982	Notice of Pendency of Action/ Condemnation Civil Number: 82-384-C	USA-BOR
337E	17	2S	11E	424	607-619	5/31/1985	Dwight C. Rogers Jr. and Patricia A. Rogers	USA-BOR
337E	17	2S	12E	424	607-619	5/31/1985	Dwight C. Rogers Jr. and Patricia A. Rogers	USA-BOR
338E	1	2S	11E	429	171-179	9/17/1982	Jimmie H. Rogers and Margaret E. Rogers	USA-BOR
338E	36	1S	11E	429	171-179	9/17/1982	Jimmie H. Rogers and Margaret E. Rogers	USA-BOR
339E	1	2S	11E	432	474-479	1/6/1982	Ethan Allen	USA-BOR
340E	36	1S	11	428	287-295	8/4/1982	Florence Rogers Neal	USA-BOR
340E-1	36	1S	11E	429	164-170	9/10/1982	Florence Rogers Neal	USA-BOR
341E	1	2S	11E	433	69-71	12/21/1982	Atoka County Industrial	USA-BOR
341E	36	1	11E	433	69-75	10/13/1982	Oklahoma City Municipal Improvement Authority	USA-BOR
342E	1	2S	11E	433	72-75	12/21/1982	Don Barnard, Keith Sanders, Jimmy Kelloqq, Albert G. Steele, Bill Moore, and Larry C. Key	USA-BOR
343E	35	2S	12E	428	248-286	5/19/1982	Charles E. Mead and Jean Mead, Calvin W. Mead Jr., and Jura F. Mead	USA-BOR
344E	12	2S	11E	431	482-484	1/5/1983	Notice of Pendency of Action/ Condemnation Civil Number:83-10-C	USA-BOR
345E	4	3S	13E	420	681-684	12/15/1983	Notice of Pendency of Action/ Condemnation Civil Number:82-527-C	USA-BOR

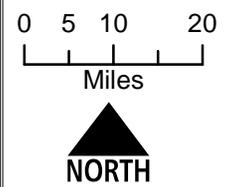
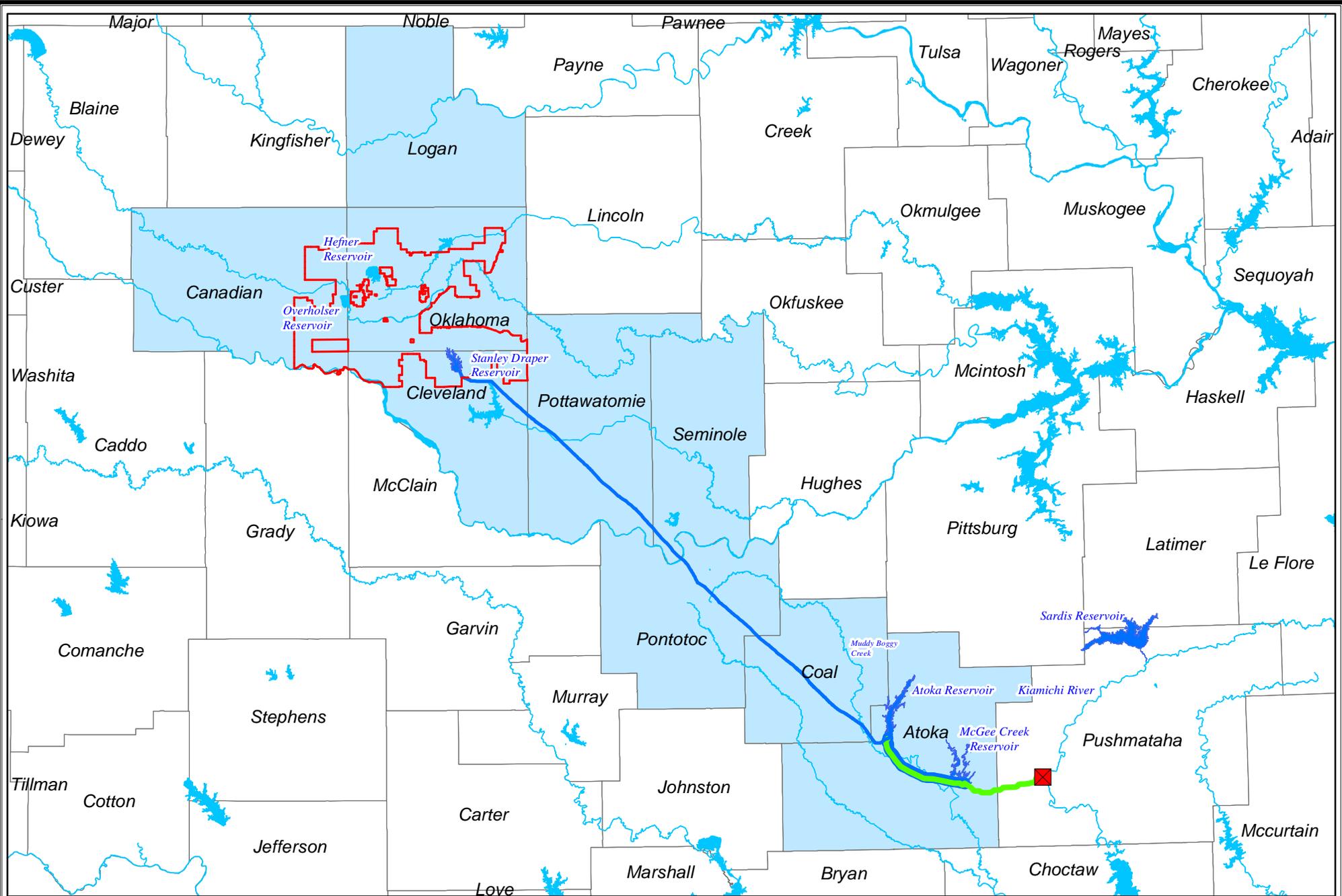


-  Adjacent Cities
-  OKC
-  Continuous Service
-  Supplemental Service

Attachment E

Current OKC Water Service Areas





- Present & Future Service Areas
- Existing Pipeline
- Future Pipeline

Attachment F

Present and Potential Future Water Needs



WATER RIGHTS NEEDS FORECAST

Excerpt from "Regional Raw Water Supply Study for Central Oklahoma (WC-0602)"

Table 1 - Total Demand Projections to Year 2060 (AFY)

Year	Oklahoma City Total	Participants Total	Total Demand
2010	121,711	36,931	158,642
2015	129,888	41,793	171,681
2020	138,596	49,466	188,062
2025	148,020	57,575	205,595
2030	158,073	66,450	224,523
2035	171,471	71,062	242,533
2040	186,277	76,651	262,928
2045	201,904	82,118	284,022
2050	218,462	87,909	306,371
2055	235,132	94,182	329,314
2060	251,690	101,339	353,029

Table 2 - Estimate of Additional Water Rights Needed for 2060 (AFY)

North Canadian River Permit	80,000
Atoka Lake Permit	91,667
McGee Creek Reservoir Permit	40,000
Permitted Total	211,667
Projected 2060 Needs	353,029
Additional Water Rights Required	141,362

Regional Raw Water Supply Study

for Central Oklahoma



COWRA

Central Oklahoma Water Resource Authority

PO Box 851331
Yukon, OK 73085-1331



GOLDSBY



Oklahoma City Water Utilities Trust

Regional Raw Water Supply Study

March 2009



Final Report

Contents

Section 1 - Introduction

1.1	Project Overview	1-1
1.2	Demand Projections and Water Rights Needs	1-4
1.3	Source and System Alternatives	1-4
1.4	Supply and Transmission Alternatives	1-5
1.5	Summary of Water Availability Analysis	1-6
1.6	Environmental Regulatory Requirements	1-8
1.7	Estimated Conveyance Infrastructure Cost	1-8
1.8	Estimated Operations and Maintenance	1-9
1.9	Project Cost Distribution to Participants	1-9
1.10	Unit Cost Distribution for Participants	1-9
1.11	Decision Modeling.....	1-9
1.12	Schedule of Future Activities.....	1-10
1.13	Summary of Economic and Non-Economic Findings	1-10

Section 2 - Demand Projections and Water Right Needs

2.1	Introduction	2-1
2.2	Oklahoma City Demand Projections	2-1
2.3	Incremental Water Supply Needs for Each Participant	2-3
2.4	Summary of Supply Needs	2-4
2.5	Additional Water Rights Required	2-6
2.6	Additional Pipeline Capacity Needs	2-8
2.7	Summary.....	2-9

Section 3 - Existing Source and System Description

3.1	Existing Supply Sources	3-1
3.2	Existing Source Transmission Pipelines.....	3-3
3.2.1	Background and Previous Investigations	3-3
3.2.2	Hydraulic Criteria for Parallel Transmission Pipeline.....	3-4

Section 4 - Supply and Transmission Alternatives

4.1	Source Alternatives	4-1
4.1.1	Sardis Lake	4-2
4.1.2	Kiamichi River at Moyer’s Crossing.....	4-2
4.1.3	Kiamichi River at Highway 3	4-3
4.1.4	Hugo Lake	4-3
4.2	Intermediate Delivery Alternatives	4-3
4.2.1	Atoka Lake	4-4
4.2.2	McGee Creek Reservoir	4-5
4.2.3	Buffer Tank.....	4-5
4.3	Delivery Alternatives.....	4-7

Section 5 - Water Availability Analysis

5.1 Introduction.....5-1
 5.2 Hydrologic Summary 5-1
 5.3 Supply Estimation Model.....5-4
 5.3.1 Model Formulation 5-4
 5.3.2 Model Assumptions.....5-7
 5.3.3 Model Testing 5-9
 5.4 Baseline Yield Results with Existing Southeast Oklahoma Permits.....5-10
 5.5 Potential Impacts of Pending Water Rights Allocations.....5-12
 5.6 Water Availability Conclusions.....5-15

Section 6 - Environmental Regulatory Requirements

6.1 Introduction.....6-1
 6.2 Regulatory Overview 6-1
 6.2.1 Clean Water Act.....6-1
 6.2.2 Endangered Species Act 6-3
 6.2.3 National Environmental Policy Act.....6-4
 6.2.4 Other Requirements 6-4
 6.3 Water Quality.....6-5
 6.3.1 Water Quality Data 6-5
 6.3.2 Existing Water Quality – Potential Source Waters6-6
 6.3.3 Existing Water Quality – Receiving Waters.....6-7
 6.4 Water Transfers.....6-8
 6.4.1 Clean Water Act.....6-9
 6.4.2 Endangered Species Act6-9
 6.4.3 NEPA Consultation.....6-11
 6.4.4 OWRB Water Use Permit6-12
 6.4.5 Other Requirements6-12
 6.5 Water Delivery Pipeline Construction.....6-12
 6.5.1 Clean Water Act.....6-12
 6.5.2 Endangered Species Act6-13
 6.5.3 NEPA Consultation.....6-14
 6.5.4 Other Requirements6-14
 6.6 Environmental Permits and Approvals – Next Steps.....6-15
 6.6.1 Resolve NEPA Compliance Uncertainty.....6-15
 6.6.2 Initiate Consultation with Sovereign Indian Nations6-16
 6.6.3 Consult with USFWS to Identify Environmental Studies6-16
 6.6.4 Finalize Identification of Local Environmental and
 Permitting Requirements6-16
 6.6.5 Monitor Environmental Permit Requirements6-16

Section 7 - Estimated Conveyance Costs

7.1 Introduction..... 7-1
 7.2 Approach for Estimating Costs for Conveyance..... 7-1
 7.3 Source Alternatives 7-2
 7.3.1 Sardis Lake 7-6
 7.3.2 Kiamichi River (Moyers Crossing)..... 7-8
 7.3.3 Kiamichi River (Highway 3)..... 7-8
 7.3.4 Hugo Lake 7-11
 7.4 New Parallel Atoka Pipeline 7-11
 7.5 Water Delivery Themes 7-14
 7.5.1 Theme D1 – Oklahoma Water Treatment Option..... 7-16
 7.5.2 Theme D2 – Regional Water Treatment Option..... 7-18
 7.5.3 Theme D3 – Raw Water Delivery Option 7-20
 7.6 Estimated Conveyance Summary 7-20

Section 8 - Estimated Operation and Maintenance Costs

8.1 Introduction..... 8-1
 8.2 Operation and Maintenance Cost Methodology 8-1
 8.2.1 Estimates of Energy Requirements and Costs for
 Conveyance and Distribution..... 8-2
 8.2.2 Maintenance Costs of Pipelines and Pump Stations 8-3
 8.2.3 Water Treatment Operation and Maintenance 8-3
 8.3 Water Delivery Theme Assessment O&M 8-4

Section 9 - Project Cost Distribution to Participants

9.1 Introduction..... 9-1
 9.2 Summary of Project Costs – Transmission and Distribution Systems 9-1
 9.3 Cost Allocation Methodology – Transmission System 9-2
 9.4 Cost Allocation Results per Participant – Transmission System 9-3
 9.5 Cost Allocation Methodology – Treatment Theme D1
 (Regional WTP at Stanley Draper) 9-7
 9.6 Cost Allocation Results per Participant Treatment 9-7
 9.7 Cost Allocation Methodology – Treatment Theme D2
 (Regional WTP at Thunderbird)..... 9-8
 9.8 Cost Allocation Results per Participant – Treatment Theme D2 9-9
 9.9 Cost Allocation Methodology – Treatment Theme D3
 (No Regional WTPs)..... 9-11
 9.10 Cost Distribution Summary 9-12

Section 10 - Unit Cost Distribution for Participants

10.1 Introduction..... 10-1
 10.2 Unit Cost Determination Approach..... 10-1
 10.3 Unit Cost Results for Participants 10-6
 10.4 Unit Cost Summary 10-19

Section 11 – Comparison of Alternatives

11.1 Introduction..... 11-1
 11.2 Alternatives Comparison Approach..... 11-1
 11.2.1 Defining the Ranking Criteria 11-2
 11.2.2 Weighting the Criteria 11-3
 11.2.3 Use of the Criteria in Evaluation and Ranking of the
 Alternatives 11-3
 11.3 System Alternatives..... 11-5
 11.4 Results of Evaluation and Ranking..... 11-6
 11.4.1 Scenario Model 11-6
 11.4.2 System Alternative Analysis Results 11-7
 11.4.3 System Alternative Ranking 11-9

Section 12 – Schedule of Future Activities

12.1 Introduction..... 12-1
 12.2 Organizational Activities..... 12-1
 12.3 Environmental and Permitting Activities 12-2
 12.4 Water Rights Activities 12-3
 12.5 Public Outreach Activities..... 12-3
 12.6 Engineering and Construction Activities 12-4
 12.7 Funding and Financing Activities 12-4
 12.8 Summary of Activities 12-4

Section 13 – Summary of Economic and Non-Economic Findings

13.1 Introduction..... 13-1
 13.2 Findings of Economic Review of Alternatives – Capital Cost..... 13-1
 13.3 Findings of Economic Review of Alternatives –
 Operation and Maintenance..... 13-1
 13.4 Findings of Economic Review of Alternatives – Unit Cost Distribution
 to Participants 13-1
 13.5 Comparison of Alternatives – Non-Economic Considerations..... 13-2
 13.6 Summary of Alternatives Comparison..... 13-2

Appendices

Appendix A Sampled Water Quality Summary
Appendix B Opinion of Probable Cost for Source Alternatives/Detailed
 Maps of Source Routes
Appendix C Opinion of Probable Cost for Atoka Pipeline Alternatives
Appendix D Opinion of Probable Cost for Distribution Themes
Appendix E Water Supply System Simulation Tool
Appendix F Operations and Maintenance Cost Tables
Appendix G Cost Distribution Results for Participants
Appendix H Unit Cost Results for Participants
Appendix I List of Assumptions

Figures

1-1	Alternatives for Each Major Project Component	1-2
1-2	Study Process Overview	1-3
1-3	Work Progress Schedule.....	1-3
1-4	Project Demands and the Need for Resources and Infrastructure through 2060.....	1-4
1-5	Source Alternatives Map	1-5
2-1	Projected Water Demands	2-6
2-2	Total Project Demand.....	2-8
2-3	Timeframe for Additional Pipeline Capacity Needs	2-9
4-1	Source Alternatives Map	4-1
4-2	Intermediate Delivery/Storage Alternatives Map.....	4-4
4-3	Delivery Theme D1 Schematic.....	4-9
4-4	Delivery Theme D2 Schematic.....	4-10
4-5	Delivery Theme D3 Schematic.....	4-11
5-1	Kiamichi River Basin and Representative Hydrologic Gage.....	5-2
5-2	Flow Statistics for Kiamichi River at Belzoni.....	5-3
5-3	Network Configuration of Central Oklahoma Yield Model	5-6
5-4	Annual Hydrology of Kiamichi River at Belzoni (near Highway 3).....	5-8
5-5	Baseline Supply Results to Central Oklahoma with Existing Water Rights Allocations.....	5-11
5-6	Comparison of Sustainable to Average Supply	5-11
5-7	Impact of Pending Future Allocations on Sustainable Yield.....	5-14
5-8	Impact of Pending Future Allocations on Average Yield.....	5-15
7-1	Source Demand and Flow Summary	7-4
7-2	Route Alternatives from Southeast Oklahoma Sources	7-5
7-3	Raw Water Transmission from Sardis Lake to Atoka Lake.....	7-7
7-4	Raw Water Transmission from Moyers to Atoka Lake.....	7-9
7-5	Raw Water Transmission from Highway 3 to Atoka Lake.....	7-10
7-6	Raw Water Transmission from Hugo Lake to Atoka Lake	7-12
7-7	Central Oklahoma Proposed Distribution Routes	7-15
7-8	Central Oklahoma Proposed Routes - Theme D1	7-17
7-9	Central Oklahoma Proposed Distribution Routes - Theme D2.....	7-19
7-10	Central Oklahoma Proposed Distribution Routes - Theme D3.....	7-21
8-1	Year 2060 Operations Costs for Project Alternatives.....	8-4
8-2	Year 2060 Regional Water Deliveries for Project Alternatives	8-5

8-3 Total O&M Costs for Project Alternatives8-6

11-1 Alternative Analysis and Ranking Path 11-2

11-2 System Alternatives Evaluation Criteria and Associated
 Performance Measures..... 11-3

11-3 Maximum, Minimum and Average Weights Assigned to the Criteria
 by Participant Cities (average presented just for reference and not used
 in the ranking process)..... 11-4

11-4 Number of Times Criteria is in the Top 1 or Top 2 According to the
 Weights Assigned by Participant Cities 11-4

11-5 Screen Shot of the Scenario Model Used in System
 Alternatives Analysis 11-7

11-6 Example of the Multi-Attribute Rating Method..... 11-10

11-7 Ranking Stack Bar Showing the Contribution of Each Performance
 Measure to a Total Weighted Ranking Score..... 11-11

11-8 Color Ranking Map for All System Alternatives and All Participant
 Cities [red indicates less desirable alternatives (lower ranking scores)
 and green indicates preferred alternatives] 11-12

13-1 Color Ranking Map for All System Alternatives and All Participant
 Cities [red indicates less desirable alternatives (lower ranking scores)
 and Green Indicates Preferred Alternatives] 13-3

Tables

2-1	Oklahoma City and Base Load Cities' Demands (AFY)	2-2
2-1A	Oklahoma City and Base Load Cities' Demands (mgd)	2-2
2-2	Oklahoma City + Base Load Cities + COWRA Extra Demands (AFY)	2-3
2-2A	Oklahoma City + Base Load Cities + COWRA Extra Demands (mgd)	2-3
2-3	Incremental Supply Needs Identified by Participants (AFY).....	2-4
2-3A	Incremental Supply Needs Identified by Participants (mgd)	2-4
2-4	Total Project Supply Needs Identified by Participants (AFY).....	2-5
2-4A	Total Project Supply Needs Identified by Participants (mgd)	2-5
2-5	Estimate of Additional Water Rights Needed for 2060 Project Deliveries (AFY).....	2-7
2-5A	Estimate of Additional Water Rights Needed for 2060 Project Deliveries (mgd)	2-7
3-1	Average Annual Water Supplies [in mgd and AFY], by source type (2000-2007)	3-1
3-2	Projected Local Surface Source Supplies	3-2
3-3	Projected Local Groundwater Source Supplies	3-2
3-4	Hydraulic Criteria Used for Transmission Facility Sizing in this Study	3-4
4-1	Summary Features of Source Alternatives.....	4-2
4-2	Summary Features of Delivery/Storage Alternatives.....	4-4
4-3	Individual Water Rights Summary	4-6
4-4	Delivery Theme D1 Attributes.....	4-7
4-5	Delivery Theme D2 Attributes.....	4-8
4-6	Delivery Theme D3 Attributes.....	4-8
5-1	USGS Streamflow Gages in the Kiamichi River Basin	5-2
5-2	Supply Model Formulation.....	5-6
6-1	Water Quality Based on Trophic Characteristics	6-6
6-2	Trophic Classification and Impairment Status of Potential Source Waters.....	6-7
6-3	Median Annual Water Quality Values for Selected Water Quality Constituents Analyzed at Each Potential Source Water (2003-present; N/A - not applicable to waterbody).....	6-7
6-4	Trophic Classification and Impairment Status of Potential Receiving Waters	6-8
6-5	Median Annual Water Quality Values for Selected Water Quality Constituents Analyzed at Each Potential Receiving Water (2003-present).....	6-8

6-6	Summary of USFWS Preliminary Opinion Regarding Biological Consultation Process	6-11
7-1	Distribution Theme D1 Feasibility Level Opinion of Probable Capital Cost for Regional Distribution Facilities	7-18
7-2	Distribution Theme D2 Feasibility Level Opinion of Probable Capital Cost for Regional Distribution Facilities	7-18
7-3	Distribution Theme D3 Feasibility Level Opinion of Probable Capital Cost for Regional Distribution Facilities	7-20
7-4	Summary of Costs for Raw Water Transmission Alternatives	7-22
7-5	Summary Matrix of Conveyance Infrastructure and Implementation Costs	7-22
8-1	Unit Treatment Costs at WTPs	8-3
8-2	Example Breakdown of Pumping Costs by System Segment	8-6
9-1	Summary of Transmission and Supply Pipeline Costs	9-1
9-2	Summary of Distribution Pipeline Costs.....	9-2
9-3	Demand Projections (AFY and mgd) – Transmission Pipeline.....	9-3
9-4	Transmission System Pipeline Atoka to Seminole & Shawnee.....	9-3
9-5	Transmission System Pipeline Seminole/Shawnee to Stanley Draper.....	9-4
9-6	Supply System Pipeline Sardis to Atoka	9-4
9-7	Supply System Pipeline Moyers Crossing to Atoka.....	9-5
9-8	Supply System Pipeline Highway 3 to Atoka	9-5
9-9	Supply System Pipeline Hugo to Atoka.....	9-6
9-10	Sardis Debt Repayment Assumption.....	9-6
9-11	Stanley Draper WTP Demands – Theme D1.....	9-7
9-12	Calculation of Stanley Draper WTP Expansion Costs – Theme D1.....	9-8
9-13	Stanley Draper WTP Cost Allocation – Theme D1	9-8
9-14	Thunderbird Regional WTP Demands – Theme D2.....	9-9
9-15	Calculation of WTP Costs – Theme D2.....	9-10
9-16	Thunderbird Regional WTP Cost Allocation – Theme D2	9-10
9-17	Calculation of WTP Costs – Theme D3.....	9-11
9-18	Preliminary Preferred Alternative Supply from Moyers Crossing and Distribution D1	9-13
10-1	Project Demand Projections – Basis for Treatment O&M Costs	10-2
10-2	Water Treatment Plant (WTP) Variable Operating Costs per 1,000 Gallons	10-3
10-3	Recommended Alternative Supply from Moyers Crossing and Distribution D1 Annual Variable Operating Costs.....	10-3
10-4	Water Treatment Plant (WTP) and Pipeline Deferred Projects.....	10-4
10-5	Recommended Alternative Supply from Moyers Crossing and Distribution D1	10-5

10-6	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Annual Debt Service	10-6
10-7	Recommended Alternative Supply from Moyers Crossing and Distribution D1 OKC - Annual and Unit Costs.....	10-7
10-8	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Seminole - Annual and Unit Costs	10-8
10-9	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Shawnee Annual and Unit Costs	10-9
10-10	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Edmond Annual and Unit Costs	10-10
10-11	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Norman Annual and Unit Costs	10-11
10-12	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Moore Annual and Unit Costs	10-12
10-13	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Chickasha Annual and Unit Costs.....	10-13
10-14	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Midwest City Annual and Unit Costs.....	10-14
10-15	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Mustang Annual and Unit Costs	10-15
10-16	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 El Reno Annual and Unit Costs	10-16
10-17	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Yukon Annual and Unit Costs	10-17
10-18	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Calumet Annual and Unit Costs.....	10-18
10-19	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 Okarche Annual and Unit Costs	10-19
10-20	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 All Participants Monthly Construction.....	10-20
10-21	Recommended Alternative - Supply from Moyers Crossing and Distribution D1 All Participants Annual Unit Costs (Tables 10-7 through 10-19)	10-21
11-1	Performance Measures Estimates.....	11-5
11-2	System Alternative Analyzed and Descriptor Used in the Presentation of Results.....	11-5
11-3	Summary of Non-Economic Performance Measures Used for the System Alternative Ranking	11-9

Section 1 Introduction

1.1 Project Overview

The Regional Water Supply Study for Central Oklahoma (the study) was conducted to characterize the financial, technical, and regulatory feasibility of bringing additional water supplies from southeast Oklahoma to meet the projected needs of participating central Oklahoma communities (participants) through 2060. The study was initiated and facilitated through a collaboration of central Oklahoma communities who together are contemplating the potential formation of the Oklahoma Regional Water Utilities Trust (ORWUT). Participants in the study included the following: Central Oklahoma Water Resource Authority (Mustang, Yukon, El Reno, Piedmont, Okarche, and Calumet), City of Chickasha, City of Edmond, City of Norman, City of Midwest City, City of Seminole, City of Oklahoma City, City of Moore, City of Del City, City of Shawnee, and Town of Goldsby.



The water supply project contemplated in the study, referred to as the “project” in this report, would include acquisition of Sardis Lake, a new surface water diversion, pumping and pipeline conveyance infrastructure, metro-area terminal storage, water treatment, and transmission facilities to deliver either raw or treated water to the participating water providers.

Section 1
Introduction

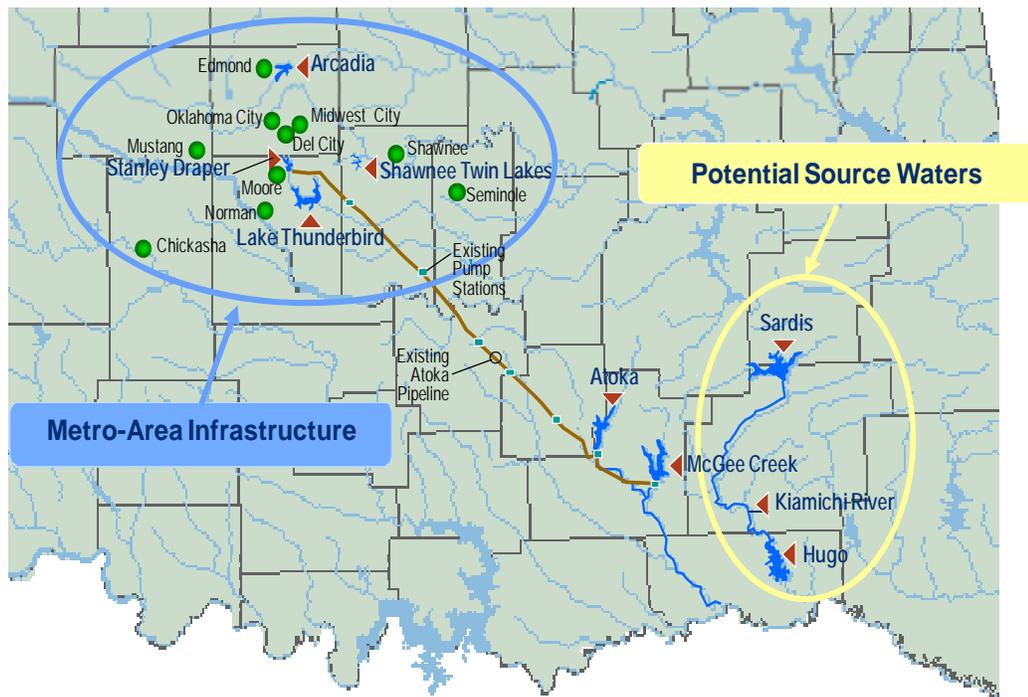


Figure 1-1
Alternatives for Each Major Project Component

Alternatives for each major project component were identified and assessed as part of the study, as shown in **Figure 1-1**. It is anticipated that the majority of the pipeline alignment would parallel the existing Oklahoma City Atoka Pipeline using the existing easement from Atoka Lake to Lake Stanley Draper. Alternate diversion sites in the Kiamichi River Basin in southeast Oklahoma, and alternative approaches to metro-area terminal storage, treatment, and transmission were evaluated as described in subsequent sections of this report.

The project's construction and operation could be administered through ORWUT. The primary goal of the study was to provide sufficient information for the participants to determine whether each will continue with the next step toward implementation of the project. An overview of the study approach is provided in **Figure 1-2**. Each of these steps is described in more detail in subsequent sections of this report.

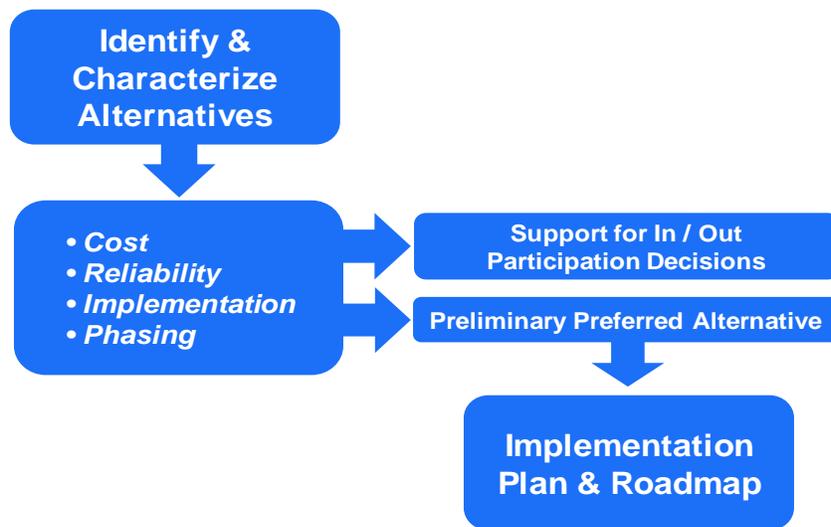


Figure 1-2
 Study Process Overview

Participants and CDM met during five separate Workshops to continually communicate the progress and gather input from each with regards the needs of each individual. During Workshop #1 the participants, through a facilitated process, defined the following mission statement for the project.

To engage in a facilitated process which recognizes the broad differences in group members and allows us to make informed decisions on participation (opt in/opt out) in a regional water supply project with particular consideration to cost and timing.

To implement the Mission Statement, communication of project progress and milestones were critical for participants to make informed decisions with regards to this project. To facilitate the communication between CDM and participants weekly progress reports were distributed to all participants to provide continual updates of progress. These reports provided up to date information related to progress, data collection, initial findings, and project milestones. **Figure 1-3** is an example of the work progress schedule followed throughout the project.

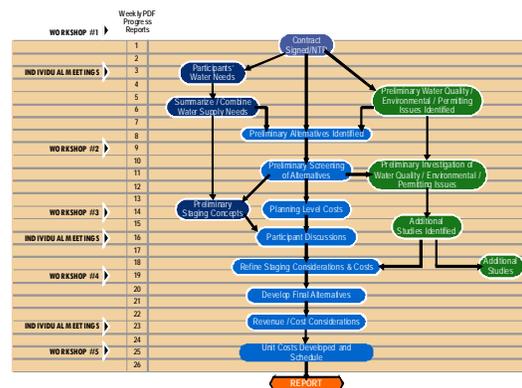


Figure 1-3
 Work Progress Schedule

1.2 Demand Projections and Water Rights Needs

Section 2 of this report reviews total water demand projections for Oklahoma City and the incremental water supply needs for each of the nine other participants in this study were assembled for analysis. Incremental water supply needs, for purposes of this study, are the water supplies the participants are requiring from the project while maintaining their existing resources. This approach allows for the establishment of both the infrastructure required and the additional water rights needed to meet participant demands.

Figure 1-4 shows the project demands along with the need for resources and infrastructure through 2060 required to receive water from southeast Oklahoma.

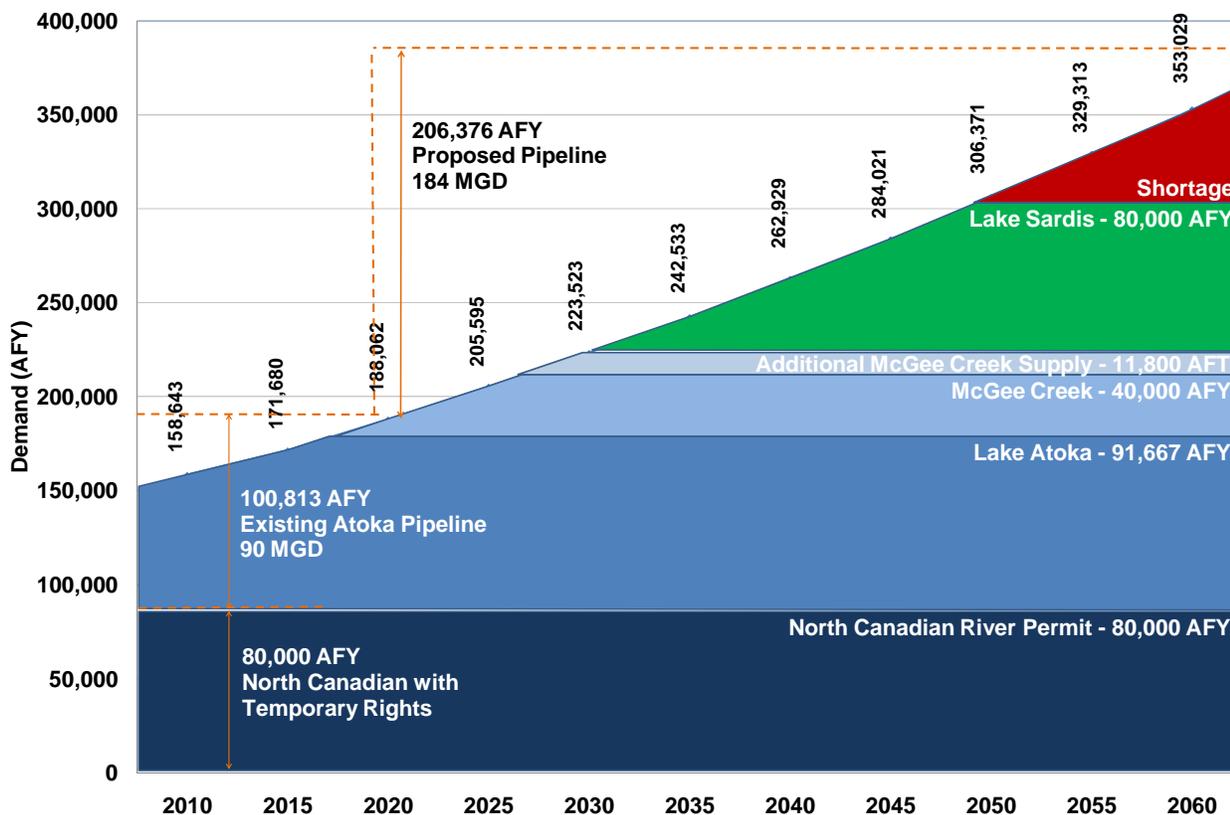


Figure 1-4
 Project Demands and the Need for Resources and Infrastructure through 2060

1.3 Source and System Alternatives

Section 3 of this report reviews water needs of participants and where they currently acquire water existing supplies. This review includes projection of individual demands from three primary source categories: local surface water bodies (Lake Thunderbird, Arcadia Lake, Shawnee Twin Lakes, Tecumseh Lake and Lake Stanley

Draper), local groundwater pumping (Garber-Wellington Aquifer), and purchases of water from the Oklahoma City Water Utility Trust (OCWUT). OCWUT has an additional type of supply, as it already acquires water from surface water bodies in southeast Oklahoma (Atoka Lake and McGee Creek Reservoir) via the Atoka Pipeline system. The Source and System Alternatives section of this report provides a summary of existing supplies and projected demands through 2060 and is reported in 5-year increments for use in other sections of this report.

1.4 Supply and Transmission Alternatives

Section 4 of this report reviews the four source alternatives that were considered in the development of this report. **Figure 1-5** reflects these alternatives and their general location within the Kiamichi River Basin. The four source alternatives consist of: Sardis Lake, Hugo Lake, the Kiamichi River at Moyer's Crossing, and the Kiamichi River at Highway 3. These four sites were selected based on previous evaluations and anticipated availability of water supplies and for consistency with Oklahoma City's pending permit application for water from Sardis Lake. Water from one of these withdrawal locations will be pumped to the McGee Creek Reservoir, Atoka Lake, or a constructed receiving tank prior to introduction into the existing and new Atoka Pipelines (see Sections 4.2 and 4.3).

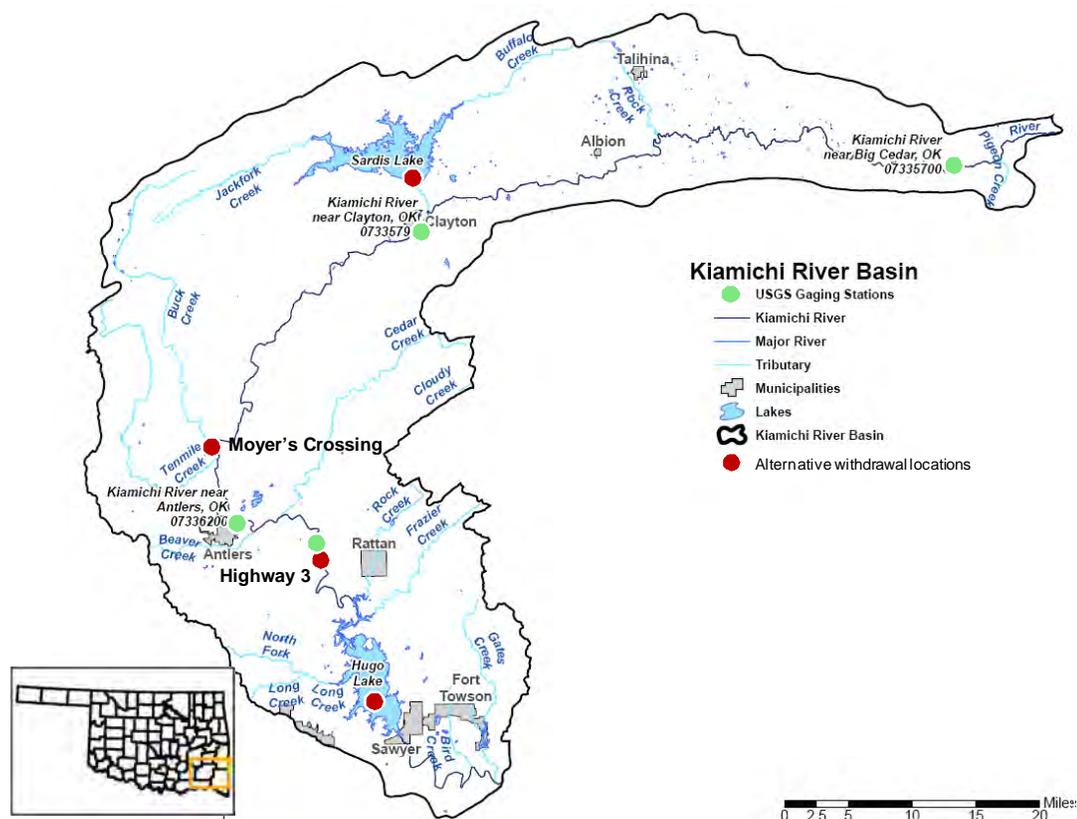


Figure 1-5
Source Alternatives Map

Intermediate storage between the sources (diversions) in the Kiamichi River Basin and the Atoka Pipeline(s) will offer operational flexibility, especially for the riverine source alternatives, since the timing of withdrawals need not necessarily match the timing of actual water demands. Water would be pumped from one of the four Kiamichi River Basin source alternatives into one of the three intermediate storage alternatives before entering the existing and new parallel Atoka Pipelines. Three alternatives for intermediate water storage prior to entering the Atoka Pipeline(s) were considered; Atoka Lake, McGee Creek Reservoir, and a constructed holding tank. Both Atoka Lake and McGee Creek Reservoir are existing supply sources for Oklahoma City. The McGee Creek Reservoir system delivers water to Atoka Lake and both sources deliver water to Oklahoma City through the existing Atoka Pipeline (See Section 4.3).

Once the water is brought from the southeast Oklahoma region via the parallel Atoka Pipelines, it will need to be delivered to the participants in central Oklahoma. In order to clearly define the analysis, three alternative delivery themes were developed. These themes represent, as a starting point, the extremes between a centralized and decentralized system. Ultimately, a hybrid configuration of the delivery themes will probably be the most practical solution, but starting with the themes described below allows a general comparison between a centralized and decentralized system.

The three delivery themes evaluated were as follows:

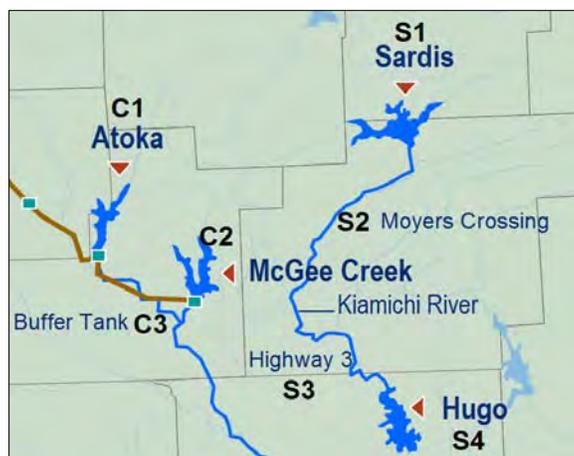
- Theme D1 - Centralized: Regional Treatment at (expanded) Stanley Draper Water Treatment Plant
- Theme D2 - Semi-Centralized: New Regional Water Treatment Plant at Lake Thunderbird
- Theme D3 - Decentralized: Local Treatment at individual plants

1.5 Summary of Water Availability Analysis

Section 5 of this report reviews the water availability review results. The amount of water available to participants once a pipeline project from the Kiamichi River Basin is completed was estimated with a computer model of the hydrology and operations of the contributing basins and reservoirs. The analysis estimated the yield that would be sustainable from each site even during the most severe drought of record. The analysis also considers the potential impacts of pending allocations that may someday become permitted withdrawals by other parties. This analysis was a precursor to a more detailed combined modeling analysis of the entire regional raw water system, which is also included in this report (Section 11).

Results of the water availability analysis are presented in Section 5 of this report. Several key findings are listed below:

- Oklahoma City's pending request for 80,000 AFY from Sardis Lake would have to be increased to meet the full demand over the 50-year planning period for this project.



- Diversions from Sardis Lake would be a marginal alternative, and would barely provide sufficient water to meet projected demands in 2060. Any of the other source alternatives would be marginal without augmenting supply with Sardis releases. However, if Sardis Lake releases supplemental flow when needed, the withdrawal alternatives at Moyer's Crossing, Highway 3, and Hugo Lake could provide ample supply through 2060 *under existing*

permitted water rights allocations only, and recognizing that Oklahoma City's pending request for 80,000 AFY from Sardis would have to increase in volume. Concerted releases of water from Sardis Lake may provide opportunities for basin-wide water management to support current and future withdrawals as well as promote stability, even improvement, in local ecosystems.

- There are significant increases in average 10-year yield when comparing normal hydrologic conditions to the drought of record. Under normal conditions (and existing water allocations), the yield to ORWUT could increase by as much as 150 – 300 mgd above the sustainable yield during drought conditions, depending on the source.
- When pending future allocations are considered (senior to Oklahoma City's pending allocation from Sardis Lake of 80,000 AFY; additional 120,000 AFY from Sardis Lake and additional 310,000 AFY from Hugo Lake assumed), the system would be over-allocated during severe drought conditions (by 10 – 20 percent in most cases, with more extreme deficits expected if Sardis were the sole source for participants), but could reliably supply all users during average hydrologic conditions. The projected deficits could potentially be managed through drought-year demand management measures, negotiated use agreements, additional system storage, or supplemental local sources. Additional study would be required.
- The decision of whether to route water through Atoka Lake or McGee Creek Reservoir does not noticeably affect system yield.

1.6 Environmental Regulatory Requirements

Section 6 describes the various alternatives under consideration for the transfer of water from southeastern Oklahoma to central Oklahoma. Regardless of the alternatives selected, significant environmental regulatory requirements must be addressed prior to receiving approval from regulatory agencies for implementation of an alternative. This section provides an overview of the key environmental issues associated with water transfers and water delivery pipeline construction, as they are known at this time. This information will be presented mostly within the context of applicable federal and state laws and regulations. Compliance with these regulatory requirements does not typically occur independently of one another. For example, compliance with federal Clean Water Act requirements may require a demonstration of compliance with federal Endangered Species Act requirements.



1.7 Estimated Conveyance Infrastructure Cost

Section 7 of this report reviews infrastructure needs to receive water from the source water alternatives. Conveyance infrastructure is a significant component required to utilize additional water supplies acquired from southeast Oklahoma. Section 4 of this report reviewed alternatives and were formulated for three primary system components:

1. Raw water transmission from a source water alternative in southeast Oklahoma
2. Increased raw water transmission capacity along the existing McGee Creek and Atoka Pipeline corridors
3. Regional distribution of treated or raw water to each participant

Section 7 of the Report provides feasibility level opinions of probable costs developed to quantify capital and project implementation costs for infrastructure identified water delivery themes. Section 7 also reviews the methodology used to estimate required conveyance infrastructure components and develop opinions of probable costs.

1.8 Estimated Operations and Maintenance

Following the estimation of infrastructure cost in the previous section, Section 8 provides for an analysis of operational and maintenance (O&M) costs associated with this project. O&M costs include power costs for pumping, water treatment costs, and annual maintenance on the conveyance infrastructure. These costs were determined using the water supply simulation tool developed for this project. The scenario tool includes a conceptual-level network representation of the regional water system that allows for water supply-and-demand mass balance calculations to be performed on each pipeline in the system in order to determine the flow of water required to meet the projected demands. Pumping and treatment costs are then derived from the determined flow rates. Additional information about the simulation tool can be found in **Appendix E** to this report.

1.9 Project Cost Distribution to Participants

Distribution costs components were established in Section 7 and 8 of this report then divided between participants in Section 9 based on projected demands reported in Section 3. The distribution of project capital costs will be compared with operational costs in Section 10 in order to establish an estimated unit cost for each participant. Four (4) supply alternatives were analyzed in detail reflecting the four source alternatives considered in this report.

1.10 Unit Cost Distribution for Participants

The previous section developed the distribution of costs to participants. Section 10 provides an analysis of the impact of the costs on the individual participants. The costs from Section 7, 8, and 9 will be analyzed and overall costs per 1,000 gallons developed per participant. The costs per participant will also be expressed as a cost per water connection, based on capital and operation and maintenance costs (existing and new).

1.11 Decision Modeling

Section 11 summarizes the process and method to compare the system-wide alternatives or system alternatives. System alternatives are composed of alternatives for the southeast Oklahoma part of the system (source alternatives and intermediate delivery alternatives) and the central Oklahoma part of the system (delivery alternatives). The source, intermediate delivery and delivery alternatives (the “building blocks” of the system alternatives) were described in Section 3.

The objective of the system alternative comparison and ranking was to define, in a defensible and transparent way, a viable system alternative as a starting point for subsequent phases of the project. Subsequent phases include environmental documentation, a selection of a definitive source selection, route and alignment verification and preliminary design. In order to identify a consented system

alternative, a multi criteria ranking approach was selected. The process to implement that approach and the results of the process are presented in this section.

1.12 Schedule of Future Activities

Section 12 of this report provides a listing of activities needed in the execution of this project. Section 2 reported that the parallel Atoka Pipeline will need to be operational by 2020 in order to meet the participants' water supply needs. Storage rights from Sardis Lake should be acquired prior to the construction of any improvements. In addition, the infrastructure and additional water rights to deliver water from one of the four source water alternatives needs to be in place by 2030 to meet the participants' projected water demands.

In order to accomplish the 2020 and 2030 targets, a series of actions and projects will have to occur. These can be categorized as follows:

- Organizational
- Environmental & Permitting
- Water Rights
- Public Outreach
- Engineering & Construction
- Funding/Financing

Section 12 reviews the major steps necessary to be able to operate the new Atoka Pipeline by 2020 and receive water from the selected diversion location by 2030.

1.13 Summary of Economic and Non-Economic Findings

Section 13 of this report reviews the findings, economic and non-economic, resulting from the investigations completed in this study. Consideration of the various aspects of this project results in the consideration of the following:

- Economic Review of Alternatives - Capital Costs
- Economic Review of Alternatives - Operation and Maintenance
- Economic Review of Alternatives - Unit Cost Distribution to Participants
- Comparison of Alternatives - Non-Economic Considerations

Section 13 concludes with a Summary of Alternatives Comparison wherein the twelve separate source alternatives are represented as to their ranking score established by project participants. This figure identifies the Moyers Crossing as the most favorable means of collecting waters and then delivered using Theme D1 as discussed within the report.

Section 2

Demand Projections and Water Right Needs

2.1 Introduction

This section summarizes total water demand projections for Oklahoma City and the incremental water supply needs for each of the nine other participants in this study. Incremental water supply needs, for purposes of this study, are the water supplies the participants are seeking from the project. They do not include projected water demands that would be met by other sources. This approach allows for the establishment of both the infrastructure required and the additional water rights needed to meet study participants' project needs through the year 2060.

To initiate discussions, preliminary project needs were developed for each participant at the beginning of this study. In accordance with the scope of work for the study, the participants supplied their final project water delivery expectations based on their individual demand projections and their other available or anticipated sources of supply. The annual project need projections, reported in five year time increments, provided the basis for all analyses required for this project.

2.2 Oklahoma City Demand Projections

Demand projections for Oklahoma City included the needs of seven (7) Base Load Customers who chose not to participate in this study but will ultimately receive water from the project. The following communities represent the Base Load Cities for this project: Blanchard, Cashion, Newcastle, Purcell, The Village, Tuttle, and Warr Acres. **Table 2-1** represents the projected demands for Oklahoma City and the seven Base Load Customers in acre-feet per year (AFY). The information contained in **Tables 2-1** and **2-1A** was derived from data contained in the latest Master Plan Report completed for Oklahoma City in 2003.

Section 2

Demand Projections and Water Right Needs

Year	Oklahoma City	Base Load Cities							Total
		Blanchard	Cashion	Newcastle	Purcell	The Village	Tuttle	Warr Acres	
2010	116,127	837	26	644	0	2,009	11	2,057	121,711
2015	123,886	1,014	44	803	0	1,990	44	2,106	129,888
2020	132,164	1,230	68	913	0	1,971	95	2,156	138,596
2025	140,994	1,491	99	1,036	72	1,953	168	2,208	148,020
2030	150,414	1,807	141	1,176	96	1,934	244	2,260	158,073
2035	160,464	2,191	196	1,335	105	1,916	372	2,314	168,894
2040	171,186	2,657	270	1,517	115	1,897	555	2,369	180,565
2045	182,623	3,221	365	1,722	126	1,879	804	2,426	193,167
2050	194,826	3,905	451	1,956	138	1,862	1,079	2,483	206,700
2055	207,028	4,589	538	2,190	149	1,844	1,354	2,541	220,234
2060	219,230	5,274	624	2,424	161	1,826	1,629	2,599	233,767

Table 2-1
 Oklahoma City and Base Load Cities' Demands (AFY)

Year	Oklahoma City	Base Load Cities							Total
		Blanchard	Cashion	Newcastle	Purcell	The Village	Tuttle	Warr Acres	
2010	103.67	0.75	0.02	0.57	0.00	1.79	0.01	1.84	108.66
2015	110.60	0.91	0.04	0.72	0.00	1.78	0.04	1.88	115.96
2020	117.99	1.10	0.06	0.82	0.00	1.76	0.08	1.92	123.73
2025	125.87	1.33	0.09	0.92	0.06	1.74	0.15	1.97	132.14
2030	134.28	1.61	0.13	1.05	0.09	1.73	0.22	2.02	141.12
2035	143.25	1.96	0.17	1.19	0.09	1.71	0.33	2.07	150.78
2040	152.83	2.37	0.24	1.35	0.10	1.69	0.50	2.11	161.20
2045	163.04	2.88	0.33	1.54	0.11	1.68	0.72	2.17	172.45
2050	173.93	3.49	0.40	1.75	0.12	1.66	0.96	2.22	184.53
2055	184.82	4.10	0.48	1.96	0.13	1.65	1.21	2.27	196.61
2060	195.72	4.71	0.56	2.16	0.14	1.63	1.45	2.32	208.69

Table 2-1A
 Oklahoma City and Base Load Cities' Demands (mgd)

At the beginning of this study, Central Oklahoma Water Resources Authority (COWRA) projected their project needs increasing from 9,745 AFY (8.7 million gallons per day or "mgd") in 2010 to 40,325 AFY (36 mgd) in 2060. After the completion of initial assessments COWRA requested the reduction of their maximum project deliveries to 22,403 AFY (20 mgd). The difference between initial and final COWRA project needs was then assigned to Oklahoma City. The study assumes that in the future, COWRA project needs beyond the revised total will be provided by Oklahoma City through treated water wholesale purchase agreements. Therefore Oklahoma City's total demand was increased, for the purpose of this study, to reflect this requested change. Tables 2-2 and 2-2A provide the additional demand projected for Oklahoma City based on the revised COWRA demands.

Year	Oklahoma City + Base Load	Additional COWRA	Total
2010	121,711	0	121,711
2015	129,888	0	129,888
2020	138,596	0	138,596
2025	148,020	0	148,020
2030	158,073	0	158,073
2035	168,894	2,576	171,471
2040	180,565	5,713	186,277
2045	193,167	8,737	201,904
2050	206,700	11,762	218,462
2055	220,234	14,898	235,132
2060	233,767	17,922	251,690

Table 2-2
Oklahoma City + Base Load Cities + COWRA Extra Demands (AFY)

Year	Oklahoma City + Base Load	Additional COWRA	Total
2010	108.66	0.00	108.66
2015	115.96	0.00	115.96
2020	123.73	0.00	123.73
2025	132.14	0.00	132.14
2030	141.12	0.00	141.12
2035	150.78	2.30	153.08
2040	161.20	5.10	166.30
2045	172.45	7.80	180.25
2050	184.53	10.50	195.03
2055	196.61	13.30	209.91
2060	208.69	16.00	224.69

Table 2-2A
Oklahoma City + Base Load Cities + COWRA Extra Demands (mgd)

2.3 Incremental Water Supply Needs for Each Participant

All study participants need additional water supplies to meet projected 2060 demands. **Tables 2-3** and **2-3A** represent the reported incremental needs of each participant to be provided by the project, other than Oklahoma City and Base Load Cities. The following participants provided the information contained in **Tables 2-3** and **2-3A**: COWRA, Moore, Chickasha, Norman, Shawnee, Seminole, Del City, Edmond, and Midwest City.

Section 2

Demand Projections and Water Right Needs

Year	COWRA	Moore	Chickasha	Norman	Shawnee	Seminole	Del City	Edmond	Midwest City	Total
2010	9,745	8,849	6,049	3,999	3,472	2,016	1,680	1,120	0	36,931
2015	12,770	9,073	6,161	3,372	3,584	2,240	1,680	2,912	0	41,793
2020	15,794	9,409	6,273	5,556	3,584	2,464	1,680	4,705	0	49,466
2025	18,930	9,745	6,385	7,841	3,696	2,800	1,680	6,497	0	57,575
2030	21,955	9,969	6,497	10,227	3,808	3,024	1,680	8,289	0	65,450
2035	22,403	10,305	6,609	12,702	3,921	3,248	1,680	10,081	112	71,062
2040	22,403	10,641	6,721	15,268	4,033	3,472	1,680	11,986	448	76,651
2045	22,403	10,865	6,833	17,934	4,145	3,696	1,680	13,778	784	82,118
2050	22,403	11,201	6,945	20,700	4,257	4,033	1,680	15,570	1,120	87,909
2055	22,403	11,537	7,057	24,061	4,369	4,257	1,680	17,362	1,456	94,182
2060	22,403	11,762	7,169	26,514	4,481	4,481	1,680	20,947	1,904	101,339

**Table 2-3
 Incremental Supply Needs Identified by Participants (AFY)**

Year	COWRA	Moore	Chickasha	Norman	Shawnee	Seminole	Del City	Edmond	Midwest City	Total
2010	8.70	7.90	5.40	3.57	3.10	1.80	1.50	1.00	0.00	32.97
2015	11.40	8.10	5.50	3.01	3.20	2.00	1.50	2.60	0.00	37.31
2020	14.10	8.40	5.60	4.96	3.20	2.20	1.50	4.20	0.00	44.16
2025	16.90	8.70	5.70	7.00	3.30	2.50	1.50	5.80	0.00	51.40
2030	19.60	8.90	5.80	9.13	3.40	2.70	1.50	7.40	0.00	58.43
2035	20.00	9.20	5.90	11.34	3.50	2.90	1.50	9.00	0.10	63.44
2040	20.00	9.50	6.00	13.63	3.60	3.10	1.50	10.70	0.40	68.43
2045	20.00	9.70	6.10	16.01	3.70	3.30	1.50	12.30	0.70	73.31
2050	20.00	10.00	6.20	18.48	3.80	3.60	1.50	13.90	1.00	78.48
2055	20.00	10.30	6.30	21.48	3.90	3.80	1.50	15.50	1.30	84.08
2060	20.00	10.50	6.40	23.67	4.00	4.00	1.50	18.70	1.70	90.47

**Table 2-3A
 Incremental Supply Needs Identified by Participants (mgd)**

2.4 Summary of Supply Needs

The combination of the total Oklahoma City demands reported in **Tables 2-2** and **2-2A** and the incremental supply needs of the remaining participants reported in **Tables 2-3** and **2-3A** provide the total supply needs for this study. In addition, this information provides the basis for evaluation of water rights requirements and infrastructure staging opportunities. **Tables 2-4** and **2-4A** provide the Oklahoma City total and the participants' incremental supply needs for delivery via the project. The combined total is the amount of water that would need to be delivered through a combination of the existing Atoka Pipeline and the new parallel pipeline from southeast Oklahoma contemplated in this study. The new diversion, conveyance, and treatment facilities were sized to meet the incremental difference between total demands and existing infrastructure capacities.

Year	Oklahoma City Total	Participants Total	Project Total
2010	121,711	36,931	158,643
2015	129,888	41,793	171,680
2020	138,596	49,466	188,062
2025	148,020	57,575	205,595
2030	158,073	65,450	223,523
2035	171,471	71,062	242,533
2040	186,277	76,651	262,929
2045	201,904	82,118	284,021
2050	218,462	87,909	306,371
2055	235,132	94,182	329,313
2060	251,690	101,339	353,029

**Table 2-4
 Total Project Supply Needs Identified by Participants (AFY)**

Year	Oklahoma City Total	Participants Total	Project Total
2010	108.66	32.97	141.63
2015	115.96	37.31	153.27
2020	123.73	44.16	167.89
2025	132.14	51.40	183.54
2030	141.12	58.43	199.55
2035	153.08	63.44	216.52
2040	166.30	68.43	234.73
2045	180.25	73.31	253.56
2050	195.03	78.48	273.51
2055	209.91	84.08	293.99
2060	224.69	90.47	315.16

**Table 2-4A
 Total Project Supply Needs Identified by Participants (mgd)**

Figure 2-1 shows the demands, in acre-feet per year, graphically for each participant in direct relation to each other.

Section 2

Demand Projections and Water Right Needs

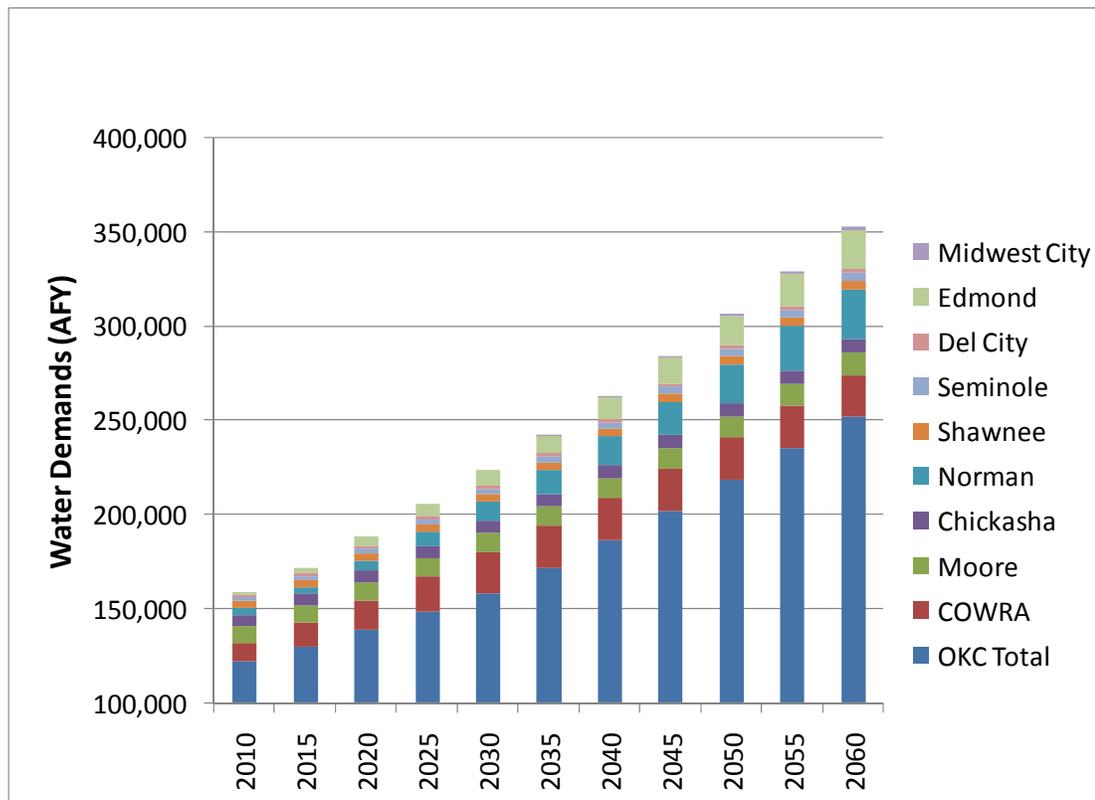


Figure 2-1
 Projected Water Demands

2.5 Additional Water Rights Required

The City of Oklahoma City possesses surface water permits totaling 223,467 AFY at a combination of multiple diversion sites. This total does not sufficiently meet project demands projected for 2060. **Tables 2-5 and 2-5A** provide a summary of surface water permits currently possessed by Oklahoma City and the amount of additional water rights required to meet project demands. For simplicity in preliminary planning the study assumes that water rights held in Southeast Oklahoma by the City of Oklahoma City may be made available to the participants on a contractual basis and that new water rights in Southeast Oklahoma supplies would be shared in some manner.. If water rights are to instead be held individually, the amount of additional water rights needed to meet the 2060 demand on the project would be higher than shown in **Tables 2-5 and 2-5A**.



November 20, 2013

Mr. Brian Nazareus
Ryley Carlock & Applewhite
1700 Lincoln Street, Suite 3500
Denver, CO 80203-4535

**Re: Future Population of Oklahoma City and Other Municipalities Interested in
Water Supply from Sardis Lake**

Dear Mr. Nazareus:

At your request, BBC Research & Consulting (BBC) has examined the projections of future population for Oklahoma City, for the additional cities currently served by Oklahoma City through wholesale contract arrangements, and for other cities in the region that have indicated the desire to receive water supplies from Sardis Lake in the future. We have also reviewed historical information regarding population growth in the region and other sources of demographic projections relevant to these entities. This letter summarizes the results of our review and additional research and provides our conclusions regarding future population growth for the relevant municipalities.

Background

BBC experience. BBC is a 43-year-old economic research firm based in Denver. I am a Managing Director at BBC and currently lead BBC's water, natural resource and environmental economics practice. BBC has considerable experience and expertise in regional economic, demographic and water demand forecasting. We have produced long term forecasts for a wide range of entities including the Denver Water Department, Colorado Springs Utilities, San Antonio Water System, the Wyoming Water Development Commission, and the Colorado River Water Conservation District. We have also performed recent water demand-related studies for the Texas Water Development Board and the Phoenix Water Services Department. A copy of my resume is attached at the end of this letter.

Context for this assignment. Oklahoma City and other cities and water providers in the region are seeking to develop additional water supplies to meet future needs. In particular, these entities wish to construct and operate a pipeline to bring raw water from Sardis Lake, in southeastern Oklahoma, to the Oklahoma City region.

A dispute has arisen regarding the amount of water that Oklahoma City, and the other entities participating in this project, will need in the future and – correspondingly – the appropriate size for the proposed project. One of the elements at the core of this dispute is the future population projections that provide part of the basis for determining the need for the project and the size of the project (in terms of anticipated future water withdrawals from Sardis Lake).

BBC was retained by Ryley Carlock & Applewhite, acting as counsel for the City of Oklahoma City and Oklahoma City Water Utilities Trust, to review the various population projections incorporated in previous estimates of future water demand for Oklahoma City and the other entities participating in the project, conduct additional demographic research as we deemed necessary, and provide our independent assessment of future population growth for Oklahoma City and the other participants.

Oklahoma City is by far the largest of the entities involved in the proposed project. Because the projections of future population in Oklahoma City have been the primary issue of demographic dispute in this case, our assessment begins by considering future population growth in Oklahoma City in particular.

Oklahoma City Population Projections

Much of the dispute over projected future water demands related to the proposed project appears to stem from the large difference between two population forecasts that have been used to project future demands for Oklahoma City. These population forecasts were used to project water demands in the *Regional Raw Water Supply Study for Central Oklahoma* (RRWSS) produced in March 2009 and in the *2012 Update of the Oklahoma Comprehensive Water Plan* (OCWP). BBC's evaluation began with a review and assessment of each of these population projections.

Population projections from the RRWSS. The projections of future Oklahoma City population in the RRWSS were based on extending the forecasts from a previous study, the *Water Master Plan Report*, produced by MWH Americas for the Oklahoma City Water Utilities Trust in 2003.

RRWSS Methods and Results. The population projections in the RRWSS were based on the relatively simple approach of calculating the average annual population growth rate in Oklahoma City over the ten year period from 1990 through 2000, and assuming that same growth rate would continue to occur throughout the forecast period. The forecasting approach used in the RRWSS can be described as an exponential projection.

Based on the calculated average annual growth rate of about 1.3 percent per year between 1990 and 2000, this forecast produced a projected population for Oklahoma City in 2060 of about 1,087,300 residents. For reference purposes, the 2010 Census indicated there were 579,999 residents in Oklahoma City on April 1st of that year, while the most recent estimate of the city's population in 2012 (from the American Community Survey) was 599,199 residents.

RRWSS Assessment. The exponential forecasting approach used in the RRWSS is a fairly common approach for projecting population and corresponding future water demands, but is a technique that is most often used by smaller water systems. This is a purely statistical method of projecting future population and does not incorporate or require an extensive theoretical foundation regarding the sources of future population growth. As noted in the review of these population projections by CDM Smith in their July 23, 2012 memorandum: “Application of the 1990 to 2000 growth rate for future years makes the underlying assumption that whatever demographic or economic conditions were driving the population growth in Oklahoma City from 1990 to 2000 will continue year after year through 2060.”¹

Another potential concern regarding the RRWSS population projections is their reliance on the growth rate experienced over the relatively short period of ten years (from 1990 through 2000) to forecast future growth over a 60 year period. However, BBC’s review of the longer-term history of population growth in Oklahoma City indicates the 1.3 percent growth rate experienced from 1990-2000 is not inconsistent with the longer-term history of the city’s population growth. As shown in Figure 1, since 1950 the average annual rate of population growth in Oklahoma City has been about 1.46 percent per year. The city’s population growth rate has actually accelerated slightly since year 2000.

Figure 1. Oklahoma City Population Growth Since 1950

Year	Oklahoma City Population	Avg. Annual Growth Increment	Annual Growth Rate by Decade*	Cumulative Annual Growth Rate Post 1950	Change in Cumulative Annual Growth Rate
1950	243,504				
1960	324,253	8,075	2.91%	2.91%	
1970	368,856	4,460	1.30%	2.10%	-0.81%
1980	404,255	3,540	0.92%	1.70%	-0.39%
1990	444,719	4,046	0.96%	1.52%	-0.19%
2000	506,132	6,141	1.30%	1.47%	-0.04%
2010	579,999	7,387	1.37%	1.46%	-0.02%
2012	599,199	9,600	1.64%	1.46%	0.01%

Sources: 1950 – 2000 population counts for Oklahoma City from Water Master Plan Report for Oklahoma City Water Utilities Trust (2003). 2010 population from US Census, 2012 population from American Community Survey. All calculations provided by BBC.

In sum, the population growth projections used in the RRWSS have a relatively weak theoretical foundation and are based on a short historical period relative to the length of the forecast period. However, these projections are not inconsistent with the historical growth experience in Oklahoma City. It should be noted that the RRWSS projections of 1.3 percent annual growth under projected the growth that has occurred in Oklahoma City since year 2000.

¹ CDM Smith, Draft Memorandum, July 23, 2012, page 10.

Population projections from the OCWP. The OWCP projections of future Oklahoma City population were derived from state and county population projections produced by the Oklahoma Department of Commerce (ODC), the official state demographic source for Oklahoma.

OCWP Methods and Results. There are three important elements involved in the OCWP population forecasts for Oklahoma City: the statewide population projections produced by the ODC, the corresponding ODC population projections for individual Oklahoma counties, and the derivation of the projected population for Oklahoma City based on the ODC county-level projections.

The ODC statewide population projections were based on a cohort-component model of Oklahoma's population. These types of models project the number of births and deaths that will occur in each future year based on the age structure of the population and fertility and mortality rates by age cohort. They also incorporate assumptions about net migration (the difference between the number of individuals that move into the state each year and the number that move out). The net migration assumptions are the most challenging to forecast. As noted in the latest update to the ODC projections (produced in 2012), "As difficult as the previous variables are to project, migration is likely even more difficult to gauge...The only consistency in Oklahoma's recent migration history has been its unpredictability."²

While ODC uses the cohort-component model to develop statewide population projections, the county-level projections are based on simpler trend-based forecasts. In most cases, county populations were forecast based on a linear regression analysis of population growth from 1950-2012. ODC then makes adjustments, as needed, to balance the statewide population forecast to the sum of the county-level population projections. The 2012 ODC population projection update describes these adjustments: "Over the course of the 65 years between 2010 and 2075, the required adjustment averaged 0.2% of each year's total population. This was deemed an acceptable range of variation and was added into the statewide population total for balancing purposes."³

The manner by which the ODC projections were used to develop population projections at the municipal level is less clear. The most recent update to the ODC projections in 2012 does not provide any projections for municipal areas. The only description of the development of the municipal population projections used in the OCWP is limited to the following information: "The Oklahoma Department of Commerce (ODC) prepared a special tabulation of population projections for the OWRB in 2002 that estimates population to the year 2060 for each county, city, and town, and remaining rural area within each county. These county-level projections were calibrated by CDM to match 2007 Census estimates of population. This was done to

² 2012 *Demographic State of the State Report*. Oklahoma Department of Commerce, page 7.

³ Ibid. page 8.

capture changes in economic growth and demographic patterns since the 2002 release. The calibration adjusted the projections to align with the most recent available data.”⁴

Based on these three methodological elements, the latest update to the OCWP indicates a projected population for Oklahoma City of 673,025 residents in 2060. This figure would represent an increase of less than 100,000 residents over the next fifty years relative to Oklahoma City’s 2010 population of 579,199.⁵ This population growth projection would correspond to an average annual growth rate of about 0.3 percent per year.

OCWP Assessment. The OCWP population projections start from a strong theoretical foundation in the ODC cohort-component model. Although net migration is difficult to predict, and the accuracy of net migration assumptions are critical to the accuracy of the overall forecast, cohort-component models such as the approach used by the ODC are the “industry standard” for developing long-term population projections. Similar models are used by the Census Bureau and many of the official state demographers across the nation.

Many states with statewide cohort-component models also use simplified methods to allocate projected future statewide population growth to the county level. The approaches used to make this type of allocation vary, but the Oklahoma approach seems generally reasonable. The similarity between the sum of the county level trend-based projections and the state level cohort-component based projections, noted earlier, provides additional support for this methodology.

It is important to note that the 2002 ODC statewide and county-level projections underestimated actual population growth in the state (and many of the counties) through 2007. Even after rebenching the forecasts to 2007 population estimates, they also underestimated the population of the state and many of its counties in 2010.⁶ This error may have resulted from inaccuracy in the net migration assumptions.

Our greatest concern in regard to the OCWP projections, however, relates to the derivation of the municipal-level population forecasts from the county population forecasts. As noted previously, municipal projections are not typically produced by ODC and there is little documentation regarding the process that was used for developing the municipal forecasts. More importantly, we believe the municipal population forecast for Oklahoma City is fundamentally inconsistent with the county-level projections for the seven counties that comprise the Oklahoma City Metropolitan Statistical Area (MSA). While further detail regarding

⁴ *Oklahoma Comprehensive Water Plan 2012 Update, Water Demand Forecast Report*, page 3-2.

⁵ 2060 Oklahoma City population based on reported “Retail Population Served” from *Oklahoma Comprehensive Water Plan, Central Region Report*, page 25. From that table, the 2010 population served was reported as 564,969 -- about 15,000 fewer people than the actual 2010 population of Oklahoma City according to the Census.

⁶ CDM Smith, Draft Memorandum, July 23, 2012, pages 10-12.

the basis for this conclusion is provided in the next section of this letter, this issue can be seen simply by comparing the OCWP population projections for Oklahoma City with the city's actual population history shown earlier in Figure 1. The projected 0.3 percent average annual growth rate for Oklahoma City derived from the OCWP projections would be about one-fifth of the city's average annual growth rate since 1950 (1.46 percent) and less than one-third of the *lowest* average annual growth rate the city has experienced over the past six decades (0.92 percent during the 1970-1980 period). Without some clear and logical rationale supporting this radical change in the city's growth trajectory, we believe the OCWP population projections for Oklahoma City are highly implausible.

Alternative population projections for Oklahoma City. As indicated by the preceding discussion, BBC has reservations and concerns regarding both of the Oklahoma City population projections that have been used in the previous statewide and regional water planning efforts. Although the projections used in the RRWSS have been more accurate, to date, than the OCWP projections, they have a weak theoretical foundation. The OCWP projections for Oklahoma City appear fundamentally implausible, likely due to issues in the derivation of the municipal-level forecasts from the county level projections. BBC's consideration of potential alternative population projections begins with further analysis of the relationship between the population of Oklahoma City and the population of the seven counties that comprise the Oklahoma City MSA.

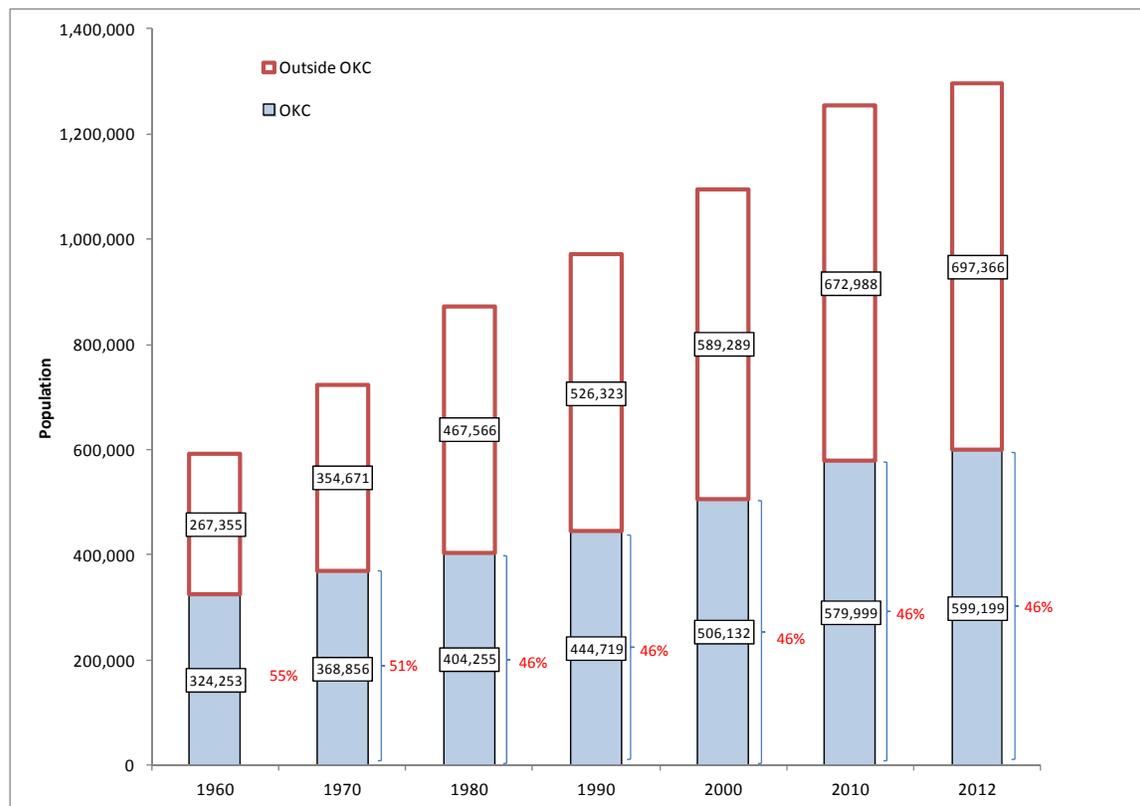
Alternative 1: Projection based on ODC county-level forecasts and historic Oklahoma City share of regional population growth. The current definition of the Oklahoma City MSA consists of seven counties. From largest population to smallest, the counties include: Oklahoma, Cleveland, Canadian, Grady, Logan, McClain and Lincoln. The seven county MSA had a total population of 1,252,987 in 2010. Based on 2012 population estimates from the American Community Survey, the MSA's population grew by about 44,000 residents between 2010 and 2012, to a total of 1,296,565.

In contrast to other metropolitan areas where recent growth has been most concentrated in outlying suburban areas, Oklahoma City's share of the total population in the seven county region⁷ has been extraordinarily consistent over a long period of time. As shown in Figure 2, on the following page, the population of the seven county region grew from about 592,000 residents in 1960 to about 872,000 residents in 1980. During those two decades, Oklahoma City's share of the area's population declined from 55 percent to 46 percent of the total. Over the 32 years since 1980, the seven county region has grown by more than 400,000 residents to nearly 1.3 million people. During that period of more than three decades, Oklahoma City's share of the region's population has remained essentially constant at 46 percent of the total. The city's

⁷ Note that the definition of the Oklahoma City MSA has changed over the years. For consistency in this analysis, BBC examined the historical population of the seven counties that make up the current MSA definition rather than the total MSA population reported in historical Census information which is affected by geographic changes.

share of the total has varied by less than one percent over this period which includes four decennial Census counts and the latest interim estimates from the ACS for 2012.

Figure 2. Historical Population Share of Oklahoma City within the 7 County MSA*



Note: *Based on the seven counties included in the current MSA definition. Because the geographic definition of the MSA has changed over time, the seven county totals reflected in this figure will not correspond to reported MSA population totals for years prior to 2010.

Sources: Historical population counts for counties (1960-2010) from ODC 2012. 2012 estimates from American Community Survey. Historic counts for OKC from MWH 2003 (1960-2000) and Census 2010. 2012 estimate for OKC from American Community Survey.

Given the very consistent share of the region’s population growth that has been located within Oklahoma City, the most reasonable conclusion is that the city is likely to continue to capture about 46 percent of the region’s future growth. Applying this assumption to the most recent county-level population forecasts from the ODC results in a projected population for Oklahoma City of about 864,000 residents in 2060, as illustrated in Figure 3 on the following page. This projection implies a declining average annual growth rate for Oklahoma City over the 50 year forecast period. The projected annual growth rate from 2010 to 2020 would be about 0.9 percent per year, while the cumulative average annual growth rate from 2010 through 2060 would be about 0.8 percent per year. Given that these growth rates are lower than the area has historically experienced, even during the low growth period of 1970-1980, we consider this to be a conservative (potentially lower bound) projection.

Figure 3. Oklahoma City Population Projections based on 2012 ODC County Projections and Historic Population Share of Oklahoma City within the 7 County MSA*

Year	ODC Projections for Current MSA Counties								Assumed OKC Share	Oklahoma City
	Canadian	Cleveland	Grady	Lincoln	Logan	McClain	Oklahoma	Total		
2020	133,468	294,868	56,561	37,260	46,185	38,671	772,053	1,379,066	46%	634,370
2030	151,440	336,050	61,286	40,558	50,462	42,858	821,230	1,503,884	46%	691,787
2040	169,413	377,232	66,011	43,857	54,740	47,045	870,407	1,628,705	46%	749,204
2050	187,385	418,414	70,736	47,155	59,017	51,231	919,584	1,753,522	46%	806,620
2060	205,357	459,595	75,462	50,453	63,295	55,418	968,760	1,878,340	46%	864,036

Sources: Projected county populations from ODC 2012. Projected OKC population based on historic share of 7 county region (46%).

Alternative 2: Projection based on population growth forecasts for regional transportation planning. Larger municipal water providers such as Oklahoma City frequently base their population growth forecasts on existing forecasts for their city or region developed for other purposes. Perhaps the most common source for these independent regional population forecasts is the region’s transportation planning agency.

Transportation planning in the Oklahoma City region is the responsibility of the Association of Central Oklahoma Governments (ACOG). In April 2011, the ACOG adopted the Oklahoma City Area Regional Transportation Study, also known as the *Encompass 2035 Plan (2035 Plan)*. In developing the 2035 Plan, ACOG produced population and employment forecasts through 2035, including anticipated allocations of future growth by small areas known as traffic analysis zones or TAZs. The population forecasts “were developed using three sources – county level projections from Woods & Poole (2005-2040), the Oklahoma Department of Commerce (2000-2060), and 1980-2000 historical population data, along with the 2005 population estimates, extrapolated to 2035.”⁸

Based on the 2005 population estimate for the transportation planning region of 1,076,258 and the adopted 2035 forecast of 1,464,814, the 2035 Plan anticipates average annual population growth of just over 1.0 percent per year. Oklahoma City represents just over 50 percent of the total population in the transportation planning region.⁹

Extrapolating the projected 1.0 percent annual growth rate from the 2035 Plan further into the future results in a projected 2060 population for Oklahoma City of about 953,900 residents. Given the possibility that population growth rates further in the future (after 2035) may tend to be lower, on a percentage basis, than population growth rates in the nearer term, this projection provides a more aggressive view of future growth in Oklahoma City than the Alternative 1 projections described on the previous page. However, because the 1.0 percent average annual

⁸ Encompass 2035 Plan Report, The Oklahoma City Regional Transportation Study, Association of Central Oklahoma Governments, May 2012. Page 17.

⁹ Based on comparison of the midpoint between the actual Oklahoma City population totals in 2000 and 2010 from Figure 1 (543,066) with the 2005 population estimate for the transportation planning region of 1,076,258.

growth rate used in this projection is considerably lower than both the long-term growth rate in Oklahoma City from 1950-2012 and the more recent growth experience in the city since year 2000, we would not consider this projection to represent a definite upper bound on future growth in the city.

Other considerations regarding long-term growth potential. Each of the four population forecasts for Oklahoma City described in this letter is based on either statistical extrapolation, projected shares of regional growth forecasts, or a combination of both methods. One potential concern regarding long-term municipal growth projections based on these types of “top-down” methods— as opposed to “bottom-up” projections based on current and projected future land uses — is the whether there will be sufficient availability of developable land (and/or lands with suitable redevelopment potential) to accommodate the projected population growth.

In Oklahoma City, however, there appears to be more than adequate room to accommodate future growth. Among the 239 U.S. cities with populations greater than 100,000 residents in year 2000, Oklahoma City had the fifth lowest population density with approximately 834 residents per square mile. The average population density among these large U.S. cities was about five times as dense as Oklahoma City’s population, with 4,295 residents per square mile.¹⁰

Other Participants in the Proposed Sardis Lake Project

Oklahoma City is not the only entity expecting to use water from the proposed Sardis Lake project. Other entities that would use water from Sardis Lake include both smaller cities that current receive their water supplies from Oklahoma City through wholesale contracts and a number of larger cities in the region that expect to use Sardis Lake supplies as a means to meet some of their future growth needs and/or to replace a portion of their current supplies which are becoming more problematic due to increasingly stringent federal water quality standards under the Safe Drinking Water Act.

Wholesale water customers (“Base Load” cities). As discussed in the RRWSS, Oklahoma City currently provides wholesale water supplies to a number of smaller municipalities within the Metropolitan Area. Seven such cities (termed “Base Load” cities in the RRWSS) were identified in the 2009 RRWSS. These cities included:

- Blanchard,
- Cashion,
- Newcastle,
- Purcell,
- The Village,

¹⁰ U.S. Census Bureau, County and City Data Book: 2000, Table C.1.

- Tuttle, and
- Warr Acres.

BBC examined the potential future population growth of the Base Load cities under the two alternative population forecasting scenarios previously described for Oklahoma City.

Alternative 1: Projection based on ODC county-level forecasts and historic Base Load Cities share of regional population growth. The Base Load cities have grown from a total population of about 25,400 residents in 1960 to just over 47,000 residents in 2010. Not surprisingly, the relationship of the population in these smaller communities to the total population in the seven counties that now comprise the Oklahoma City MSA has not been as consistent at the relationship between the overall MSA population and Oklahoma City (described previously). As shown in Figure 4, below, the Base Load cities grew rapidly from 1960 to 1970, and then experienced relatively little growth from 1970 to 1990. Since 1990, however, growth has accelerated in these smaller cities. The average annual growth rate for the Base Load cities during the 1990s was 1.35 percent per year, during the decade from 2000 to 2010 it was 1.98 percent per year. Both of those growth rates were larger than the annual rate of growth in Oklahoma City during those time periods (see Figure 1). Most of the growth during the past 20 years has occurred in Blanchard, Newcastle and Tuttle.

Figure 4. Historic Population Growth in the Base Load Cities

Year	Base Load Cities				Seven County OKC MSA*	Base Load City Share of 7 Cos.	Base Load Share of MSA Growth
	Total Population	Avg. Annual Growth Increment	Annual Growth Rate by Decade	Cumulative Annual Growth Rate Post 1960			
1960	25,435				591,608	4.3%	
1970	32,478	704	2.47%	2.47%	723,527	4.5%	5.3%
1980	34,054	158	0.47%	1.47%	871,821	3.9%	1.1%
1990	33,798	-26	-0.08%	0.95%	971,042	3.5%	-0.3%
2000	38,642	484	1.35%	1.05%	1,095,421	3.5%	3.9%
2010	47,032	839	1.98%	1.24%	1,252,987	3.8%	5.3%
1970-2010 Averages		432	1.24%			3.8%	3.1%

Note: *Based on current seven county definition of the Oklahoma City MSA.

Source: Historical Census documents, various years.

Figure 4 also shows the share of the total population in the seven county Oklahoma City MSA¹¹ accounted for by the Base Load cities since 1960, and the share of the MSA's growth in each decade that took place within the Base Load cities. The Base Load cities currently account for about 3.8 percent of the total population in the Oklahoma City Metropolitan Area. On average over the past five decades, just 3.1 percent of the MSA's growth has occurred within the Base Load Cities.

¹¹ Based on current definition of the Oklahoma City MSA.

The most recent ODC county-level projections described earlier indicate the seven county Oklahoma MSA will grow by about 625,000 residents over the 50 year period from 2010 through 2060. Assuming the Base Load cities will capture about 3.5 percent of the future growth in the MSA, their total population would be projected to reach approximately 68,900 residents by 2060.

Alternative 2: Projection based on population growth forecasts for regional transportation planning. Each of the Base Load cities is within the transportation planning region included in the *Encompass 2035 Plan*. As described earlier, the 2035 Plan envisions regional population growth at a rate of approximately 1.0 percent per year. Applying the projected regional growth rate to the 2010 population of the Base Load cities results in a projected population of about 77,400 residents in 2060.

Other regional participants. Apart from Oklahoma City and the Base Load cities, nine other entities in the region are also participating in the proposed Sardis Lake project. These entities include the following cities and water providers:

- Central Oklahoma Water Resources Authority (COWRA),
- Chickasha,
- Del City,
- Edmond,
- Midwest City,
- Moore,
- Norman,
- Seminole, and
- Shawnee.

Evaluating the potential future population growth, and the corresponding future water needs, of these regional participants using the two alternative forecasting scenarios described in this letter presents some additional challenges.

- COWRA is a regional water provider, not a municipality. Consequently, there is no historical population information for COWRA's service area from regularly published sources such as the US Census.
- Three of the regional participant cities (Chickasha, Seminole and Shawnee) are located outside of the *Encompass 35 Plan* transportation planning area. Seminole and Shawnee are also outside of the seven county Oklahoma City Metropolitan Statistical Area.
- The regional participants have other existing water supplies. Their level of participation in the proposed Sardis Lake project is based on their own, individual assessment of their additional water supply needs in the future. Those needs may be less than implied by their

future population growth – to the extent they plan to serve at least a portion of that growth from their existing sources of supply. Alternatively, some of these participants have indicated concerns about the growing challenges of relying on their current supplies, partly due to increasingly stringent water quality requirements under the Safe Drinking Water Act. To the extent they plan to use water from the proposed Sardis Lake project to replace some of their existing supplies, their needs from the proposed project may be greater than indicated by their future population growth.

In light of these issues, BBC has applied the two alternative population forecasting approaches developed in this letter to estimate potential future population growth for the five of the nine regional participants that are located within the current Oklahoma City Metropolitan Area and the current Oklahoma City regional transportation planning area. These projections are provided for informational purposes, recognizing that they do not directly translate into estimates of the regional participants’ water supply needs from the proposed Sardis Lake project.

Alternative 1: Projection based on ODC county-level forecasts and historic share of regional population growth among five of nine regional participants. The five municipal regional participants that are located within the seven county Oklahoma City Metropolitan Statistical Area, and within the regional transportation planning area, are Del City, Edmond, Midwest City, Moore and Norman. These five regional participant cities have grown from a total population of about 92,800 residents in 1960 to over 323,000 residents in 2010. The fastest growing cities in this group over the past few decades have been Edmond, Moore and Norman.

As is the case with Oklahoma City, the five regional participants located within the MSA and the transportation planning region have shown a very consistent relationship with the MSA’s population growth over the past few decades. As shown in Figure 5, below, the five regional participant cities have consistently accounted for 26 percent of the MSA population since the 1990 Census.

Figure 5. Historic Population Growth among Five of the Nine Regional Participants**

Year	5 of 9 Regional Participants				Seven County OKC MSA*	5 Regional Participants Share of 7 Cos.	5 Regional Participants Share of MSA Growth
	Total Population	Avg. Annual Growth Increment	Annual Growth Rate by Decade	Cumulative Annual Growth Rate Post 1950			
1960	92,764				591,608	16%	
1970	162,856	7,009	5.79%	5.79%	723,527	23%	53%
1980	215,802	5,295	2.85%	4.31%	871,821	25%	36%
1990	248,899	3,310	1.44%	3.34%	971,042	26%	33%
2000	281,363	3,246	1.23%	2.81%	1,095,421	26%	26%
2010	323,114	<u>4,175</u>	<u>1.39%</u>	2.53%	1,252,987	<u>26%</u>	<u>26%</u>
1970-2010 Averages		4,607	2.54%			25%	35%

Note: *Based on current seven county definition of the Oklahoma City MSA.

**The figure includes the populations of the five regional participants located within the MSA and the regional transportation planning area: Del City, Edmond, Midwest City, Moore and Norman.

Source: Historical Census documents, various years.

As noted previously, the most recent ODC county-level projections described earlier indicate the seven county Oklahoma MSA will grow by about 625,000 residents over the 50 year period from 2010 through 2060. Assuming the five regional participant cities located in the MSA (and the regional transportation planning area) will continue to capture about 26 percent of the future growth in the MSA, their total population would be projected to reach approximately 485,700 residents by 2060. Note that these population counts and projections do not include the other four regional participants: COWRA, Chickasha, Seminole and Shawnee.

Alternative 2: Projection based on population growth forecasts for regional transportation planning. The five regional participant cities (Del City, Edmond, Midwest City, Moore and Norman) are also within the transportation planning region included in the *Encompass 2035 Plan*. As described earlier, the 2035 Plan envisions regional population growth at a rate of approximately 1.0 percent per year. Applying the projected regional growth rate to the 2010 population of the five regional participant cities within the transportation planning results in a projected population of about 531,400 residents in 2060.

Findings and Conclusions Regarding Potential Sardis Lake Project Participant Population Projections

Based on our review of the RRWSS and OCWP population projections, and the other information discussed in this letter, we have reached the following conclusions:

- There are reasons to be concerned about the reliability of either the RRWSS or the OCWP projections for Oklahoma City. The RRWSS projections have been more accurate, to date, but are based on a weak theoretical foundation and rely on the extrapolation of historical growth rates over a relatively short 10 year period to forecast growth 50 years into the future. The OCWP projections begin from a stronger theoretical foundation with the ODC's statewide cohort component model, but the approach used to derive population projections for Oklahoma City from the ODC's county-level growth projections appears to have been flawed.
- Oklahoma City's share of the population in the seven county region that currently comprises the Oklahoma City Metropolitan Statistical Area has been remarkably consistent over the past 32 years — at 46 percent of the region's total population. Based on that steady relationship, BBC has developed an alternative population forecast for Oklahoma City using the most recent ODC county-level projections. That forecast indicates a projected population for Oklahoma City of about 864,000 residents in 2060.
- We have also developed an alternative forecast for Oklahoma City's population in 2060 based on extending the recently adopted 2035 population forecasts for transportation planning in the region. That alternative forecasting method indicates a projected population of about 953,900 residents in 2060.

- In sum, we anticipate the population of Oklahoma City in 2060 is likely to include somewhere between 864,000 residents and 953,900 residents. It is possible the city's population will be either higher or lower than the range between these two forecasts. Based on Oklahoma City's historical growth experience we believe the city's population is more likely to exceed the projected range than to fall below it.
- There appears to be more than adequate land available for development or redevelopment within Oklahoma City to accommodate these projected population totals.
- The same alternative population forecasting methodologies can be applied to Oklahoma City's wholesale water supply customers (the Base Load cities) and to five of the nine other potential regional participants in the proposed project. BBC has not developed projections for the other four regional participants — COWRA, Chickasha, Seminole and Shawnee — because they are either not municipalities (COWRA) or are located outside of either the Oklahoma City MSA or the regional transportation planning area.
- Figure 6, on the following page, summarizes the potential population growth of Oklahoma City, the Base Load cities, and the five regional participants in the proposed Sardis Lake project that can be forecast based on the alternative methodologies BBC developed for this analysis. These projections indicate a projected total population for Oklahoma City, the Base Load cities, and five of the nine regional participants of between 1,418,600 and 1,562,700 residents in 2060. These projections correspond to a combined *increase* in population for these entities over the 2010 to 2060 period of between 468,500 and 612,600 residents.
- It is important to note that the regional participants' future need for supplies from Sardis Lake cannot be directly inferred from these projections for two reasons:
 - Four of the nine regional participants (COWRA, Chickasha, Seminole and Shawnee) are not included in these population totals and projections.
 - Each of the regional participants has other existing water supplies. Their level of participation in the proposed Sardis Lake project is based on their own, individual assessment of their additional water supply needs in the future. These needs may be either less than is implied by these growth projections (if they rely on their existing supplies to meet a portion of their future growth needs) or more than is implied by these projections (if they plan to switch from relying on some of their existing supplies to using water supplied from Sardis Lake).

Figure 6. Summary of Alternative Population Projections for Most of the Sardis Lake Project Participants*

Sardis Lake Participants	2010 Population	Projected 2060 Population		Projected 2010-2060 Increase	
		Low Estimate	High Estimate	Low Estimate	High Estimate
Oklahoma City	579,999	864,000	953,900	284,000	373,900
Base Load Cities	<u>47,032</u>	<u>68,900</u>	<u>77,400</u>	<u>21,900</u>	<u>30,400</u>
Oklahoma City and Base Load Cities Combined	627,031	932,900	1,031,300	305,900	404,300
Five of Nine Regional Participants*	<u>323,114</u>	<u>485,700</u>	<u>531,400</u>	<u>162,600</u>	<u>208,300</u>
Total, excluding Four Regional Participants*	950,145	1,418,600	1,562,700	468,500	612,600

Note: *The figure includes the populations of the five regional participants located within the MSA and the regional transportation planning area: Del City, Edmond, Midwest City, Moore and Norman. Four regional participants – COWRA, Chickasha, Seminole and Shawnee – are not included in this figure.

Source: BBC Research & Consulting, based on methods and assumptions described in this letter.

Thank you for providing BBC with the opportunity to examine these demographic forecasting issues for the Oklahoma City region. We look forward to the opportunity to further discuss this research and analysis.

Sincerely,



Douglas L. Jeavons
Managing Director

Douglas L. Jeavons

Mr. Jeavons joined BBC Research & Consulting in 1992 as an associate, became a director of the firm in 1996 and currently leads the firm's water and natural resources practice. His career emphasis includes regional economic modeling and assessment, natural resource and environmental economics and public finance. Before joining BBC, Mr. Jeavons worked in Washington, DC, for an economic consulting firm specializing in the economics of regulated industries.

Water Demand-related Project Examples

- **Denver Water Department Demand Projections and Expert Witness Support.** Mr. Jeavons has directed the development of two generations of long-term demand models for Denver Water, in 2000-2001 and in 2008-2010. Both demand models were based on custom designed econometric analyses incorporating historical cross-sectional and time series data. The models incorporated demographic and economic factors as well as effects due to weather, marginal water prices, and expenditures on conservation programs. Demand projections using these models have been incorporated in each of Denver Water's Integrated Resource Plans. Mr. Jeavons has also led several other demand or planning-related studies for Denver Water and provided expert witness services to Denver Water on related topics.
- **Phoenix Water Use and Conservation Analysis.** Mr. Jeavons examined indoor and outdoor water use patterns among single-family households in the Phoenix metropolitan area. This analysis identified and quantified factors influencing indoor and outdoor use, including landscaping practices, irrigation methods, swimming pools, development trends and price elasticity. The analysis was a precursor to development of a new conservation campaign for the City of Phoenix. Mr. Jeavons is currently working on another project for Phoenix to analyze recent and future changes in industrial, commercial and institutional water use.
- **Drought Management and Water Conservation in Texas.** In 2008-09, Mr. Jeavons led BBC's work for the Texas Water Development Board (TWDB) to evaluate the role of drought management measures in state and regional planning. This assignment included interviews with the managers of each of the state's regional water planning groups and surveys of over 100 other Texas stakeholders as well as detailed reviews of the drought management plans for more than 100 municipal providers. BBC also examined drought management in other western states. In 2010-2011, Mr. Jeavons directed another statewide assignment for the TWDB to examine how municipalities throughout Texas endeavor to estimate the effects of their conservation efforts and identify potential standardized approaches to quantifying conservation savings. This assignment involved detailed analysis of the conservation plans of many water providers and in-depth interviews with more than 40 municipal utilities.

- **Northern Integrated Supply Project EIS.** Mr. Jeavons is currently directing BBC's work on the Northern Integrated Storage Project EIS on behalf of the Corps of Engineers. BBC's role includes assisting in development of the purpose and need for the project based on projected future water demands of the NISP participants in Northern Colorado. BBC is also responsible for evaluating a number of anticipated socioeconomic impact concerns, including financial impacts on participants, potential economic effects related to water quality, economic effects on kayaking and other uses of the Poudre River, and socioeconomic impacts related to construction and transportation.
- **Northwest Colorado Socioeconomic Forecasts and Water Demand Projections.** Mr. Jeavons completed a study of future economic and demographic growth in northwest Colorado. Commissioned by the Associated Governments of Northwest Colorado and the State of Colorado Department of Local Affairs, this assignment focused on the near and long-term impacts of energy development on local counties and communities. In a related assignment, Mr. Jeavons assisted the Colorado River Basin Roundtable in evaluating water requirements for future energy development in the region.
- **San Antonio Water System Project Optimization Model.** Mr. Jeavons directed development of an operation and planning model for the San Antonio Water System. The model utilizes advanced programming techniques to determine the optimal construction timing and value of multiple water storage and production projects. This model incorporates a statistical analysis of water demand under varying weather conditions over a time period of 50 years.
- **New York City Water Demand Evaluation.** In 2005, Mr. Jeavons was among 10 experts in water demand forecasting from across the U.S. invited to participate in an intensive review of the City of New York's water demand model and future demand projections. Along with other panel members, Mr. Jeavons evaluated the structure, methodology, data sources, and results of the City's model, and recommended a number of potential improvements for the City's consideration.
- **Colorado Springs Economic, Demographic and Water Demand Projections.** Mr. Jeavons was the lead analyst in developing the forecasting model and preparing socioeconomic projections for the Colorado Springs Utilities and Pikes Peak Area Council of Governments. Demographic forecasts were based upon a cohort-component model designed and customized for Colorado Springs by Mr. Jeavons.

Education

M.A., Economics, University of Colorado, 1992

B.A., International Affairs, Lewis and Clark College, 1984

Other

Member of American Water Works Association and American Water Resources Association. Past-president of the Denver Association of Business Economists. Member of the Metro Denver Long Range Forecasting Task Force. Board member of Consolidated Mutual Water Company (Lakewood, CO).

Litigation Experience

Mr. Jeavons was involved in a school finance lawsuit in Wyoming from 1992 through 2002. He was deposed in these cases, but was not required to testify.

Mr. Jeavons has provided testimony before the Kentucky Public Service Commission regarding the socioeconomic effects of siting new power plants in the state.

Mr. Jeavons was designated as an expert for Denver Water in the Eagle River diligence case, Case No. 02CW125, in 2006-2007. He prepared an expert report and was deposed, but did not testify. Mr. Jeavons was also designated as an expert for Denver Water in its Darling Creek water rights diligence case, 2007CW29 WD5 and prepared an expert report in that case. Mr. Jeavons was designated as an expert for Denver Water in its Roberts Tunnel Diligence Case (06CW255), prepared an expert report and was deposed in that case. Case 06CW255 did not go to trial.

Mr. Jeavons was designated as an expert witness for the Upper Yampa Water Conservancy District in two water court cases in 2008. He prepared an expert report, but was not deposed or required to testify.

Mr. Jeavons provided written testimony, by sworn affidavit, on behalf of the Bureau of Reclamation and the Eastern New Mexico Water Utility Authority in Case No. 1:12-CV-401-WJ-LFG in 2012.

Exhibit 14: State of Oklahoma, Choctaw Nation of Oklahoma, Chickasaw Nation, City of Oklahoma
City Water Settlement

**CITY OF OKLAHOMA CITY SCHEDULE OF BENEFICIAL USE
FOR AMENDED PERMIT APPLICATION 2007-2017**

THROUGH END OF YEAR	PERCENT OF TOTAL AUTHORIZED PUT TO BENEFICIAL USE	ACRE-FEET TOTAL AUTHORIZED PUT TO BENEFICIAL USE
2020	0%	0 acre-feet
2030	0%	0 acre-feet
2035	7%	8,000 acre-feet
2040	20%	23,000 acre-feet
2045	35%	44,000 acre-feet
2050	50%	57,000 acre-feet
2055	66%	76,000 acre-feet
2060	83%	95,000 acre-feet
2065	100%	115,000 acre-feet