THE STATE



OF KANSAS

STATE BOARD OF AGRICULTURE Sam Brownback, Secretary

DIVISION OF WATER RESOURCES David L. Pope, Chief Engineer

BEFORE

DAVID L. POPE, CHIEF ENGINEER DIVISION OF WATER RESOURCES KANSAS STATE BOARD OF AGRICULTURE

IN THE MATTER OF THE DESIGNATION OF AN INTENSIVE GROUNDWATER USE CONTROL AREA IN BARTON, RUSH AND NESS COUNTIES, KANSAS

The Chief Engineer, Division of Water Resources, Kansas State Board of Agriculture, (hereinafter referred to as "Chief Engineer"), after having given due consideration to all evidence, testimony and other information presented to him at, or as a result of, the hearing held in Great Bend, Kansas, on December 4-7, 1990, January 3-4, February 5-8, March 19-22 and 26-28, 1991 and in Topeka, Kansas on April 18, 1991, regarding the proposed designation of an intensive groundwater use control area (hereinafter referred to as the "IGUCA") in the Walnut Creek Valley in Barton, Rush and Ness Counties, Kansas, hereby makes the following Findings, Conclusions and Order:

FINDINGS

 That in September 1989, the Division of Water Resources Report No. 89-1 titled <u>Availability of Water in Walnut Creek, its Tributaries, their Valley</u> <u>Alluviums, and Hydraulically Connected Aquifers</u>, was completed by James That based upon Report No. 89-1, the Chief Engineer on September 15, 1989, adopted Administrative Policy No. 89-10 which provides that applications received on or after September 15, 1989, for a permit to appropriate surface water from Walnut Creek and its tributaries or groundwater from the valley alluviums and other aquifers that are hydraulically connected to Walnut Creek and its tributaries outside the boundary of Western Kansas Groundwater Management District No. 1, except for domestic use, temporary permits and short term permits, would be accepted for filing and given a file number, if acceptable for filing, but will be denied on the basis that approval of such application would prejudicially and unreasonably affect the public interest or would impair use under existing water rights.

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- 3. That by letter dated October 10, 1989, Robert Meinen, Secretary, Department of Wildlife and Parks, requested that the Chief Engineer initiate proceedings for designation of an IGUCA in all areas that affect the Department's Cheyenne Bottoms water right in the Walnut Creek drainage basin.
- 4. That in accordance with the provisions of K.S.A. 82a-1036 through K.S.A. 82a-1040, the Chief Engineer may, upon his own initiative, initiate proceedings for designation of an IGUCA outside the boundaries of an existing groundwater management district whenever he or she has reason to believe that one of the following conditions exists:

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- Groundwater levels in the area in question are declining or have decline excessively;
- the rate of withdrawal of groundwater within the area in question equals or exceeds the rate of recharge in such area;
- preventable waste of water is occurring or may occur within the area in question;
- d. unreasonable deterioration of the quality of water is occurring or
 may occur within the area in question; or
- e. other conditions exist within the area in question which require regulation in the public interest.
- 5. That in accordance with the provisions of K.S.A. 82a-1036 through K.S.A. 82a-1040, the Chief Engineer may initiate proceedings for designation of an IGUCA within a groundwater management district whenever a groundwater management district recommends the same.
- 6. That by letter dated January 15, 1990, Ms. Sharon Falk, Manager, Big Bend Groundwater Management District No. 5, requested, in accordance with the action of the Board of Directors on January 11, 1990, that the Chief Engineer of the Division of Water Resources initiate proceedings for designation of an IGUCA in the Walnut Creek Basin in Barton County.

7. That by letter received February 1, 1990, Ms. Sharon Falk, Manager, Big Bend Groundwater Management District No. 5, transmitted to Mr. David L. Pope, Chief Engineer, Division of Water Resources, a list of the land to be included within the boundary of the proposed intensive groundwater use control area in Barton County; that the intensive groundwater use control area proposed by the District was generally that part of the Walnut Creek Basin that lies in Barton County excluding some parts of the Dry Walnut Creek drainage area; that by letter dated February 27, 1990, Ms. Falk informed the Division that, through mutual agreement, 12 sections in Barton County originally recommended by the District to be included within the proposed boundaries which lie outside the boundaries of the District can be deleted from the proposed area based on the determination that those sections would not have an effect on the issue.

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- 8. That based upon information contained in the files of the office of the Chief Engineer, it appeared that groundwater levels in the area in question were declining or had declined excessively, that the rate of withdrawals of groundwater within the area in guestion equaled or exceeded the rate of recharge in such area, and that conditions existed within the area in question which required regulation in the public interest.
- 9. That on March 13, 1990, David L. Pope, Chief Engineer issued an Order initiating proceedings for designation of an IGUCA with proposed boundaries as follows:

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Barton County:

Township 18 South, Range 13 West, Sections 28 through 33 Township 18 South, Range 14 West, Sections 4 through 10 and 14 through 36 Township 18 South, Range 15 West, Sections 1 through 36 Township 19 South, Range 12 West, Sections 19, 30 and 31 Township 19 South, Range 13 West, Sections 3 through 11 and 14 through 36 Township 19 South, Range 14 West, Sections 1 through 36 Township 19 South, Range 15 West, Sections 1 through 36 Township 19 South, Range 14 West, Sections 1 through 36

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<u>Rush County:</u>

Township 17 South, Range 16 West, Sections 31 through 35 Township 17 South, Range 17 West, Sections 19 through 36 Township 17 South, Range 18 West, Sections 19 through 36 Township 17 South, Range 19 West, Sections 23 through 26 & 31 through 36 Township 17 South, Range 20 West, Sections 35 and 36 Township 18 South, Range 16 West, Sections 1 through 36 Township 18 South, Range 17 West, Sections 1 through 36 Township 18 South, Range 18 West, Sections 1 through 36 Township 18 South, Range 19 West, Sections 1 through 36 Township 18 South, Range 19 West, Sections 1 through 36 Township 18 South, Range 19 West, Sections 1 through 36 Township 18 South, Range 19 West, Sections 1 through 36 Township 18 South, Range 19 West, Sections 1 through 36 Township 18 South, Range 17 West, Sections 1 through 36 Township 18 South, Range 17 West, Sections 1 through 36 Township 19 South, Range 16 West, Sections 1 through 36 Township 19 South, Range 17 West, Sections 3 through 6 Township 19 South, Range 17 West, Sections 1 through 6

Township 19 South, Range 19 West, Sections 1 through 7 Township 19 South, Range 20 West, Sections 1, 2, 11 and 12

Ness County:

Township 17 South, Range 25 West, Sections 32 through 34 Township 18 South, Range 21 West, Sections 1 through 36 Township 18 South, Range 22 West, Sections 1 through 4 and 7 through 36 Township 18 South, Range 23 West, Sections 19, 25 and 36 Township 18 South, Range 24 West, Sections 13 through 27, 35 and 36 Township 18 South, Range 25 West, Sections 1 through 5, 10 through 13, 24, 33 and 34 Township 19 South, Range 21 West, Sections 4 through 9

Township 19 South, Range 22 West, Sections 4 through 12, 17 and 18 Township 19 South, Range 23 West, Sections 1 through 23 Township 19 South, Range 24 West, Sections 1, 2 and 7 through 29 Township 19 South, Range 25 West, Sections 1 through 3 and 11 through 13

10. That in the March 13, 1990, Order, the Chief Engineer also ordered that all applications to appropriate water for beneficial use (other than for domestic use, temporary permits and short term permits) received on or after March 13, 1990, which proposed the appropriation of groundwater from portions of the Walnut Creek Basin in Barton, Rush or Ness Counties, within the proposed boundaries, would continue to be processed in accordance with Administrative Policy No. 89-10 described in Finding No. 2. Book 231 Page 741

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- 11. That on March 22, 1990, the Chief Engineer issued a Correctional Order correcting an error in the March 13, 1990, Order in the description of lands in Ness County found at page 3, line 40 of the Order to read: "Township 18 South, Range 23 West, Sections 19 and 25 through 36."
- 12. That on April 10, 1990, a prehearing conference was held; that on June 29, 1990, the Chief Engineer issued a Prehearing Order which, among other things, divided the hearing into a formal and an informal phase.
- 13. That the Prehearing Order established that the purpose and scope of the formal phase was to gather evidence on the following factual issues: (1) whether the area in question should be designated as an IGUCA; (2) if the area in question is designated as an IGUCA, what corrective control provisions, as enumerated in K.S.A. 82a-1038, should be adopted; and (3) if the area in question is designated as an IGUCA, what boundaries for the area should be established; that the following organizations provided notice of their desire to participate in the formal phase of the hearing and were allowed to do so: the Kansas Department of Wildlife and Parks through its attorney DeAnn E. Hupe; the Big Bend Groundwater Management District No. 5 through its attorney H. Phillip Martin; the Walnut Creeks Basin Association through its attorney Richard Boeckman; the City of Great Bend through its attorney Robert Suelter; the Kansas Wildlife Federation through its attorney Frank L. Austenfeld; the Mid-Kansas Quality Water Association through its attorney Mark Calcara; the Kansas Natural Resources Council and the Kansas Audubon Council through their attorney John M. Simpson; the Central Kansas Utility Co., Inc. through its attorney Donald

Pitts; the Kansas Farm Bureau through its attorney Charles Arthur; the City of Hoisington through its attorney Donald Reif; and the Wet Walnut Creek Watershed, Joint District No. 58 through its attorney Thomas Toepfer.

- 14. That the Prehearing Order established that the purpose and scope of the informal phase of the hearing was to provide a free and informal forum for participation in the proceedings.
- 15. That notice of the hearing was published in the following papers: The Ness County News, November, 1, 1990; and a corrected notice was published November 8, 1990; The Rush County News, November 1, 1990; and a corrected notice was published November 8, 1990; The Hoisington Dispatch, November 1, 1990; and a corrected notice was published November 8, 1990; The Great Bend Tribune, October 31, 1990; and a corrected notice was published on November 1, 1990; that notice was also published in the Kansas Register on November 15, 1990; notice was also given to every person holding a water right of record in the office of the Chief Engineer within the proposed IGUCA and to selected persons representing organizations or agencies with an interest in the matter.

INFORMAL PHASE

That the Informal Phase of the hearing was held in the evening on December 5, 1990 at Great Bend, Kansas, and testimony was given as follows:

1. That Eugene Shore, farmer and irrigator from Stanton County and Representative in the Kansas House of Representatives for the 124th District, testified that he serves on the reapportionment committee of the legislature and that the only areas in Kansas that maintained or grew in population were those areas that depended on irrigated agriculture; that he felt there were some steps that could be taken to conserve water used in Cheyenne Bottoms such as making the pools deeper and lining the ditches and that a conservation plan for Cheyenne Bottoms should be required.

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2. That Doyle Rahjes, President of the Kansas Farm Bureau and farmer from Agra, testified that Farm Bureau has historically supported soil and water conservation activities, the construction of watershed structures and funding for the State water plan; that the availability of water has been a major factor in bringing economic development and determining the standard of living in much of the western two-thirds of the State; that irrigation has been largely responsible for the development of the livestock industry; that the development of the livestock industry has resulted in an increased number of jobs and has expanded the tax base; that if the irrigation water rights in Rush County were eliminated, the tax base would be cut by over 2.3 billion dollars based on the value of irrigated land versus dry land; that the establishment of an IGUCA is desirable because it gives all water users the opportunity to receive some water rather than cutting off junior water right holders entirely under the authority of the Kansas Water Appropriation Act; that it is unrealistic to use 1960 as a benchmark for determining water levels because the aquifer

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was full at that time due to the 1959 flood; that Farm Bureau recommends that an advisory committee be formed consisting of all parties.

- 3. That Dale E. Schartz testified that he has a well in which the water level raised five to six feet from 1989 to 1990; that he suggests that the management at Cheyenne Bottoms be worked on before getting into other areas of restriction.
- That Jacob Roenbaugh entered the written testimony of Darrell Miller, grain 4. producer from Edwards County, into the record; that Mr. Miller stated in the written testimony that he is a dry land farmer and he is a strong advocate of minimum tillage farming, soil conservation and water management; that in his opinion, reduction of irrigated farm land could devaluation of cultivated farm land; realignment of the tax lead to: structure for residential, farmland and business property; increased unemployment in all sectors; reduction of income for allied businesses; reduction of state and federal income taxes; realignment of ASCS bases and yields; increased transportation costs for farm products; reduction of grain storage income; reduction of Commodity Credit Corporation payments; reduction of livestock, both stocker and feeders; increased CRP acres; reduced farm equipment values; increased school consolidation; and accelerated farm foreclosures.
- 5. That Melvin D. Pinkston, farmer, testified generally regarding his concern with how a wetland is defined.

- 6. That Joel Daubert, member of the Board of Directors for Rural Water District No. 3 and farmer from near Otis, testified that Rural Water District No. 3 was organized in 1973 by farmers in Rush, Barton and Russell Counties because of a problem with drinking water; that the water is purchased from the City of Otis; that the Water District has 481 users, with 85-90 percent of the water used for domestic use in small communities and for farmers in the area; that the Water District has placed a moratorium on hooking up pasture units because it is trying to save as much water as possible for domestic uses; that the Water District feels that if water use was curtailed, it would create a hardship on many of the users within the District.
- 7. That Glen Schniepp, farmer from Bazine, testified that in 1936 his family built a small dam across Walnut Creek that would hold around 15 acre-feet of water; that they could pump the creek dry in five or six days pumping only in daylight hours with a pump capable of pumping over a thousand gallons per minute; that in the 1930s, a three to five inch rain at Dighton, which is 60 to 65 river miles from Bazine, would reach Bazine in about a week; that because of conservation practices, presently a three to five inch rain at Dighton would not reach Bazine; that the only time in 60 years that the creek went dry was in 1956 which was one of the driest years; that the normal flow down Walnut Creek would hardly ever reach Cheyenne Bottoms and if the creek did run very much, several wells with vested rights close to the creek would dry it up; that the water table at Bazine is normal and the springs are running; that there has been a problem with silt in the creek causing a lot of storage loss in his pond.

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- 8. That Kevin E. Mauler, farmer, irrigator along Dry and Wet Walnut Creeks, rancher and sportsman, testified that because of the threat of water curtailment, he has applied several different conservation measures including short season corn and surge valves; that water conservation devices such as surge valves and LEPA systems are expensive and farmers are reluctant to spend money on them if they are not going to be able to irrigate for more than another year or two or will only be able to irrigate every other year; that farmers may also be reluctant to purchase conservation devices because under an IGUCA reductions might be made from actual use rather than permitted quantities and this would penalize people who are using water conserving devices; that taking reductions from actual use would also promote waste of water; that a five year study should be conducted to monitor and meter all wells to study withdrawal and recharge and more test wells should be drilled and monitored.
- 9. That Bob Wendelburg, operator of Sunrise W Farms in Stafford County, testified on behalf of the Water Protection Association of Central Kansas; that irrigation has greatly increased both the species and the numbers of wildlife in his area.

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10. That Maurice L. Huenergardt, farmer and rancher from Otis, testified that he has lived by Walnut Creek since he was born in 1920; that he recalls his father telling him that when he was young the creek would be slightly riled after a big rain but would never be muddy; that in the 1920s, a lot of grass land was being broken out and after a rain, the stream would

become more muddy; that during the drought years of the 1930s, Walnut Creek was dry during the summer and in the winter, water would be put into the creek by melting snow; that in the 1930s, the creek at Timken did not flow; that flooding became more and more frequent and that he recalls in 1951 that they had six floods, one each weekend for six weeks; that, at the present time, the creek is so silted up and there is so much debris that water flow after a rain is greatly restricted; that the Walnut Creek carries water when it rains and it is dry when there is no rain.

- 11. That Richard Spare, farmer in Stafford County and a Stafford County Commissioner, testified generally regarding the economic impact a reduction in water use would have on Stafford County.
- 12. That Kent Lamb, President of the Water Protection Association of Central Kansas, testified that the Association supports the position of the Walnut Creek Basin Association; that a committee should be formed to develop research data regarding the current situation in the Walnut Creek area.
- 13. That E.F. Mohr, farmer from Otis, testified that prior to a flood in 1935, after all of the dust storms, there was always sand in the bottom of the Walnut and since the flood there is no longer any sand; that he was a member of the Soil Conservation Service (SCS) in Rush County for 14 years and that the SCS encouraged terracing.
- 14. That Loyal Otte, farmer from Heizer, testified that in the 1930's his family irrigated 10 acres with water from a pool in Walnut Creek that was

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approximately 50 yards up and down the creek; that it would take about four or five hours to pump the water from the pool and then the pool would fill up again in four or five days; that when it rained, they irrigated 24 hours; that his father and he drilled an irrigation well in 1948 to provide a reliable source of water; that in the fall of 1954 or 1955, a hunter paid him and three other farmers to pump water from their irrigation wells for 30 days into Wet Walnut Creek so that it would run into Cheyenne Bottoms; that the four wells each pumped about a thousand gallons per minute; that today the creek is dry from Heizer to Bazine or Alexander and the only time the creek runs is when it rains.

- 15. That Alvin Otte, farmer from Barton County, testified that his family moved to a farmstead by the Wet Walnut Creek in 1917 and that he remembers that there was sand in the bed of the creek; that the creek at best ran about 20 inches deep at its normal depth; that he remembers times when he was young that the creek quit running; that the bed of the creek has silted up at least 30 inches; that there are no longer any springs on the creek; that he drilled a well in 1947 to get a reliable source of water; that he recalls Charlie Hume asking him to pump water into the Wet Walnut from his irrigation well but that he did not do it.
- 16. That Elmer Mausolf, Albert, testified that he tried to irrigate land that he purchased in 1939 but he could not get enough water; that there were some pools of water and sometimes he could get enough to irrigate for five or six hours; that in 1955 he drilled a well and the depth to water was about 28 feet; that the water level in the well has been down to 35 feet;

that in 1990 he drilled a replacement well 12 to 15 feet away and that the depth to water in that well was 27 feet; that the creek used to have a sand bottom and now it is filled with two to thirty inches of silt.

- 17. That John Kraft, member of the Board of Directors for the Kansas Natural Resource Council and operations manager at the Land Institute in Salina, testified that if current irrigation technologies were utilized, around 20 to 50 percent of the water that is currently being pumped would not be needed; that if curtailments in water use are necessary, he would like to see assistance from the State, such as no interest short-term loans for farmers to purchase equipment; that similar water savings can be had in municipalities by adapting water conservation measures such as low flush toilets; that KNRC believes that it is of vital importance that Cheyenne Bottoms be preserved; that Mr. Kraft submitted a report regarding potential irrigation efficiency improvements.
- 18. That Charlie Meyer, Great Bend, testified that he is 91 years old and that when he was a boy there were times when the creek hardly had any water in it and it was totally dry in places.
- 19. That Francis Vondracek, farmer from Timken, testified that in the 1940s, the sides of three channels that had been constructed to re-route the flow of Walnut Creek washed down causing the springs to silt shut; that at a condemnation hearing in 1939 Gene Oborny testified that four years earlier he had seen the water in Walnut Creek get so low that it stopped flowing and there was no water that could be pumped out of the creek.

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- 20. That Steven Oborny, farmer in Rush County, testified that his grandfather started irrigating in 1939 and that if their water is cut off or drastically reduced, they would be forced to leave the farm.
- 21. That Marvin Schwilling, certified wildlife biologist, testified that he had worked at Cheyenne Bottoms for 14 years as refuge manager; that Cheyenne Bottoms is recognized as the most important wetland for migratory wildlife in the western hemisphere; that Cheyenne Bottoms is the largest, most extensive marsh in the interior of the United States; that Cheyenne Bottoms is host to more than 90 percent of the continental population of five species of shorebirds; that Cheyenne Bottoms is the most important nesting area for ducks in Kansas and also for several species of shorebirds; that Cheyenne Bottoms is federally designated as critical habitat for nationally endangered wildlife species, including the Whooping Crane, Peregrine Falcon, Bald Eagle and the Least Tern and to the federally threatened Piping Plover; that Cheyenne Bottoms is used by state endangered or threatened species including the Snowy Plover and the White-face Ibis; that marshes such as Cheyenne Bottoms cannot be duplicated.
- 22. That D. Jean Avey, Albert, Kansas, testified generally concerning the survivability of wildlife species in spite of the activities of humans; that in 1948 the Chief Engineer was considering the reduction of irrigation because of declining groundwater levels, but floods of the 1950's saturated the aquifer to its maximum; that this also happened with floods in 1903, 1905, 1913 and 1927.

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- 23. That Mike Walts, President of First National Bank of Great Bend and Ellinwood, testified generally regarding the economic significance of the issue.
- 24. That Carol Bales, irrigator from Bison, Kansas, testified that from 1947 to 1958, other than when there were floods in the early 1950s, she could walk across Walnut Creek a lot of the time; that the 1959 flood completely changed the terrain of the creek because of the silt.
- 25. That Steve Hetzke, farmer six miles west of Great Bend, testified that he achieved a 19 percent reduction in water use by installing an underground drip irrigation system, surge valves and planting one hundred day corn; that because of the cost involved, irrigators would need time to make such systems pay and work.
- 26. That Nathan Ochs, farmer, testified generally regarding his observations of Cheyenne Bottoms.
- 27. That Gene Knieling, council member for the City of Rush Center and municipal representative for the Walnut Creek Basin Association, testified that city water systems in the basin area are currently pumping at approximately 80 to 85 percent of their permitted amount; that Mr. Knieling testified generally regarding the economic impact of reductions in water usage including hindering the growth of the communities in the area and

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lower crop production resulting in less revenue coming to town for the purchase of necessary products.

- 28. That Daylon Wissman, farmer from the Albert area, testified that in the 1930s there were many times that Walnut Creek did not have water running in it; that in 1990, he went down by the creek and dug a hole about three feet deep and got only silt; that he measures his wells before he starts pumping every season and the water table has varied from 18 feet to approximately 26 feet; that building terraces, ponds and other conservation practices have had a major effect on the streamflow in Walnut Creek.
- 29. That Irwin Alefs testified that he grew up along Walnut Creek and that they drilled an irrigation well because the Walnut Creek was unreliable; that his grandfather had a dam in the creek and that it was about four feet above the normal flow of the creek and now it is covered with silt; that in 1954 or 1955, that they pumped water into the creek from their irrigation well so that it could be diverted by Cheyenne Bottoms.
- 30. That Margaret Oborny, Bison-Timken area, testified generally about their family farm and that without irrigation or with drastic cuts in irrigation, there is a very limited future for the family farm.
- 31. Bernard Juno, farmer in Rush County, testified that a March 30, 1933 article in the Rush County newspaper shows that before active irrigation was developed, the Walnut Creek was an unreliable stream as far as the base flow for irrigation or any other use; that there are 17 surface water

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rights in Rush County alone that secure any base flow that was ever in Walnut Creek; that the 1933 article also shows that any water the Cheyenne Bottoms would receive would have to be in excess runoff due to a heavy rainfall.

32. Roger Mohr, farmer southwest of Otis in the Walnut Valley, testified that the water level in his well drilled in 1977 was 27 feet; that the lowest the water level has been was 36 feet in 1984 and that the water level has continued to rise since a watershed dam built on his property was filled for the first time in 1987; that they have used surge valves for five or six years and have seen substantial savings in water.

FORMAL PHASE

That the Formal Phase of the hearing was held in Great Bend, Kansas beginning on December 4, 1990.

1. That James O. Bagley, Section Head, Technical Services Section, Division of Water Resources, Kansas State Board of Agriculture, testified to a report that he had authored entitled "Availability of Water in Walnut Creek, its Tributaries, their Valley Alluviums, and Hydraulically Connected Aquifers"; that this report is Division of Water Resources Report No. 89-1, dated September 1989; that the purpose for preparing the report was to determine if any additional water was available for appropriation in Walnut Creek, its tributaries and their valley alluviums in Barton, Rush, Ness, Lane, Scott and Pawnee Counties. That the report concludes streamflow in Walnut Creek has decreased

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- substantially over the last 30 years; that this decrease in streamflow does not appear to be a direct result of climatic changes since the average annual precipitation has not changed significantly; that base flow in the lower part of the basin is virtually non-existent. (Exhibit 1, Page 6)
- 3. That the report also concludes groundwater levels have declined in the alluvial valley of Walnut Creek since 1960 in Barton and eastern Rush Counties by as much as 18 feet. (Exhibit 1, Page 6; Exhibit 1, Figures 9, 10 and 11)
- 4. That the report concludes the combination of declining streamflows and declining groundwater levels over at least the last 20 years seems to indicate that the hydrologic system is out of balance; that it appears that pumpage of groundwater and surface water has exceeded the ability of the surface water/groundwater system to be recharged on a consistent basis; that Walnut Creek, its tributaries, their valley alluviums and aquifers in strong hydraulic connection with the valley alluviums are at least fully appropriated based on conditions now existing. (Transcript, Pages 171 through 172; Exhibit 1, Page 7)
- 5. That Mr. Bagley testified that he had a role in drawing the proposed boundaries for the proposed intensive groundwater use control area; that Big Bend Groundwater Management District No. 5 was also involved in drawing the proposed boundaries for that part of the area lying within the

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groundwater management district; that the boundaries were drawn to include all of the alluvial valley in Barton, Rush and the eastern half of Ness County; that the western boundary was drawn so that the western-most well for which there was a water right of record that was in the valley alluvium or terrace deposits in Ness County was included; that the north and south boundaries in Rush and Ness counties were drawn to include the existing and proposed watershed structures on tributaries to Walnut Creek within an area thought to have the greatest influence on Walnut Creek; that the eastern boundary and the north and south boundaries in Barton County were drawn by the Big Bend Groundwater Management District No. 5. (Pre-filed Testimony of James O. Bagley, Page 19; Transcript, Pages 138 through 140)

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6. That Guy E. Ellis, Section Head, Compliance, Enforcement, Water Use and Certificate Section, Division of Water Resources, Kansas State Board of Agriculture, in pre-filed testimony testified that he prepared Division's exhibits 4 and 5 which summarized the requested and authorized quantities of water appropriated within the boundaries of the proposed Walnut Creek IGUCA; that these exhibits, modified and updated as of May 6, 1991 to reflect the revised boundaries, show 71,724.64 acre-feet of water were authorized to be diverted under the authority of 504 vested rights, water rights and approved applications for both surface and groundwater uses within the proposed IGUCA; and that 7,899.21 acre-feet were authorized under the authority of 82 vested rights. (Pre-filed Testimony, Pages 2 through 6; Exhibits 4 and 5, Revised)

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That Mr. Ellis testified that within the proposed Walnut Creek IGUCA boundaries there are 40,028.8 acres of land authorized to be irrigated as

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of October 23, 1990. (Transcript, Page 229)

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- 8. That Dr. Gonzalo Castro, Program Manager, Western Hemisphere Shorebird Reserve Network in Manomet, Massachusetts, testified regarding a research program that he conducted at Cheyenne Bottoms from September 1988 through October 1990; that Cheyenne Bottoms is one of the most important wetlands in the world, and is one of the largest in the United States (Transcript, Page 298); that Cheyenne Bottoms has been recognized internationally by inclusion in the Western Hemisphere Shorebird Service Network and within the Ramsar Convention. (Transcript, Pages 323 through 324)
- 9. That the major importance of Cheyenne Bottoms is its unique geographic position as a resting and refueling site for migratory birds (Transcript, Page 299); that the birds stop at Cheyenne Bottoms to build up fat for fuel to continue their migration (Transcript, Pages 316 through 317); that if the birds cannot build up enough fat, they will be unable to complete their migration or, if they can complete their migration, they will be unable to breed.
- 10. That of all the shorebirds counted at 210 stopover sites throughout the Western Hemisphere, 76 percent of them were at either Cheyenne Bottoms or Cape May in New Jersey (Transcript, Page 306); that the number of shorebirds counted at Cheyenne Bottoms represents 43 percent of all the shorebirds in the Western Hemisphere. (Transcript, Page 306)

- 11. That Cheyenne Bottoms is much more important to migratory shorebirds during the spring than during the fall. (Transcript, Page 314)
- 12. That during a dry year, any water would be extremely important to Cheyenne Bottoms because it would give some feeding conditions to the birds and they would be able to survive; that even 3,000 acre-feet of water would be plenty to allow the birds to survive. (Transcript, Page 326)
- 13. That Matt Scherer, III, Water Conservation Engineer, Division of Water Resources, Kansas State Board of Agriculture, testified that he prepared Exhibit 9 summarizing the net and gross irrigation water requirements for common crops in the proposed IGUCA; that the net irrigation water requirement in inches per year for the area of the IGUCA given the 50% chance rainfall (that amount of precipitation that is equalled or exceeded on average every other year) is as follows:

<u>County</u>	<u>Wheat</u>	<u>Corn</u>	Sorghum	<u>Soybeans</u>	<u>Alfalfa</u>
Ness	9.3	13.3	11.3	10.4	20.5
Rush	8.5	12.6	10.4	9.6	20.3
Barton	7.8	12.0	9.7	8.9	19.3

(Transcript, Pages 419 through 423; Exhibit 9; Table 9B)

14. That Mr. Scherer testified that he prepared two graphs (Exhibits 10 and 11) showing the reported depth of application (acre-feet per acre) for 1989 within the proposed boundaries of the IGUCA for points of diversion that are not metered and points of diversion which are metered; that comparing the two graphs indicates that the amount of water estimated by those irrigators who do not have meters is probably higher than the amount of water actually pumped. (Transcript, Pages 423 through 426; Exhibits 10 and 11)

- 15. That Mr. Scherer testified that he prepared graphs and tables summarizing the results of a paper titled "Crop Responses Under Various Irrigation Scheduling Criteria" (Exhibit 18) by Freddie Lamm, Kansas State University, Northwest Research-Extension Center, Colby, regarding crop responses under various irrigation scheduling criteria (Exhibits 12 and 13); that the study indicated that intense management practices can reduce the amount of water used to irrigate corn, grain sorghum and soybeans without adversely affecting the yields in most years. (Transcript, Pages 426 through 435; Exhibits 12, 13 and 18)
- 16. That he also testified that he prepared Division Exhibit 15 summarizing the water use reported by cities withdrawing water from the proposed IGUCA for the years 1986 through 1989; that in most cases cities drawing water from within the boundaries of the IGUCA used less water on a gallons per capita basis than did their peers in similar climatological conditions. (Transcript, Pages 435 through 440; Exhibits 14 and 15)
- 17. That Thomas McClain, associate section chief of Geohydrology Section of the Kansas Geological Survey, testified to portions of a report entitled "Cheyenne Bottoms An Environmental Assessment" which he co-authored; that

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chapters 4 and 10 of this report contain the results of two studies Mr. McClain had done for the assessment.

- 18. That Mr. McClain testified that Walnut Creek Basin is a long narrow valley extending from approximately Scott County to Barton County. (Transcript, Page 643)
- 19. That he further testified that the Walnut Valley Aquifer is composed of gravel, sand, silt and clay deposited by Walnut Creek; that terrace deposits on the sides of the valley are composed of similar material; that both deposits yield water to wells, although the valley fill is the predominate aquifer; that the alluvial material rests on bedrock of Cretaceous age; that the bedrock consists of the Greenhorn Limestone, Graneros Shale, and Dakota Formation; that neither the Greenhorn or the Graneros is an aquifer in the Walnut Valley area; that the Ogallala Formation is in the western part of the basin. (Cheyenne Bottoms An Environmental Assessment, Page 171; Transcript, Page 643)
- 20. That he also testified that the Ogallala Formation is separate hydrologically from the other aquifers to the east, being separated by erosional features from the alluvial aquifer. (Transcript, Page 644)
- 21. That Mr. McClain testified that no long-term change in average annual precipitation for the period 1946 through 1985 was observed for the basin as represented by the precipitation stations at Ness City, Bison, and Great

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Bend; that Mr. McClain did not study the duration and intensity of precipitation. (Transcript, Page 646 and 647)

- 22. That Mr. McClain testified that groundwater declines from 5 to 18 feet have been observed in Rush County from 1960 through 1982; that groundwater declines for Barton County have averaged from 5 to 15 feet in the study area from the early 1940's to 1982; that groundwater fluctuations have been observed in Ness County but no trends are evident; that groundwater declines from 1960 to 1982 in Rush County have resulted in a loss of approximately 69,000 acre-feet of water in storage; that there was an estimated 241,000 acre-feet of water in storage in 1960 and 172,000 acrefeet in 1982. (Transcript, Pages 653 through 658, 764)
- 23. That he testified that the causes of groundwater declines that have occurred in the Walnut Creek alluvial aquifer are lateral outflow, evapotranspiration, downward leakage, discharge by pumping wells, and groundwater seepage to streamflow; that lateral outflow, evapotranspiration, and baseflow would be relatively small portions of the total discharge so that the major discharge would be groundwater pumping by wells. (Transcript, Pages 659 through 661)
- 24. That he testified that streamflow in Walnut Creek has declined from 1959 through 1985 based on the gaged flow at the Albert gaging station; that in the 1960's and 70's there was a significant component of base flow, that is, contribution of water from the aquifer to the stream; that after the mid 1970's the base flow in large part disappeared and flow in the creek

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was only present when there was heavy precipitation and runoff. (Transcript, Pages 663 through 667)

- 25. That he testified that the decline in streamflow is due to a decline in both base flow and runoff; that the factors that affect runoff are the duration and intensity of precipitation and changes in land use; that the factors effecting baseflow are evapotranspiration by plants and trees and the change of the water level in the aquifer; that the decline in baseflow is due to a decline in groundwater levels; that if the water level in the aquifer does not come into contact, or is not above the base of the channel, there is no baseflow. (Transcript, Pages 669 through 671)
- 26. That Mr. McClain testified that he would recommend further study of the Walnut Creek Aquifer; that essentially a water budget study that would take into account stream aquifer interaction and tie in the rainfall and runoff factors would be useful; that he didn't have the time to do this type of study for the Cheyenne Bottoms Environmental Assessment. (Transcript, Page 699)
- 27. That Mr. McClain testified that there was no long term decline in groundwater levels in Ness County. (Transcript, Page 752)
- 28. That Mr. McClain testified that even with a fully recharged aquifer there would not necessarily be baseflow; that under natural conditions the water level in the aquifer could be lowered below streambed elevation in a dry year, which would result in no baseflow; that if you then had above average

rainfall for a year or two, the water table could then rise; that fluctuations in the water table could occur even in a fully recharged aquifer. (Transcript, Pages 819 and 820)

- 29. That Mr. McClain testified that more study would be needed to quantify the effects of watershed structures and other surface practices. (Transcript, Page 827)
- 30. That Mr. McClain testified, when cross examined about information contained in Kansas Water Resources Board Bulletin No. 17, "Natural and Artificial Groundwater Recharge, Wet Walnut Creek", (hereinafter referred to as the Gillespie Report), that there were water level rises of 6 to 14 feet in the eastern part of Rush County as a result of the 1959 flood (Transcript, Pages 882 and 883); that he also testified concerning the same report that water level rises from .42 to 4.09 feet occurred in wells in the Wet Walnut Valley in response to high flows that occurred in mid-June of 1970; that Mr. McClain testified that high flows in the stream could have an effect on recharge but that it would depend on how high the flows are and where they go and what the lateral spread is. (Transcript, Pages 884 through 886)
- 31. That Mr. McClain testified under cross examination that whether a well would have a direct impact on streamflow would depend on a number of factors, such as the distance of the well from the stream, whether the aquifer was in direct connection to the stream, or whether the aquifer had

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declined enough so that it was not in direct connection with the streambed. (Transcript, Page 888)

- 32. That Mr. McClain testified under cross examination, when he was questioned about some low flow discharge measurements made on Walnut Creek in the 1950's, that those measurements show periods of time when there was little or no flow at specific locations on Walnut Creek. (Transcript, Pages 894 through 899)
- 33. That Mr. McClain under cross examination was questioned about the hydrograph for a well identified as 18-15W-28CCB shown in the Gillespie Report; that he testified that this hydrograph indicates that from 1954 through 1957 the water table was generally below the bottom of the creek. (Transcript, Page 903)
- 34. That Mr. McClain under cross examination, when questioned about the Gillespie Report, testified that he agreed that significant recharge can occur in the Walnut Creek given the correct type of rain event. (Transcript, Page 906)
- 35. That Mr. McClain testified that with a silt layer present in the creek channel that there would be less downward percolation than if the silt layer was not there. (Transcript, Page 919)
- 36. That Mr. McClain testified that for the wells mentioned in the United States Department of Agriculture, Soil Conservation Service, Biological

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Assessment: Wet Walnut Creek Watershed, Sub-watershed Nos. 1, 2, 3 and 5 (June 1989) there have been fluctuations in the water table for the period 1982 to 1988; that the average depth of the water table appears to be greater in 1982 than in 1988 which would mean that the water table came up during that period of time. (Transcript, Pages 920 and 921)

- 37. That Mr. McClain testified that the source of water that underlies the city of Great Bend would be from the south and west of Great Bend in general, and mostly from the west by the shape of the water level contours (Transcript, Pages 960 and 961); that he also testified that if a well in the City of Great Bend was pumping water and formed a cone of depression that the water would be replenished by water from the Arkansas River Alluvium (Transcript, Page 962); that Mr. McClain testified that a well located from 3 to 4 miles from Walnut Creek would likely not have a significant effect on streamflow in Walnut Creek (Transcript, Page 965); that Mr. McClain testified that the source of water for a well at the Great Bend municipal airport would be the Arkansas River Valley system. (Transcript, Page 984)
- 38. That Sharon Falk, Manager, Big Bend Groundwater Management District No. 5, testified regarding the programs and objectives of the District; Ms. Falk testified that the major goal of the District is to manage and protect the groundwater to conserve it for present and future generations. (Transcript pages 1058 through 1059)

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- 39. That Ms. Falk testified that in her opinion unpermitted uses of water such as domestic, sand pits, lakes, evaporation, windmills, stock watering and evapotranspiration need to be quantified. (Transcript, Pages 1051 through 1052)
- 40. That Ms. Falk testified that more accurate water use records for the District's data base need to be obtained in order to make recommendations in regard to the proposed IGUCA (Transcript, Page 1053); that at least two to three years of water use reporting are needed; (Transcript, Page 1055); that water use reporting has increased 20 percent from 1980 to the present and that there has been improvement in water use reporting in the last two years. (Transcript, Pages 1053 through 1054)
- 41. That Ms. Falk testified that the District started studies of recharge in various areas in 1984 (Transcript, Page 1061); that there is presently no recharge study site in the Walnut Creek Basin. (Transcript, Page 1083)
- 42. That Ms. Falk testified that metering would be a useful tool to give a more accurate picture regarding the actual use of water in the area (Transcript, Page 1063); that the District has required permanent flow meters on all new applications and change applications beginning in 1984 (Transcript, Page 1099); that water users in the District were required to install either a main line flow meter or a port and valve system in conjunction with an hour meter by 1989. (Transcript, Pages 1062 and 1099 through 1100)

- 43. That Ms. Falk testified that in order to provide assistance within the proposed IGUCA, the District would need additional human resources and equipment. (Transcript, Page 1065)
- 44. That Ms. Falk testified that the District recommended that the IGUCA proceedings be initiated based upon declining groundwater levels in the Barton County portion of the proposed IGUCA; that the determination that there were declining groundwater levels was based on past annual water level measurements taken by the United States Geological Survey, the Kansas Geological Survey and the Division of Water Resources. (Transcript, Page 1069)
- 45. That Larry Panning, member of the Board of Directors, Big Bend Groundwater Management District No. 5 and member of the Kansas Water Authority, testified regarding the programs initiated in the Groundwater Management District and in general regarding expenditures on conservation practices in the State of Kansas. (Transcript, Pages 1152 through 1188)
- 46. That Danny D. Zehr, Assistant Manager and District Geologist for Big Bend Groundwater Management District No. 5, testified to a report which he authored entitled "Preliminary Assessment of Walnut Creek, Its Tributaries, Their Valley Alluviums, and Aquifers In Strong Hydraulic Connection with The Valley Alluviums"; that this report was prepared in accordance with the directions of the board of directors of Big Bend Groundwater Management District No. 5; that the purpose of the report was to specifically identify the groundwater aquifer that encompassed Walnut Creek and its tributaries,

their valley alluviums and any other aquifer that was affected by or could directly affect the Walnut Creek Valley (Exhibit 29, Pages 2 and 3); that it was primarily an assessment of known publications. (Transcript, Pages 1189 through 1194)

- 47. That Mr. Zehr testified that the aquifer within the proposed boundaries of the IGUCA within Barton County contains hydraulically interconnected sands and gravels; that these sands and gravels which exist in the alluvial valley of Walnut Creek, Dry Walnut Creek and in the area along the Arkansas River Valley are generally of Kansan stage; that the basal sands and gravels are hydraulically interconnected and are of Kansan stage, specifically the Meade Formation. (Exhibit 29, Pages 12 through 15)
- 48. That Mr. Zehr testified that the Barton County portion of the Walnut Creek valley aquifer contains deposits which vary in thickness from a few feet to over 120 feet in deeper portions of the bedrock paleochannel; that these deposits are generally unconfined, but due to the presence of thick clays, in places are semi-confined with a perched water table above the clays (Exhibit 29, Pages 14 and 18); that the presence of bedrock channels could have an influence on movement of water in the aquifer; that water would tend to move down gradient from west to east throughout most of this area (Transcript, Page 1220); that after having looked at the kind of deposition, mostly sands and gravels and some silts and clays, there did not seem to be anything physically present in any of the bedrock channels that would impede interconnection of the flow once the aquifer was full of water (Transcript, Page 1232); that water in the aquifer near the

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elevation of the water table could move in a direction that would cross the axis of a bedrock valley as opposed to following the direction of the bedrock valley itself. (Transcript, Pages 1242, 1243 and 1439)

- 49. That Mr. Zehr testified that recharge to the Walnut Creek valley alluvium and its tributary channels is predominately from percolation of streamflow through the channel; that this is especially true during high flows; that very little recharge to the aquifer occurs from infiltration of precipitation on the land surface (Exhibit 29, Page 20 and 21); that better quantitative information on recharge is needed (Transcript, Page 1253); that most of the recharge occurs from streamflow and that streamflow is a function of runoff which in turn is a function of the intensity and duration of storms (Transcript, Pages 1370 and 1371); that there is some evidence that some recharge is occurring downstream from several of the watershed structures. (Transcript, Page 1342)
- 50. That Mr. Zehr testified that water level declines in Barton County within the proposed boundaries for the proposed IGUCA in four representative wells from 1944 to September 1990 ranged from 5.58 to 15.71 feet (Exhibit 29, Page 28 and Table 4); that a water level decline of 15 feet where 80 feet of saturated thickness remains may not have the same impact as a decline of 15 feet over the same period of time in an area where only 40 feet of saturated thickness would remain. (Transcript, Pages 1277 and 1278)
- 51. That Mr. Zehr testified that groundwater usage exceeds current recharge as evidenced by water level declines (Exhibit 29, Page 29; Transcript,

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Pages 1316 and 1364); that both recharge and withdrawal may vary from year to year and place to place within the aquifer. (Transcript, Pages 1360 and 1361)

- 52. That Mr. Zehr testified that runoff has been reduced by changing farm practices, conservation of soil moisture, terracing, and small holding ponds resulting in less recharge; that large floods in the past produced dramatic recharge but now with watershed structures in place there will no longer be large floods and no longer any dramatic recharge (Exhibit 29, Page 29); that during cross examination Mr. Zehr testified that he did not have any figures to disagree with a study that shows that in a one percent storm frequency chance there would be a reduction of the inner bench water depth from 12.8 to 11.7 feet as a result of the watershed structures. (Transcript, Pages 1339 through 1341)
- 53. That Mr. Zehr testified that the accumulation of silts in the Walnut Creek channel inhibits low flows from producing recharge (Exhibit 29, Page 30; Transcript, Pages 1293 and 1294); that high flow events might not entirely remove silts but rather might remove silts from one area and redeposit them somewhere else. (Transcript, Page 1294)
- 54. That Mr. Zehr testified that the quantification of water use by native grasses and trees has not been done for the Walnut Creek area; that estimates of water use by trees may be significant (Transcript, Pages 1259 through 1263; 1302 through 1303); that there has been an increase since the 1930's in the number of trees in this particular area (Transcript,

Pages 1324 through 1326); that the actual amount of groundwater being pumped in the area needs to be quantified and that the metering plan described in testimony of Sharon Falk would be of benefit (Transcript, Pages 1268 and 1269); that the amount of water used for domestic purposes from wells has not been quantified (Transcript, Pages 1269 and 1270); that further study is needed to develop a water budget model for the Walnut Valley that would take into account these various factors as well as soil types, land uses, and cropping patterns. (Transcript, Pages 1308 and 1309)

55. That Mr. Zehr testified that the original proposed boundaries for the Walnut Creek IGUCA within Barton County were determined by staff of Groundwater Management District No. 5; that the rationale for those boundaries was the drainage basin divide between the Walnut Creek drainage basin and the Arkansas River drainage basin using section lines nearest the divide (Transcript, Pages 1423 through 1424); that the area within the proposed boundaries appears to be a continuous combination of sand, gravel, clay, and silt that is all interconnected (Transcript, Page 1248); that there seems to be nothing to separate one area from the other, as far as the aquifer is concerned; that the amount of water appropriated within the boundaries of the proposed IGUCA within Barton County south of Walnut Creek is approximately 22,000 acre-feet (Exhibit 30; Transcript, Pages 1346 through 1348); that there is no natural divide in this area on which to base a boundary (Transcript, Page 1440); that additional study is needed to determine an appropriate southern boundary for the IGUCA in Barton

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County and that there is insufficient data on which to base the southern boundary of a control area. (Transcript, Pages 1359, and 1439)

56. That Mr. Zehr testified that the only way base flow could be restored to Walnut Creek is to bring the water table above the elevation of the bottom of the stream (Transcript, Page 1315); that referring to Figure 8 in Exhibit 29 which is a hydrograph of a well identified as 18-15-28CCC in Barton County, Mr. Zehr testified that this shows periods of time when the water level in this well was both above and below streambed elevation (Transcript, Pages 1320 through 1322); that since 1974 the water level has continuously been below the streambed elevation; that Walnut Creek has undergone several changing periods as being either a gaining or losing stream (Exhibit 29, Page 25; Transcript, Page 1350); that base flow can exist whenever the water level in the aquifer is at or above the elevation of the bottom of the stream channel and that when the water level in the aquifer falls below the bottom of the stream channel base flow will cease (Exhibit 29, Pages 24 and 25); that if Walnut Creek has been silted in such that the bottom of the stream channel is higher now than it used to be, in order to restore base flow, the water level in the aguifer would have to be brought higher now than it would have been prior to the deposition of the silt. (Transcript, Pages 1355 and 1356)

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57. That Clark Ruscoe, City Engineer for the City of Great Bend, testified concerning Exhibit No. 32; that Exhibit No. 32 consists of twenty individual slides; that these slides contain information in reports presented by other witnesses; that the maps shown on the slides were mainly

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traced electronically from the various reports; that Mr. Ruscoe was in no way testifying as to the substance or the validity of the information contained in those reports or how it might relate to the decisions that would be made in the intensive groundwater use control area proceedings (Transcript pages 1525 and 1526); that the purpose for these slides, which are colorized versions of information contained in reports presented by other witnesses, is to get the information on a common scale so the various information could be overlaid on top of a base map (Transcript 1483).

58. That Terry Lee Dale, District Manager for Central Kansas Utility which is owned by Mid-Missouri Engineers, testified concerning static water level measurements made for the City of Great Bend's eleven water supply wells, which are operated by Central Kansas Utility, for May 1990 through December 1990 (Exhibit No. 33; Transcript pages 1530, 1534 and 1535); that the static water level measurements were made from the vent pipe to the water level in each well except for Well No. 12; that the vent pipes are typically three to five feet above the surface of the ground (Transcript page 1538 through 1540); that the elevation difference between the measuring point and the ground level for the wells was not specifically measured (Transcript page 1543); that Mr. Dale testified that it was his observation that water levels in the city's wells respond very, very quickly to flow in the river (Transcript page 1549); that Mr. Dale also indicated that during an extended dry period of about nine months, the water in the levels in the wells fell around six feet (Transcript pages 1583 and 1584); that Mr. Dale was not testifying as to the scientific evidence or hydrologic analysis of the cause for the rapid response of

water levels in the wells to flow in the Arkansas River since he is not a hydrologist (Transcript pages 1579 and 1580); that Mr. Dale testified that there was a change in the water levels in the Great Bend area between the 1950's and 1960's to the present; that he characterized the change as a downward trend, indicating that the change may have been somewhere on the order of perhaps five feet (Transcript page 1602).

- 59. That Robert Lee Vincent, consulting groundwater geologist and founder of Groundwater Associates, Incorporated, testified to a report which he authored entitled "Analysis of the Geology and Hydrology of the Walnut Valley Area and the Arkansas Valley Area"; that the purpose of the report is to discuss the proposed Walnut Creek IGUCA, and in particular the proposed boundaries; that this report was prepared for Central Kansas Utility Company. (Exhibit 34, Page 1)
- 60. That Mr. Vincent testified that the Arkansas Valley area is a separate groundwater unit from the Walnut Creek area, and when the two areas merge, the Walnut Creek enters as a tributary to the Arkansas River. (Exhibit 34, Page 8 and Figure 1; Transcript, Page 1615)
- 61. That Mr. Vincent testified that the static water levels (past and present) in the Great Bend area show that the water comes from the Arkansas River drainage moving from southwest to northeast through the Great Bend area (Exhibit 34, Pages 1 and 8, and Figures 2, 3, and 4; Transcript, Pages 1616, 1622 through 25, 1661 through 62, and 1711 through 1712).

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- 62. That Mr. Vincent testified that the geologic formations under Great Bend are the Arkansas River alluvium and the Meade Formation, and the vast majority of these deposits were placed there by the Arkansas River or its ancestors (Exhibit 34, Page 8; Transcript, Pages 1638 through 1643).
- 63. That Mr. Vincent testified that the upper 2 to 20 feet of alluvium in the Arkansas Valley consists of silt and fine to coarse sand; that beneath these finer surficial deposits are thick beds of coarse granitic sand and gravel that are lithologically similar to the sands and gravels of the Meade Formation; that because of this similarity, it is not possible to differentiate the alluvium of the Arkansas Valley from the underlying Meade Formation (Exhibit 34, Page 4; Transcript, Pages 1638 through 1643 and 1775).
- 64. That Mr. Vincent testified that the valley-fill deposits in the Walnut Valley area are composed of fluvial clay, silt, sand and gravel; that the upper 20 to 40 feet of the fill is predominately silt with clay that overlies a thick deposit of sand and gravel in Walnut Creek Valley (Exhibit 34, Page 4; Transcript, Pages 1638 through 1643).
- 65. That Mr. Vincent testified that he examined 552 logs for water wells located in Township 19S, Range 13W and Township 19S, Range 14W (Transcript, Pages 1613, 1675 and 1771); that the difference in deposits derived from the Walnut Creek area and the Arkansas River area can be seen graphically in work completed by the U.S. Army Corps of Engineers in its investigation for the Great Bend Local Flood Protection Project; that the change in

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lithology occurs in the area between cross sections F-F and G-G as shown on Figure 6 of Exhibit 34; that Dry Walnut Creek crosses the area between cross sections F-F and G-G (Exhibit 34, Page 5 and Figures 6 through 10; Transcript, Pages 1664 through 1680).

- 66. That Mr. Vincent testified that the quality of the water found under Great Bend and the surrounding area shows it comes from underflow associated with the Arkansas River rather than Walnut Creek (Exhibit 34, Page 8); that very little water from the Walnut Creek alluvium is getting down to Great Bend (Transcript, Pages 1707 through 1710).
- 67. That Mr. Vincent testified that there is no physical barrier separating the aquifer in the sands and gravels under the Wet Walnut Creek north of Great Bend from the sands and gravels under the City of Great Bend (Transcript, Page 1775); that although there is a significant hydraulic connection between the alluvium and the Meade Formation which underlies the city of Great Bend and the alluvium of Walnut Creek, pumping that occurs in the Arkansas River alluvium and the Meade Formation would not have a significant effect upon the alluvium of Walnut Creek because it is too far away (Transcript, Pages 1713, 1714 and 1718).
- 68. That Mr. Vincent testified that in comparing water levels between 1942 and 1982 in the Arkansas River Valley with those in the Walnut Creek Valley that there was less change in the water level in the Arkansas River Valley than in the Walnut Creek Valley; that this is the case in spite of the fact that there is much more development in the Arkansas River Valley; that part

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of the reason for this is that the aquifer in the Arkansas River Valley area is larger than that in the Walnut Creek Valley; that the depletion in the Arkansas River Valley indicated by the water level declines is not a significant depletion of that aquifer; that in the Walnut Creek Valley there has been as much as a 15 foot drop in the water level during the period of 1942 through 1982 (Transcript, Pages 1629 and 1630); that a comparison of water levels beneath the City of Great Bend between 1982 and 1990 indicates that there has virtually no change in the water level (Transcript, Pages 1633 and 1644); that the reason there has been little change in the water level in the area is because the Arkansas River Valley and the Great Bend Prairie are very susceptible to recharge and the aquifer responds quite quickly to a heavy rain; that the reason it does is because the water level is close to the surface and there is sand very close to the surface which makes it easy for the water level to change (Transcript, Pages 1636).

69. That Mr. Vincent testified that the value for transmissivity determined from a Kansas Geological Survey pump test is 145,000 per day per foot (Transcript, Pages 1684 and 1685); that the value of transmissivity determined from this pump test can be considered in the ball park for wells in the vicinity of Great Bend since both the pump test well and wells in the vicinity of Great Bend take water from both the Meade Formation and the alluvium, and the depths of the wells and the saturated thickness are very similar (Transcript, Page 1687).

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- That Mr. Vincent testified that the amount of water flowing through the 70. aquifer under a four-mile wide strip in the vicinity of Great Bend can be calculated, using Darcy's Law with a transmissivity of 145,000 gallons per day per foot, a water level gradient of 7.5 feet per mile, and a characteristic width of four miles, to be 4,873 acre-feet per year (Exhibit 38; Transcript, Pages 1688 through 1701); that the amount of water used during 1988 by the City of Great Bend was about 2,700 acre-feet per year (Exhibit 39); that 1988 was chosen since that was the year of highest use (Transcript, Page 1849); that the amount of water entering Barton County in the Walnut Creek Alluvium has been estimated to be 970 acre-feet per year (Transcript, Pages 1685 and 1686); that the 2700 acre-feet pumped in 1988 represents approximately 55 percent of the amount of water that is moving in the Arkansas River Valley area to the northeast through Great Bend (Transcript, Page 1839); that in his opinion Central Kansas Utility Company is not pumping water from the Walnut Creek Valley System (Transcript, Page 1839).
- 71. That Mr. Vincent testified that the pumping of the wells operated by Central Kansas Utility does not have a significant effect upon the streamflow of Walnut Creek or upon the water table held in the Walnut Creek alluvium (Transcript, Page 1703).
- 72. That Mr. Vincent testified that a boundary line for the southeast part of the intensive groundwater use control area can be drawn based on geology and water quality (Exhibit 34, Figure 11; Transcript, Pages 1738 through

40); that the Great Bend Airport wells lie outside of this proposed boundary (Transcript, Pages 1746 and 1747).

- 73. That Mr. Vincent testified that the bed of Dry Walnut Creek represents a natural divide between the Arkansas River Valley and the Wet Walnut Creek Valley (Transcript, Pages 1824 and 1836); that during cross examination Mr. Vincent testified that an alternate set of boundary lines for the southern portion of the proposed IGUCA could be drawn based on using Dry Walnut Creek as a natural divide (Transcript, Pages 1824 through 1840); that this boundary line is shown on correspondence from DeAnn Hupe, attorney for the Kansas Department of Wildlife and Parks, dated February 26, 1991; that this letter was sent to all parties to the IGUCA proceedings and was intended to clarify the testimony in this matter; that it would be reasonable to exclude Great Bend from the proposed IGUCA and use the Dry Walnut Creek as a natural divide (Transcript, Page 1840).
- 74. That Mr. Vincent testified that the wells shown on Exhibit 31 in the area that he has proposed to remove from the proposed IGUCA would not have an impact on the Walnut Creek aquifer; that those wells that would be in the area that is still proposed to be within the IGUCA would have an impact on the Walnut Creek Aquifer (Transcript, Pages 1847 and 1848).
- 75. That James K. Koelliker, Ph.D, Professor of Water Resources in Civil Engineering at Kansas State University, testified to a report he authored as an independent consultant for Howard, Needles, Tammen and Bergendoff titled "Summary Report Estimating the Future Water Supply for Cheyenne

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Bottoms Wildlife Area in Kansas", (Exhibit 43, Appendix A; Transcript, Page 1880); that the report is Appendix A to the "Engineering/Hydrological Study, Cheyenne Bottoms Wildlife Area, Barton County, Kansas" prepared by Howard, Needles, Tammen and Bergendoff (Exhibit 43); that the report was completed in March, 1990; that the purpose of the report was to estimate the water supply that would be available to the managers of Cheyenne Bottoms for watershed conditions that might exist in approximately the year 2000; that the estimated watershed yield for year 2000 conditions and the temperature and precipitation records for 1948 through 1988 were provided to other engineers who analyzed design and management alternatives. (Transcript, Page 1880)

76. That Professor Koelliker testified that the geographical area covered by the study includes all areas contributing water to Cheyenne Bottoms - the natural drainage area, the Arkansas River and Walnut Creek; that the long term water supply to the Bottoms by source is:

25,000 acre-feet from direct precipitation on the Bottoms 17,000 acre-feet from the natural drainage basin 37,000 acre-feet from the Arkansas River and Wet Walnut Creek 79,000 acre-feet total (Transcript, Pages 1879 and 2045 and Exhibit 43, Appendix A, Page 2)

77. That the report concludes that average precipitation at Cheyenne Bottoms is approximately 25 inches per year or about 25,000 acre-feet. (Exhibit 43, Appendix A, Page 2)

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- 78. That the report concludes that the Blood Creek drainage has an average runoff of 1.5 inches per year from its 61 square mile drainage area; that if this is indicative of the rest of the watershed the natural watershed for Cheyenne Bottoms should yield an average of 17,000 acre-feet per year. (Exhibit 43, Appendix A, Pages 1 and 2)
- 79. That Professor Koelliker testified that the amount of water contributed to the Bottoms by the natural drainage area is reduced because of marshes intercepting Blood and Deception Creeks, the two major tributaries to Cheyenne Bottoms; that the marshes intercepting Blood Creek reduce the inflow to Cheyenne Bottoms from the Blood Creek drainage basin by approximately 29% over the long term while the marshes intercepting Deception Creek reduce the inflows by approximately 60%. (Transcript, Page 1890)
- 80. That the report concludes that the marshes which intercept Blood Creek and Deception Creek above Cheyenne Bottoms have a surface area of approximately 1,000 acres. (Exhibit 43, Appendix A, Page 3)
- 81. That Professor Koelliker testified that the consultants for Howard, Needles, Tammen and Bergendoff, as a group, estimated the canal efficiency for the Arkansas River canal is approximately 70% and the canal efficiency for the Walnut diversion canal is approximately 90%. (Transcript, Page 1886)

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- 82. That the report concludes that the amount of water available from the Arkansas River and the Walnut Creek, as restricted by the water rights for the diversions and a canal efficiency of 70% for the Arkansas River canal and 90% for the Walnut Creek canal, is 37,000 acre-feet per year; that the contribution from the Arkansas River was developed from gaging data for the Arkansas River at Kinsley and the Pawnee River near Larned; that these flows were reduced for each decade to estimate reductions in streamflow caused by changes in land use practices based upon model results for Walnut Creek Basin; that the resulting flows were also reduced for the limitations on the water rights and losses due to canal efficiencies. (Exhibit 43, Appendix A, Pages 2 and 9)
- 83. That the report states that the Wet Walnut Basin was divided into six subbasins, each of which was modelled separately; that the land use practices and crops were modelled as: continuous wheat, wheat fallow, row crops, row crops with good conservation tillage, pasture/range and pasture/range on crop land; and that these land uses represent the predominant agricultural practices in the basin. (Exhibit 43, Appendix A, Pages 10 and 12)
- 84. That the report concludes the losses of water from Cheyenne Bottoms include evaporation, which averages over 60 inches per year, and seepage, which was estimated at approximately one foot per year; that some water is also discharged through the drainage canal during high flow events; that the average losses at the Bottoms would total 74,000 acre-feet per year if all the pools are wet, which is not the normal operating condition. (Exhibit 43, Appendix A, Page 2)

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- 85. That Professor Koelliker testified that small changes in soil surface conditions which affect the flow of water on the soil surface or which Oinduce the soil to store more water can have substantial effects on the amount of surface water available for use downstream; that the mechanisms which induce this reduction in surface water runoff include increasing the opportunity time for infiltration, maintaining the soil in a condition that promotes infiltration, trapping water in terraces or reservoirs and conversion of land from crop land to grassland which yields less runoff than crop land. (Transcript, Page 1891)
- 86. That he further testified that the effects of land use changes conservation practices, reservoir and pond development - are having a substantial impact on the ability of the Walnut Creek watershed to yield water to the stream system; that more water is being held on the land and then used for dry land crop production, and held in reservoirs than has been in the past; that the effect of these practices is to: make dry years drier by reducing surface runoff, increase transmission losses and trap runoff that does occur in ponds or reservoirs. (Transcript, Pages 1950 and 1988)

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87. That Professor Koelliker's report concludes that the average annual yield of the Wet Walnut system is 41,100 acre-feet per year before accounting for groundwater pumpage. (Exhibit 43, Appendix A, Page 16)

88. That Professor Koelliker testified that the responsibility for reduced surface water could be allocated as:

Conservation practices 40%

Watershed structures 25% (½ lost to evaporation, ½ to seepage) Groundwater pumping 35%

(Transcript, Pages 2024 and 2031)

- 89. That Professor Koelliker testified that he modelled the Walnut watershed to account for conservation practices and further reduced the amount of surface water available by subtracting water lost from the stream to groundwater pumping using a long term average of 16,000 acre-feet per year of groundwater depletion; that a long-term average of 16,000 acre-feet per year was used because the aquifer would not able to sustain the groundwater depletion figures that other scientists had reported. (Transcript, Page 1953; Exhibit 43, Appendix A, Pages 9 and 16)
- 90. That Professor Koelliker testified that the "runoff potential" of the western portion of the basin has been reduced somewhat more than that of the eastern portion of the basin; that yields from the portion of the watershed located in Lane County are very small because a relatively large rainfall event is necessary to overcome the depleting effects of the land use practices but that in Ness County smaller rains cause runoff events and therefore runoff events are more frequent; that the portion of the watershed in Ness County produces slightly more runoff than in Lane County. (Transcript, Pages 2015 and 1991)

- 91. That the report concludes that conservation practices, in particular, tend to make dry years even drier as conservation practices capture most of the rainfall which occurs in the basin; that before accounting for groundwater depletions the average annual yield of the Wet Walnut basin is 41,100 acrefeet; that the contribution of the sub-basins ranged from 0.22 inches in Lane County to 1.58 inches below Heizer, the lowest sub-basin; that based on the work of other researchers, Professor Koelliker reduced this yield of 41,100 acre-feet per year by an average of 16,000 acre-feet per year to account for groundwater depletions caused by pumping. (Exhibit 43, Appendix A, Pages 9, 15, and 16)
- 92. That Professor Koelliker testified that a definite trend is indicated towards lower yields being available to Cheyenne Bottoms although there are still wide variations in the annual supply. (Transcript, Page 2013)
- 93. That Professor Koelliker testified that he and other researchers found no important changes in the precipitation amounts over the watershed. (Transcript, Page 2021)
- 94. That Professor Koelliker testified that his data indicate a slight increase in temperatures which would translate into a slight increase in the amount of water lost to evapotranspiration. (Transcript, Page 2023)
- 95. That the report concludes that although the study was unable to predict the effects of groundwater withdrawals, other researchers report such losses in the range of 15,000 to 20,000 acre-feet per year; that stopping

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junior groundwater pumping might make much of this water available within 10 to 20 years after pumping is stopped; that the distribution of flow in the Walnut that would result if junior groundwater rights were shut down is unclear; that there would not be a one-to-one correlation between the amount of water no longer withdrawn from the alluvium and the amount of water available to the Bottoms; that permanent reductions in use by junior groundwater water right holders should be required. (Exhibit 43, Appendix A, Pages 39 and 40)

- 96. That Professor Koelliker testified that watershed structures are valuable because they meter water downstream making more water available for use. (Transcript, Page 2031)
- 97. That Professor Koelliker testified that conservation practices are difficult to undo, while groundwater depletions and watershed structures are more readily managed or regulated to improve the water supply to Cheyenne Bottoms. (Transcript, Pages 2030 through 2032)
- 98. That Professor Koelliker testified that reductions of groundwater use will not produce a one to one gain in water available at the Bottoms. (Exhibit 43, Appendix A, Page 39)
- 99. That Professor Koelliker recommended that the Bottoms be permitted to divert at a higher rate than currently permitted under Water Right, File No. 439 to capture flood flows. (Transcript, Page 2034)

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- 100. That Professor Koelliker recommended that further studies of the impact of watershed structures on surface water flows should be conducted. (Transcript, Pages 2080 and 2222)
- 101. That the report concludes that Deception Creek could be channelized through the marshes to reduce losses. (Exhibit 43, Appendix A, Page 38)
- 102. That the report concludes that delivery efficiencies of the diversion canals should be improved if possible. (Exhibit 43, Appendix A, Page 39)
- 103. That the report concludes that any application for a water right to Blood Creek Marsh should be denied to avoid further reductions in natural inflows to Cheyenne Bottoms. (Exhibit 43, Appendix A, Pages 38 and 39)
- 104. That the report concludes that consideration be given to requiring bypasses through existing watershed structures. (Exhibit 43, Appendix A, Page 39)
- 105. That the report concludes that consideration be given to requiring new watershed structures to be built as dry dams. (Exhibit 43, Appendix A, Page 39)
- 106. That Professor Koelliker recommended that further study of the surface water/groundwater interaction be conducted. (Transcript, Page 2222)
- 107. That Edward D. Jenkins, consulting hydrologist, testified to a report he authored entitled "Hydrology of Wet Walnut Creek Basin as it Relates to

Water Supplies for Appropriation No. 439" dated November 1990; that this report was prepared for the Walnut Creeks Basin Association (Exhibit 46, Page 1); that the purposes for the report were to study the hydrologic history of the area, to study the surface and groundwater relationship, and to determine where the water came from that was diverted in the years 1954 and 1955 under Appropriation of Water No. 439. (Transcript, Page 3234)

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- 108. That Mr. Jenkins testified that he supports the boundaries as originally proposed for the IGUCA for the following reasons:
 - a. That the Arkansas River alluvium and Meade Formation are undifferentiable; that they blend together in the aquifer system that comprises the Arkansas River alluvium and Meade Formation and the Dry and Wet Walnut Creeks alluviums; that the aquifer material is transmitting water in these formations and is continuous in the area where the three alluviums coalesce and together have a width of approximately 6 miles (Transcript, Pages 2270 through 2272);
 - b. That bedrock forms a geologic boundary north of the Cheyenne Bottoms diversion dam and also in western Barton County between the Wet Walnut Creek and the combined aquifer area composed of the Arkansas River and Dry Walnut Creek alluviums (Transcript, Pages 2277 through 2279, 2305 through 2308, and 2314 through 2317);

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- c. That there is no groundwater divide in the area where the Arkansas River, Dry Walnut Creek, and Wet Walnut Creek alluviums coalesce (Transcript, Pages 2305 through 2308);
- d. That although he agrees with Robert Vincent's testimony concerning a distinction in the lithology of upper parts of the Walnut Creek alluvium and the Arkansas River alluvium, he does not consider this a good rationale for establishing a boundary (Transcript, Pages 2311 through 2313);
- e. That the Arkansas River represents a hydrologic boundary (Transcript, Pages 2277 through 2279, 2305 through 2308, and 2314 through 2317);
- f. That the 1982 water level contours do not show water from north of Dry Walnut Creek moving underneath Great Bend. (Transcript, Page 2282)
- 109. That Mr. Jenkins testified that wells in the area between where the original proposed boundaries were drawn and the boundaries proposed by Robert Vincent may have a cumulative effect through coalescing cones of depression by:
 - a. Intercepting or removing groundwater moving from the southwest to the northeast from the Arkansas River alluvium toward the Walnut

Creek alluvium (Transcript, Pages 2282 through 2287, 2303, and 2329 through 2333);

- b. Drawing water away from the Walnut Creek area (Exhibit 46, Page 17; Transcript, Pages 2282 through 2287, and 2329 through 2333);
- c. Under certain circumstances, reducing streamflow in Walnut Creek at the diversion dam for Cheyenne Bottoms. (Exhibit 46, Page 17; Transcript, Pages 2346 through 2355)
- 110. That Mr. Jenkins testified that the Central Kansas Utilities wells are located in an area of Great Bend where the alluvial aquifer is in the deepest part of a big channel; that the position of wells in the deeper part have the capacity over long periods time to pump more water and cause a cone of depression in the whole water table (Transcript, Page 2273); that wells pumping in the deeper part of an aquifer are analogous to the draining of a swimming pool in that the water in the deeper end is going to be the last to be depleted. (Transcript, Page 2287)
- 111. That Mr. Jenkins testified that static water level contours do not necessarily give an indication of the source of recharge water to a well; that when a well pumps water out of storage it creates a cone of depression and that water comes into the cone of depression to replace the water that is pumped out; that the water that comes in to replace the water in the cone of depression comes from all directions; that in the case of a well located south of Dry Walnut Creek, the source of recharge water for the

well would not necessarily be from the Arkansas River alluvium only since it would come in from all directions. (Transcript, Pages 2285 through 2287 and 2292)

- 112. That Mr. Jenkins testified that in 1982, Walnut Creek was losing a considerable amount of water to the aquifer as indicated by a groundwater mound in the vicinity of the Cheyenne Bottoms diversion dam on Walnut Creek. (Transcript, Page 2345)
- 113. That Mr. Jenkins testified that shutting off junior groundwater users downstream of a surface water diversion would have little or no affect on the upstream surface water user unless the wells were close to the surface water point of diversion. (Exhibit 46, Page 23; Transcript, Pages 2299 and 2300)
- 114. That Mr. Jenkins testified that if upstream junior groundwater users were shut off, it may takes weeks, months, or maybe never for a downstream surface water user to receive any benefit; that the relief will depend upon the distance of a well from the stream, rate of pumping, quantity pumped, permeability of the material underlying the streambed, interconnection between the streambed and the underlying alluvial aquifer, and zone of perforation of the well. (Exhibit 46, Page 23; Transcript, Pages 2299 and 2300)
- 115. That Mr. Jenkins testified that the Walnut Creek aquifer has not always been in direct hydraulic connection with Walnut Creek; that when water

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levels in the aquifer are below streambed elevation, as they have been periodically since 1944, the hydraulic connection is lost and there is no base flow; that the hydrograph shown in Figure 17 of Exhibit 46 shows water levels below the stream channel for the period 1955 through 1957 and that this corresponds to a period in which there was little or no base flow; that in 1959 and 1960 following the flood of 1959 the water level in the aquifer was above the stream channel; that from 1967 through 1969 the water level fluctuated back and forth above and below the stream channel; that in 1973, a year in which there was 45 inches of precipitation, the water level in the aquifer rose above streambed elevation (Exhibit 46, Pages 18, 33 & 34; Transcript, Pages 3235, 3236; and 3272 through 3278); that water levels have been below streambed since 1976 in an observation well about one mile east of Albert; that the reason the water levels have been below streambed since 1976 is that pumpage is coming from storage and there has not been a huge precipitation event to recharge the aguifer. (Exhibit 46, Pages 33 and 34; Transcript, Pages 3306 through 3311)

116. That Mr. Jenkins testified that when aquifer properties are such that the volume for storage is large and transmissivities of the materials sufficient, all water can be transmitted down gradient through the aquifer as groundwater; that when the volume of the aquifer is not sufficient and the transmissivity is not great enough to transmit the underflow, then a portion of the groundwater will be discharged into stream as base flow; that seeps and springs occur along parts of Wet Walnut Creek downstream as far as Alexander and from there eastward the stream is dry much of time; that the alluvium is shallower and narrower in the western portion

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of the Walnut Creek Valley; that seeps are found where the cross section and volume of the alluvium is smaller; that where the volume of the alluvium is greater because of a greater thickness and width, water will be transmitted mainly as underflow through the aquifer; that when this occurs, streamflow is dependent on overland runoff, and in this area the lower portion of Wet Walnut Creek will be an intermittent stream. (Exhibit 46, Page 22; Transcript, Pages 3237, 3238 and 3242 through 3243)

- 117. That Mr. Jenkins testified that Walnut Creek has seldom had a steady reliable flow from the 1930's on (Transcript, Page 3298); that low flow measurements made in the 1950's prior to the establishment of the Albert gage in 1958 show periods of little or no flow (Exhibit 46, Page 29; Exhibits 70 and 71; Transcript, Pages 3245 through 3249, 3263 and 3264); that variability of flows on both an annual and a monthly basis show that streamflow is dependent on runoff; that the annual streamflow volume passing the Albert gage in 1983 was 62 acre-feet and in 1973 was 126,700 acre-feet; that there would not be such a wide range if there was significant base flow. (Exhibit 46, Pages 22 and 48A; Transcript, Pages 3278 through 3281)
- 118. That Mr. Jenkins testified that silt has accumulated in the bed of Walnut Creek; that this is not only a recent problem since it has been happening since the 1930's (Transcript, Pages 3335 through 3337); that runoff carries silt which is deposited when flows are moderate (Exhibit 46, Pages 11 and 55; Transcript, Pages 3335 through 3337); that floods help keep silt deposits to a minimum because they scour out the channel (Transcript, Page

3336); that two feet of cohesive silt with moist, but unsaturated, sand beneath was found in the streambed near Albert in October 1990; that this is considered representative of what would be found on Walnut Creek (Exhibit 46, Pages 11 and 16; Transcript, Pages 3283 and 3284); that silt impedes percolation of water, thereby reducing potential for recharge (Exhibit 46, Pages 11, 16 and 55; Transcript, Pages 3283, 3284, 3295, 3296, 3322 through 3324); that when the silt is dry it contains cracks; that when it is wetted, it expands and becomes more impermeable (Transcript, Pages 3295 and 3296); that if there is base flow, more water from a runoff event will get downstream than if the channel is dry (Transcript, Page 3312); that the silt layer acts as a liner and should result in more streamflow getting to the diversion dam for Cheyenne Bottoms than if there was just sand and gravel. (Transcript, Page 3323)

- 119. That Mr. Jenkins testified that recharge does not occur solely in the inner bench; it also occurs on the flood plain (Transcript, Pages 3303, 3304, 3338, 3339, and 3380 through 3383); that large infrequent flood events, such as the 1959 flood, produce recharge over the whole valley not just from the stream channel itself. (Transcript, Page 3382)
- 120. That Mr. Jenkins testified that metering of all the wells would be very useful in determining the amount of water pumped. (Transcript, Pages 3340 through 3342)
- 121. That Mr. Jenkins testified what the impact of reduced base flow might be on streamflow; that first, there would be a reduction in streamflow by

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the amount the base flow was reduced; that second, base flow would tend to keep the channel somewhat moist, and if the channel was moist and there was overland runoff, more of it would get down towards Cheyenne Bottoms than if the channel was dry. (Transcript, Page 3312)

122. That Mr. Jenkins testified that based on two base flow measurements taken on April 8, 1955, and November 17, 1955, the estimated total base flow for 1955 would be 525 acre-feet; that when 525 acre-feet is subtracted from 19,400 acre-feet (the quantity of water reported by Wilson and Company to have been diverted in 1955 from Wet Walnut Creek to Cheyenne Bottoms) the total quantity diverted from overland runoff would be 18,875 acre-feet. (Exhibit 46, Page 28; Transcript, Page 3259)

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123. That John Charles Tracy, Ph. D, Professor of Water Resources in Civil Engineering at Kansas State University, testified to a report he authored as an independent consultant for Howard, Needles, Tammen and Bergendoff entitled "Summary Report for Analyzing the Reliability of the Current Water Supply to the Cheyenne Bottoms Wildlife Refuge, Kansas" dated May 1990 (Exhibit 43, Appendix B; Transcript, Pages 2388 through 2390); that the report is Appendix B to the "Engineering/Hydrological Study, Cheyenne Bottoms Wildlife Area, Barton County, Kansas" prepared by Howard, Needles, Tammen and Bergendoff (Exhibit 43); that the purpose of the report was to determine the effectiveness of the current operations and structure of the Cheyenne Bottoms, and to look at possible structural or non-structural alternatives that would improve and better meet the Cheyenne Bottoms objectives as a wildlife refuge. (Transcript, Page 2390)

- 124. That Professor Tracy testified that the operational objective was to provide at least some wetlands area for migrating birds throughout the year and to produce some bird feed or crops so that the birds would have some feed when they are migrating through; that the objective could be met by maintaining certain pool levels. (Transcript, Pages 2391 through 2394)
- 125. That Professor Tracy testified that he developed a water balance and operational model for use in determining the reliability of the existing conditions and operational policy of the Bottoms as well as determining alternate wetland designs and operational policies for meeting the current and future objectives of the Cheyenne Bottoms as a wildlife refuge and wetlands (Exhibit 43, Appendix B Page 1; Transcript, Pages 2396 and 2397); that three operational options were simulated for the movement of water at Cheyenne Bottoms:
 - Existing structural conditions at Cheyenne Bottoms with no ability to move water from one pool to the next other than moving it from the center pool (Pool 1) to the outer pools;
 - Existing structural conditions with the capability to move water from any of the outer pools to Pool 1 and vice versa within a one month time frame;

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c. Subdividing and deepening Pool 1 along with the capability to move water from any of the outer pools to Pool 1 and vice versa within a one month time frame;

that these options were based on the year 2000 water availability conditions that Dr. James Koelliker testified to. (Transcript, Pages 2398 through 2399)

- 126. That Professor Tracy testified that the results of the simulations showed that the existing structure at Cheyenne Bottoms with or without pumping capabilities to move water between pools is not adequate to provide 100% reliability for meeting minimum operating objectives of the Bottoms; that a wider set of operating objectives can be met with 100% reliability by subdividing and deepening Pool 1; that this would get the Bottoms through a drought similar to the worst drought that has occurred in the last 40 years in Kansas while maintaining around 3500 to 4000 acres of water surface area in Pools 1 and 2. (Transcript, Pages 2441 and 2442)
- 127. That Helen M. Hands, Wildlife Biologist at Cheyenne Bottoms, Kansas Department of Wildlife and Parks, testified regarding the wildlife at and management of Cheyenne Bottoms; that Ms. Hands testified that Cheyenne Bottoms is an extremely important habitat for a wide variety of wildlife species and that it is an important educational and scientific resource for the community (Transcript, Page 2499); that the priority of management at Cheyenne Bottoms is the shorebirds, the waterfowl and then the threatened and endangered species. (Transcript, Page 2509)

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- 128. Ben Rogers, Contracting Officer and General Manager, Wet Walnut Watershed District, testified that the District's General Plan calls for the construction of 47 floodwater retarding dams, 1 multiple purpose reservoir and 51 smaller detention dams and at the time of the hearing 30 of the floodwater retarding dams, the multiple purpose structure and 10 of the detention dams were complete. (Transcript, Page 2558)
- 129. That Mr. Rogers testified that the District hopes to complete the remaining 17 planned floodwater retarding dams and 7 to 10 of the remaining planned detention dams. (Transcript, Page 2558)
- 130. That he further testified that construction of the floodwater retarding dams began in 1983 and most of the structures are in Ness and Rush counties, one having been completed in Lane County. (Transcript, Page 2560)
- 131. That Mr. Rogers testified that with the anticipated construction, about 34 percent of the drainage area will be controlled; that existing structures control about 18 percent of the Wet Walnut watershed. (Transcript, Page 2561)
- 132. That he testified that average annual benefits attributed to the watershed project as planned are \$2,219,300 and the project should reduce average flood damages by 58 percent. (Transcript, Pages 2562 through 2563)

- 133. That Mr. Rogers testified that all of the existing structures in the watershed, except sites 3 and 7, have valved drawdown pipes. (Transcript, Page 2595)
- 134. That he further testified that water stored below the drawdown pipes' inlet elevations cannot be released from the structures and the total storage volume below drawdown pipes is 518 acre-feet, while the total detention storage capacity between the drawdown pipes and the principal spillway is 4,162 acre-feet in the existing structures. (Transcript, Pages 2565 through 2566)
- 135. That Mr. Rogers testified that a District survey in October, 1989, found a total of 399 acre-feet of water stored between the drawdown pipes and principal spillways; that 100 acre-feet of the total was stored in the multiple purpose reservoir; that a similar survey in August, 1990, found 850 acre-feet stored between drawdown pipes and principal spillways. (Transcript, Page 2567)
- 136. That Mr. Rogers testified that the District's survey of impacts of the floodwater retarding structures indicates a rise in the groundwater level immediately below site 40 and the development of wetted areas below several structures caused by seepage from the reservoirs. (Transcript, Pages 2582 and 2552)
- 137. That Carl Nuzman, Vice-President of Layne GeoSciences and Chief Hydrologist for Layne-Western Company, testified to a report he authored entitled

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"Hydrologic Impact Study for Walnut Creek Alluvium" dated September 27, 1990; that the report is Appendix E to "Engineering/Hydrological Study, Cheyenne Bottoms Wildlife Area, Barton County, Kansas" prepared by Howard, Needles, Tammen and Bergendoff (Exhibit 56; Transcript, Page 2599); that the report was prepared under a subcontract of Howard, Needles, Tammen and Bergendoff for the Kansas Department of Wildlife and Parks (Transcript, Pages 2605 through 2606); that the purpose of the study is to review the impact of the watershed structures on groundwater recharge and its implied impact on streamflow in the Walnut Creek basin and to assess the impact of well and pump irrigation development on the water supply availability to Cheyenne Bottoms Wildlife Area (Exhibit 56, Pages 2 and 4; Transcript, Pages 2607 and 2608); that one of the conditions of his employment was that he would not be allowed to do any actual field work or go into the field and measure water levels or drill observation wells or run any tests. (Transcript, Page 2608)

- 138. That Mr. Nuzman testified that Walnut Creek and its alluvium are in direct hydraulic connection with each other (Exhibit 56, Page 62; Transcript, Pages 2653 and 2654); that the aquifer responds quickly to flow in Walnut Creek. (Exhibit 56, Page 62)
- 139. That Mr. Nuzman testified that the 1959 flood resulted in approximately 50,000 acre-feet in groundwater recharge to the aquifer in Rush County; that historically when floods have occurred, especially in the lower portion of the Walnut Creek, they replace the water that has been pumped or diverted from storage from the aquifer system (Transcript, Pages 2610

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and 2618); that flooding helps the aquifer to recover some of its losses much faster than it would have with flow only in the inner channel; that aquifer recharge from Walnut Creek to the alluvium becomes very small when the flow velocity is greater than the seepage lag time; that regulation of flow by the watershed structures, limiting flow only to the inner channel, causes high velocity of flow in the channel with a small wetted perimeter; that lower water velocity in the channel produces increased recharge compared to a higher velocity; that over bank flows or flooding greatly increase the wetted area, decrease water velocity and produce groundwater recharge refilling the aquifer storage deficit (Exhibit 56, Pages 30 and 62); that in the past, recharge in the Walnut Valley Basin occurred when water was in the creek and from floods, but now the major source of recharge is from precipitation that falls on the land area of the basin. (Transcript, Page 2744)

- 140. That Mr. Nuzman testified that base flow in Walnut Creek will not be reestablished until the aquifer storage deficit is replenished, that is, the groundwater levels are returned to the level of the creek or slightly above (Transcript, Page 2656); that the aquifer is full when the storage capacity of the aquifer is at or above the bottom of the streambed. (Transcript, Page 2745)
- 141. That Mr. Nuzman testified that he modeled the alluvial aquifer using the USGS 3D Flow Model MODFLOW; that the domain for the model extends between just west of Great Bend to just west of Ness City encompassing Townships 17, 18, and 19 South, and Ranges 14 through 23 West; that the model domain

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alluvium were identified as active cells; that in the absence of alluvium, a cell was identified as an inactive cell; that all physical processes within the alluvium were assumed to take place in the active cells; that inactive cells were used to represent no-flow boundaries. (Exhibit 56, Page 33; Transcript, Pages 2621 and 2622)

- 142. That Mr. Nuzman testified concerning the assumptions used and inputs to the model; that the model assumed unconfined aquifer flow (Exhibit 56, Page 33; Transcript, Pages 2622 and 2623); that seepage from Walnut Creek was modeled; that the streambed hydraulic conductivity was assumed to be 5 feet per day, the average stream width was assumed to be 200 feet, and a 30 foot bank thickness was used (Exhibit 56, Page 39; Transcript, Pages 2623 and 2634 through 2637); that the seepage factors vary over the model domain and are a function of the water level in the aquifer (Transcript, Page 2732); that the streambed hydraulic conductivity value of 5 feet per day is considered somewhat conservative and it fit fairly well with the model results (Transcript, Pages 2765); that the length of the stream reach in each cell was measured from topographic maps. (Exhibit 56, Page 41; Transcript, Pages 2636 and 2637)
- 143. That Mr. Nuzman testified that evaporation and transpiration were lumped together as evapotranspiration (ET); that a value of 40 inches per year was used, but the value decreases linearly with depth of water to 8 feet

below the ground surface; that at a depth of water below ground surface of more than 8 feet ET was assumed to be zero (Exhibit 56, Pages 36 and 37; Transcript, Pages 2623 through 2625 and 2628); that direct infiltration to the aguifer from precipitation was based on 10% of an average of 22 inches of annual precipitation; that it was assumed that 65% of the precipitation occurred from May through September with the balance of 35% occurring from October through April; that the 10% of annual precipitation that was used for recharge was a result of calibration to fit the water table conditions that were defined for 1982 by Tom McClain (Exhibit 56, Page 36 and Appendix B; Transcript, Pages 2626 and 2627); that the 10% figure is considered on the low side from average; that the percent of direct infiltration can vary a little bit from one end of the basin to the other and that it is based on an average or normal rainfall pattern (Transcript, Pages 2698, 2699 and 2732); that monthly precipitation amounts for the typical average year were assigned based on a distribution of precipitation by months. (Transcript, Pages 2639 and 2640)

144. That Mr. Nuzman testified that pumpage estimates were determined by use of an amount statistics report furnished by the Division of Water Resources; that pumpage amounts were adjusted for a five month pumping season with pumpage occurring six hours each day; that a maximum of 25,000 acre-feet per year was assumed to be pumped (Exhibit 56, Pages 41 and 42; Transcript, Pages 2637 through 2639); that the hydraulic conductivity of the aquifer was assigned in the range of 225 feet per day to 275 feet per day and was distributed across the model domain with the lower value in the western region and the higher value in the eastern region; that the

specific yield of the aquifer was assigned in the range of 0.1 to 0.2 and it was distributed across the model domain with the lower value in the western region and the higher value in the eastern region (Exhibit 56, Page 37; Transcript, Pages 2628 through 2632); that a calibrated value of 0.8 was obtained for the aquifer anisotropy; that this value represents that at each location the model assumes 80% of hydraulic conductivity in a north-south direction from the east-west direction values (Exhibit 56, Page 37; Transcript, Pages 2630 and 2631); that Mr. Nuzman feels very confident in the values used for hydraulic conductivity and anisotropy based on the calibrated model closely matching the 1982 water levels determined by Tom McClain throughout the length of the model domain. (Transcript, Pages 2761 through 2763)

- 145. That Mr. Nuzman testified that the 1982 water surface elevation determined by Tom McClain was used as the initial water surface (Exhibit 56, Page 39 and Figure 5-6 in Appendix A; Transcript, Pages 2626 and 2633 and 2634); that the model was calibrated to fit these 1982 water table conditions. (Transcript, Page 2626)
- 146. That Mr. Nuzman testified that the model was used to produce simulations of the aquifer; that the modeling approach is limited in that it can not simulate the dynamic river-aquifer relationship; that in order to model the aquifer, rainfall had to be a fixed amount and flow available to the stream had to be assumed to be unlimited (Exhibit 56, Page 44; Transcript, Pages 2724 and 2725); that the model produced three simulations: the first from January 1 through April 15, the second April 16 through September 15,

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and the last from September 16 through December 31. (Exhibit 56, Pages 47 through 60; Transcript, Page 2639, 2641 and 2651)

- 147. That Mr. Nuzman testified that the results of the first simulation were based on no flow in the creek, no seepage and no well withdrawals; rainfall and ET were based on monthly patterns and were occurring; that the starting water level was chosen from the 1982 Kansas Geological Survey database information (Exhibit 56, Page 47; Transcript, Page 2640); that the results of this simulation indicate a gain in aquifer storage of 3,803 acre-feet for the simulation period. (Exhibit 56, Page 47; Transcript, Page 2640) and 2641)
- 148. That Mr. Nuzman testified that the second simulation, which runs from April 15 through September 15, was conducted with five separate options (Exhibit 56, Page 47; Transcript, Page 2641);
 - a. That option 1 under this simulation assumes the river flowing continuously but there is no rainfall infiltration, well withdrawals or ET taking place; that the results of this simulation indicated for the simulation period a gain in aquifer storage of 92,134 acre-feet and that 93,340 acre-feet of streamflow would be needed in order to achieve that amount of gain in storage; that the significance of option 1 is that the aquifer storage deficit is determined; that comparing the aquifer storage deficit determined by option 1 with the other options indicates that the aquifer storage deficit is in the

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range of 92,000 to 95,000 acre-feet (Exhibit 56, Page 49; Transcript, Pages 2641 through 2644);

- b. That option 2 under this simulation assumed continuous streamflow with rainfall and ET taking place but not well withdrawals; that the results of this option indicate a gain in aquifer storage of about 100,000 acre-feet after 120 days; that the amount of gain from rainfall infiltration at this same time is 11,770 acre-feet; that the aquifer tends to fill a little higher when you have recharge from precipitation, which is indicated by the aquifer storage gain of 100,000 acre-feet instead of the 92,000 acre-feet from option 1; that this is because when you have recharge from rainfall the water table actually raises to a higher level in the aquifer than the river (Exhibit 56, Pages 52 and 53; Transcript, Pages 2644 through 2647); that this option indicates that recharge from the river is extremely important to recharge the aquifer storage deficit in the long term;
- c. That option 3 was the same as option 2 except that well withdrawal was added; that the well withdrawal was constrained not to exceed 25,000 acre-feet of pumpage in 150 days of simulation; that the results of this option indicated a gain in aquifer storage of 95,772 acre-feet; that the gain from precipitation recharge was 14,713 acre-feet and the gain from river leakage was 108,989 acre-feet; that the superimposed stress on the aquifer by pumping wells only increases the depletion of Walnut Creek if flow is available (Exhibit 56, Pages 53 and 56; Transcript, Pages 2647 and 2648);

- d. That option 4 under this simulation was the same as option 3 except that now the river was completely dry; that the results of this simulation indicated a loss in aquifer storage of 9,992 acre-feet and a gain from rainfall infiltration of 14,713 acre-feet; that the significance of this option is that if river flow is completely cut off, with average recharge from precipitation occurring and roughly 24,800 acre-feet of well withdrawals occurring, the aquifer would essentially be mined at the rate of about 10,000 acre-feet per year (Exhibit 56, Pages 56 and 58; Transcript, Page 2648);
- e. That option 5 under this simulation was the same as option 4 except that no rainfall infiltration was assumed; that the results of this option indicate a loss in aquifer storage of 24,438 acre-feet which is approximately the same as the well withdrawal; that this option was essentially a check on the model's accounting system. (Exhibit 56, Page 58; Transcript, Page 2649)
- 149. That Mr. Nuzman testified concerning the third simulation; that this simulation was designed to start with the 150-day water level from the second simulation and continue for 105 days; that for this simulation, well withdrawal and river flow were considered absent; rainfall infiltration and ET were allowed to continue to take place; that starting water levels for only options three and five from the second simulation were used for the third simulation; that in both cases the gain from rainfall infiltration for the third simulation was 3,976 acre-feet; that the
significance of this simulation is that the winter recovery period is not sufficient to replenish the aquifer after a summer of irrigation pumpage without streamflow in Walnut Creek; that the combined rainfall infiltration for the first and third simulations (the winter recovery period) is roughly 7,000 to 8,000 acre-feet of recharge to the aquifer; that if irrigation pumpage is going to continue in the 25,000 acre-foot per year range there must be some re-establishment of streamflow or some capture of flood flows to augment the recharge to the lower portion of the basin. (Exhibit 56, Page 60; Transcript, Pages 2650 through 2652)

- 150. That Mr. Nuzman testified that based on the model results the largest percentage of the 90,000 to 100,000 acre-feet of aquifer storage deficit is occurring between Great Bend and Rush Center; that with irrigation pumpage at the current level, the aquifer will continue to be de-watered without some type of regulation or restriction or recharge enhancement; that the aquifer can not continue to sustain this rate of borrowing from storage in the future. (Transcript, Pages 2652 and 2653)
- 151. That Mr. Nuzman testified concerning Table 7-1 of Exhibit 56, which is a comparison of the time to recharge the aquifer under a variety of pumpage and seepage amounts; that the comparison is based on an average rainfall infiltration of 22,700 acre-feet per year and an aquifer storage deficit of 95,000 acre-feet (Exhibit 56, Table 7-1; Transcript, Pages 2656 through 2658); that as an example, if well withdrawals of 25,934 acre-feet were allowed, it would take a minimum of 7 and a maximum of 14 years, depending on variabilities in the deficit and seepage that occurs from the river

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system, to recharge the aquifer system (Transcript, Page 2658); that Table 7-1 covers a range in average seepage from the river of from 12,000 acrefeet per year to 20,000 acre-feet per year and withdrawals, given as a percentage of the documented rights within the model domain, up to a maximum of 43,223 acre-feet per year.

- 152. That Mr. Nuzman testified that from Rush Center to roughly Ness City we don't see an aquifer storage deficit; that the primary aquifer storage deficit is from east of Rush Center to the Great Bend area; that if reductions in appropriations were needed, most of the curtailment would need to occur in the area between Rush Center and Great Bend. (Transcript, Page 2659)
- 153. That Mr. Nuzman testified that seepage from streamflow to the aquifer system may have been less than 12,000 acre-feet per year in the last few years; that in a dry year, if streamflow at Albert was 7,000 acre-feet for the year, only 5,000 or 6,000 acre-feet is all of the streamflow that would go into aquifer storage; that in a normal year of rainfall, recharge from the river would be on the order of 10,000 acre-feet per year. (Transcript, Pages 2683 through 2689)
- 154. That Mr. Nuzman testified that from a hydrologic standpoint, no differentiation could be made between wells located near the river and wells located farther away from the river since the aquifer permeability is such that the wells all interact with each other (Transcript, Page 2691); that from a regulatory position all wells could be treated somewhat

equally except, depending upon the groundwater conditions in a particular reach of the basin, a percentage reduction could be applied to the appropriation amount; that the percentage could vary depending on the location in the basin and would be a function of the groundwater storage deficit in that particular part of the basin (Transcript, Page 2692); that total pumpage should be regulated to the natural recharge of the basin; that right now that figure should be probably no higher than 22,700 acrefeet per year; that further reductions would be needed to restore the aquifer storage deficit; that after the aquifer storage deficit has been restored, it may be possible to then increase the appropriation up to about 22,000 or 23,000 acre-feet per year; that the 22,000 or 23,000 acre-feet per year should never be exceeded for this particular basin (Transcript, Pages 2695 through 2700); that to restore the aquifer deficit within a seven year period, as previously testified, it must be assumed that there is a normal rainfall pattern and not a real drought (Transcript, Pages 2698 and 2699); that Mr. Nuzman testified that he sees no reason to include within an established intensive groundwater use control area wells which are presently included within the proposed boundaries of the intensive groundwater use control area to the south of Dry Walnut Creek; that there would be no reason to impose controls on those wells. (Transcript, Pages 2756 and 2757)

155. That Mr. Nuzman testified that the benefits of the watershed structures could be substantially enhanced by considering supplemental groundwater recharge below the structures; that watershed dams within the alluvium provide some form of recharge enhancement; that watershed dams and

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structures on tributary streams should have spilled and released water routed to groundwater recharge ditches and basins in the valley and along the flanks to supplement natural basin recharge; that some of the watershed structures should be operated as dry structures and flood flows should be routed down the tributary valley to the flood plain of Walnut Creek and then spread by means of small check dams into broad level terraces, road borrow ditches, or CRP land in a somewhat controlled manner to enhance the recharge to soil profile directly overlying the alluvium (Exhibit 56, Page 67; Transcript, Pages 2660 through 2665 and 2673 through 2676); that the watershed structures for which operating criteria should be changed would be sites 1, 2, 3, 10, 11, and 13 (Transcript, Pages 2703 and 2704); that Mr. Nuzman would have no hesitation or reservation concerning recommending that the additional watershed structures be built provided the operating criteria were changed as he testified (Transcript, Pages 2738); that Mr. Nuzman testified that he has made no attempt to calculate the additional acre-feet of recharge to the groundwater system that would be realized by these modifications; that such calculations were beyond the scope of his work (Transcript, Pages 2707); that when cross examined about this matter, Mr. Nuzman admitted that of the dams presently in existence for which he would recommend modifying the operating criteria there was not a great deal of actual storage behind those dams as of August 1990 or October 1989. (Exhibit 53; Transcript, Pages 2707 and 2708)

156. That Mr. Nuzman testified that there is adequate data to show the need to establish an intensive groundwater use control area but that additional data would be needed to be able to refine the management of such a control

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area (Transcript, Pages 2731 and 2732); that Mr. Nuzman testified as to suggested control provisions for a control area; that included within these control provisions would be additional observation wells, the metering of all diversions within the area, both surface water or groundwater, an annual inventory of water levels throughout the area, and some type of detailed modeling similar to that described in his report to evaluate conditions on an annual basis to determine the amount of water going into storage and to see if goals which might be set for the control area were being met (Transcript, Pages 2667 and 2668); that in order to implement this strategy, reasonable reductions would be made in pumpage beginning in 1992; that at that time an inventory and monitoring system would be established to collect data, such as pumpage amounts and water levels, to determine with the aid of the model the amount of recharge that is going into aquifer storage to make up the groundwater storage deficit; that in 1993 and following years adjustments would be made as needed based on the calculated changes in aquifer storage. (Transcript, Pages 2697 and 2698)

157. That Peter Gordon Jarchow, an engineer employed by Howard, Needles, Tammen, and Bergendoff, testified to a report prepared by Howard, Needles, Tammen, and Bergendoff entitled "Engineering/Hydrological Study, Cheyenne Bottoms Wildlife Area, Barton County, Kansas" dated October 1990; that Mr. Jarchow testified that he was the project engineer for this study; that he did a substantial portion of the work summarized in the report and wrote 75% of the report (Exhibit 57; Transcript, Pages 2790 through 2793); that the goals of the report are to discuss data collected and reviewed

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for the study, present the results of an analysis of the existing hydraulic system, determine the magnitude, characteristics and impact of floods within the Cheyenne Bottoms Wildlife Area, summarize an analysis of water supplies, present a computerized operational model of the Cheyenne Bottoms Wildlife Area, list and discuss alternative studies for a developmental master plan, and present the recommended master plan configuration. (Exhibit 57, Page 1-1; Transcript, Pages 2793 through 2794)

- 158. That Mr. Jarchow testified that Wet Walnut Creek is not adequate as a sole source of water supply for Cheyenne Bottoms (Transcript, Page 2853); that the historical base flow for Walnut Creek probably was not large enough to achieve a significant percentage of the Kansas Department of Wildlife and Parks Wet Walnut Creek water appropriation right; that the 500 cfs maximum diversion rate was probably was chosen in order to capture flow for the twenty to forty days a year that significant creek flow might occur as the result of rainfall over the drainage area. (Exhibit No. 57, Pages 2-10 and 2-11; Transcript, Pages 2854 through 2856)
- 159. That Mr. Jarchow testified that an examination of potential alternate water supply sources done by a screening process indicates no readily available new sources of water supply for Cheyenne Bottoms. (Exhibit 57, Pages 5-7 through 5-11; Transcript, Pages 2813 through 2820 and 2938 and 2939)

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- 160. That Mr. Jarchow testified that reconfiguration of the Cheyenne Bottoms facility by sub-division of pools 1, 3, and 4, level ditching in outer pools, islands in inner pools and deeper portions of outer pools, and gate and pump systems to move water between pools can be accomplished so that a minimum pool surface area of approximately 3,000 acres can be maintained through the most severe observed three year weather pattern out of a 40 year period (1948-87) projected onto a prediction of year 2000 conditions; that this assumes a very rigid pattern of operation for the Bottoms and that a worse drought does not occurs; that it is still desirable to get more water from other sources; that Cheyenne Bottoms can use all the water it can get from both the Arkansas River and Wet Walnut Creek. (Exhibit 57, Pages 5-11, 5-12 and 6-1; Transcript, Pages 2822 through 2838 and 2841 through 2843)
- 161. That Mr. Jarchow testified that Walnut Creek was considered to be an intermittent stream at the time the 1949 Wilson and Company Report entitled "Cheyenne Bottoms, Walnut Creek Diversion Dam" was written (Transcript, Page 2854); that a base flow condition (streamflow supplied by the aquifer) existed at the beginning of the period of record for the Albert gage, where measurable flow was recorded every day for the first five years of gage operation (Exhibit 57, Page 5-4); that the Wet Walnut Creek aquifer is depleted, and the number of days and total volume of streamflow in Wet Walnut Creek have been considerably diminished since the early 1960's (Exhibit 57, Page 5-4); that the effects of the elimination of base flow are: 1) the loss of hundreds to thousands of acre-feet of water available for diversion, much of which would be available during

dryer periods, 2) a dry channel bed resulting in evaporation, transpiration and infiltration losses in runoff as the streamflow wets the channel perimeter, 3) the loss of significant volumes of streamflow to replenish a depleted aquifer. (Exhibit 57, Pages 5-4 and 5-5)

- 162. That Mr. Jarchow testified that the benefits of the yet-to-be-built Watershed Dam No. 1 would be that if water would be released into the channel probably most or all of it would infiltrate into the channel and help recharge the aquifer, and there is a chance that some of the water would make its way far enough downstream to be actually diverted, and that it would help improve the efficiency of the inlet canal system for delivery of water from the Arkansas River. (Transcript, Pages 2821 and 2822)
- 163. That Mr. Jarchow testified that he determined the efficiency for delivery of water from the Arkansas River to the Wet Walnut diversion dam to be 70%, and that the efficiency for delivery of water from the Wet Walnut diversion dam to Cheyenne Bottoms was determined to be 90%. (Transcript, Pages 2803 through 2810)

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164. That John Reh, Assistant State Conservationist for Water Resources, Soil Conservation Service, USDA, Salina, Kansas, testified that he had been involved with the Wet Walnut Watershed since working on a flood study after the 1959 Wet Walnut flood and that the flood of 1959 was "more water than I had ever seen any place before." (Transcript, Page 3026)

165. That Mr. Reh testified that he was responsible for a study titled "Biological Assessment for Wet Walnut Creek Sub-Watershed Numbers 1, 2, 3, and 5" (Exhibit 58), done by the Soil Conservation Service to comply with federal threatened and endangered species regulations, and that one purpose of the study was to determine what impact, if any, the dams remaining to be built in the Wet Walnut Watershed would have on threatened and endangered species. (Transcript, Page 2963)

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- 166. That Mr. Reh testified that the report concludes that the "...project will not reduce diversion volumes to Cheyenne Bottoms..." and that there will be no impact on habitat and therefore no adverse impact on threatened and endangered species. (Transcript, Page 2970)
- 167. That Mr. Reh testified that since his analysis shows no adverse impact there is no cause to require the dams to be operated dry. (Transcript, Page 2982)
- 168. That he further testified that he disagrees with Professor Koelliker's treatment of PL-566 structures as farm ponds, especially the assumption that seepage from the structures is lost from the system rather than being treated as potential recharge. (Transcript, Page 2984)
- 169. That Mr. Reh testified that 21 floodwater retarding dams remain to be built in the Wet Walnut watershed. (Transcript, Page 2971)

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- 170. That Mr. Reh testified that structures 1, 2 and 3 are or will be located on valley fill which is in connection with the main aquifer. (Transcript, Page 2984)
- 171. That Mr. Reh testified that PL-566 funds could not be used to fund the added expense of raising the principal spillway and emergency spillway elevations to build a floodwater retention structure instead of a floodwater retarding structure at site #1 as Mr. Nuzman suggested; that the emergency spillway elevation would have to be raised because Soil Conservation Service specifications require that the structure pass the design flood assuming that retention storage is full; that he estimated that building structure #1 as a retention structure would more than double the cost of construction and that there would be increased cost to the watershed district to obtain land for the larger structure. (Transcript, Pages 2987, 2989 and 2990)
- 172. That Mr. Reh testified regarding concerns expressed in the Howard, Needles, Tammen and Bergendoff report that floodwater retarding dams would reduce flooding so that flood events would be contained within the inner channel thus reducing recharge; that at the 1% chance event, the floodwater retarding dams in place would reduce inundation depth approximately 1.1 feet (to 11.7 feet from 12.8 feet); that this does not reduce the ability of the alluvial aquifer to be recharged by significant flooding events and that the increase in the time of inundation increases the volume available for recharge; that the 1.1 foot reduction in inundation depth has no significant impact on recharge because the entire

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inner bench is inundated for the 1% and 4% chance events; that for the 50% chance event there is some reduction in the areal extent of inundation; that total recharge should not be reduced in this case because the time of inundation is increased by the structures' operation and that the extra time of flow provided by the detention effect of the dams offsets the evaporative losses caused by storing water in the structures. (Transcript, Pages 3100 and 2994)

- 173. That Mr. Reh testified that a Soil Conservation Service geologist assisted Gillespie and Slagle in working on the study and did a number of borings in the floodplain which indicated that even after flooding events the soils in the floodplain were dry at depths of two or three feet suggesting that the bulk of recharge occurs on the inner bench so check dams on tributary streams would just spread water out to be lost to evaporation. (Transcript, Page 2996)
- 174. That Mr. Reh further testified that there is no authority under PL-566 to build check dams and Soil Conservation Service would not provide technical assistance to the watershed district if it chose to use its own taxing authority to raise money to build check dams and that funding of larger structures under PL-566, as Mr. Nuzman suggested, would require economic justification and would have to be approved by Congress. (Transcript, Page 2997)
- 175. That Mr. Reh testified that sites #1 and #10 are the only ones left to be built east of Rush Center; that operating existing and to be built dams

as dry dams increases the water available at the Bottoms diversion by 100 acre-feet in the 20% chance drought according to his calculations; that this was not a significant amount of water and did not justify requiring the dams to be built and operated as dry dams. (Transcript, Pages 2999 and 3000)

- 176. That Mr. Reh testified that the built and planned structures will reduce the sediment load on the Walnut Creek channel and will lengthen the time that water is passing over the inner bench, potentially increasing the amount of recharge to the aquifer. (Transcript, Pages 3008 and 3007)
- That Mr. Reh testified about further model runs that were done assuming 177. no irrigation in the valley (noted as "full aquifer" in Exhibit 58); that this condition is actually a full aquifer condition in the sense that the aquifer is assumed to be full throughout the model period; that he would not expect the aquifer to be full all of the time even if there was no irrigation pumping in the valley; that a 15 year record for 1973-1987, rather than the full stream gauge record at Albert of 1959-1987, was used; that the irrigated acreage used in both scenarios considered, 1974 and 1988, results in maintaining aquifer levels generally below streambed, so the results shown in the table apply to either level of irrigation; that under the irrigated scenarios the computed recharge was considered to go into aquifer storage and none of it was returned because the aquifer level was assumed to remain below streambed at all times and that this is the reason that the 1974 and 1988 levels of irrigation produce the same model results. (Transcript, Pages 3011, 3084, 3013, 3016, and 3017)

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178. That Mr. Reh testified that given a full aquifer with the watershed project in place, an average of 13,400 acre-feet per year could have been diverted to the Bottoms for 1973-1987. (Transcript, Page 3019)

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- 179. That Mr. Reh testified that with irrigation at current levels, groundwater levels would be below streambed at most times and that an average of 2,800 acre-feet per year could have been diverted to the Bottoms for the same period. (Transcript, Page 3019)
- 180. That Mr. Reh testified that with no irrigation and a 20% drought condition 2,500 acre-feet per year could be diverted at the Cheyenne Bottoms diversion versus 500 acre-feet per year with full irrigation. (Transcript, Page 3020)
- 181. That Mr. Reh testified that recharge from low flow events is reduced by fine grain sediments in the channel bottom but a substantial amount of recharge occurs at low flow rates even though the rate of recharge is low because low flow events occur frequently. (Transcript, Pages 3053 and 3169)
- 182. That Mr. Reh testified that the aquifer appears to be filling between Bazine and Rush Center. (Transcript, Page 3056)
- 183. That Mr. Reh testified that on page 20 of the 1989 Environmental Impact Statement, the 350,000 acre-feet estimated to be in storage is a more

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current estimate than the 469,000 acre-feet reported on page 23 of an earlier Environmental Impact Statement. (Transcript, Page 3079)

- 184. That Mr. Reh testified that monitoring of wells at Lacrosse and Rush Center has shown some rise in water levels which the watershed district believes is due to the impact of the floodwater retarding structures. (Transcript, Page 3082)
- 185. That Mr. Reh testified that the foundation drains that exist in most of the structures run very infrequently in the Wet Walnut watershed because the structures store very little water. (Transcript, Page 3099)
- 186. That Mr. Reh testified that his computations indicate an aquifer overdraft of approximately 3,300 acre-feet per year, however it is possible that the aquifer could be considered to be in equilibrium because he is unable to quantify the error in his model; that according to his calculations, withdrawal exceeded recharge by a total of 10,200 acre-feet for the 15 year period, 1973 through 1987. (Transcript, Pages 3095, 3096 and 3156)
- 187. That Mr. Reh testified that floodwater retarding dams have reduced runoff and have increased recharge while conservation measures have reduced both runoff and recharge and that the number of days of zero streamflow is increased by the operation of the floodwater retarding dams. (Transcript, Pages 3104, 3051, 3105 and 3103)

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- 188. That Mr. Reh testified that it was his opinion that Mr. Nuzman's assumption that 10% of precipitation goes to the aquifer as recharge was too high. (Transcript, Page 3109)
- 189. That Mr. Reh recommended the following actions:
 - a. Monitor alluvial wells below the dam sites both before and after construction of the remaining structures
 - b. Establish base year groundwater contours and monitor changes in those contours
 - c. Establish stream gaging stations and monitor streamflow including the amounts diverted to and arriving at the Bottoms
 - d. Establish a rain gauge network and collect storm rainfall reports to supplement the official stations
 - e. Install staff gauges in the watershed reservoirs and monitor water levels in storage monthly and after storm events
 - f. Establish base reservoir habitat conditions for key species and monitor changes over the study period including reservoir production of supplemental food sources for threatened and endangered shore birds

- g. Establish base land use treatment conditions in the drainage areas of selected dams and monitor changes
- Develop topographic maps and stage-storage curves for the same dams monitored for habitat conditions
- i. Compute expected runoff events for storms and compare to recorded volumes
- j. Monitor irrigation water use in the proposed IGUCA
- k. Monitor municipal and industrial water use in the proposed IGUCA
- Develop and calibrate a water budget model in the proposed IGUCA using data collected

(Transcript, Page 3001 through 3003)

190. That Mr. Brian Lang, Project Engineer, Soil Conservation Service, USDA, Ness City, testified about the construction techniques for watershed dams built in the Walnut Creek Basin and the permits required to build those structures; that the cutoff trench constructed to provide a foundation for each structure did not cut off the flow of underground water under the dam as the structures were not built to impound water for beneficial use. (Transcript, Pages 3175 through 3176)

- installed in the watershed structures to allow for bypass of water during drought periods. (Transcript, Page 3178)
- 192. That Mr. Lang testified well observation data had been collected for wells in the vicinity of Sites 33 and 44; that these data indicate that when the structures are storing water local groundwater levels are raised. (Transcript, Pages 3180 through 3182)
- That John Hecht, Servi-Tech, Inc., testified regarding a report titled 193. "The Economic Impact of Irrigation Water for Crop Production in Rush and Barton Counties, Kansas. Effective Water Loss in Rush and Barton Counties." completed October 1990 (Exhibit 73); that he prepared two sets of crop budgets, one set using long-term crop prices and one set using current (1989) crop prices, for the five major irrigated crops grown in the locale (Pre-filed Testimony, Pages 15 through 16); that for each crop, a crop budget was developed for full irrigation, 85 percent irrigation, 70 percent irrigation, 55 percent irrigation and dry land (Pre-filed Testimony, Page 17); that the crop budgets include the following inputs: labor, insecticides, herbicides, fertilizer, machinery repairs, pumping costs, irrigation equipment repair, harvesting costs, Servi-Tech bill, miscellaneous inputs (Pre-filed Testimony, Pages 20 through 22); that no fixed costs such as taxes and equipment depreciation were computed into the crop budgets. (Pre-filed Testimony, Page 23)

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191.

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- 194. That Mr. Hecht testified that he did not include government payments in the crop budgets because of the changes resulting from the 1990 Farm Bill being adopted. (Transcript, Pages 3465 through 3466)
- 195. That Mr. Hecht testified that the crop budgets were the foundation for everything else that was developed in the report. (Pre-filed Testimony, Page 34)
- 196. That Mr. Hecht testified that if a producer has less water then he will be producing less crop and, therefore, he will have less income; that when a producer has less water, his input costs will drop but they do not drop as dramatically as income. (Pre-filed Testimony, Pages 35 through 39)
- 197. That Mr. Hecht testified that he has observed a rapid increase in the number of acres that short season corn is grown on which lowers the water requirements and some of the input costs (Pre-filed Testimony, Pages 42 through 44); that producers are also starting to use surge valves. (Prefiled Testimony, Page 46)
- 198. That Carl Myers, City Manager, City of Hoisington, testified regarding the location of wells and the quantities of water authorized under the water rights held by the City of Hoisington. (Transcript, Pages 3794 through 3796; Exhibit 77)
- 199. That Mr. Myers testified that the water use of the City of Hoisington over the last 31 years has remained relatively stable, showing steady but not

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extreme growth (Transcript, Pages 3798 through 3800; Exhibits 78 & 79); that the City of Hoisington's gallons per capita per day water usage is relatively low compared to other cities in the region (Transcript, Pages 3800 through 3801, Exhibit 80; that the City of Hoisington's water use is well below the quantities authorized under the City's water rights. (Transcript, Page 3802)

- 200. That Mr. Myers testified that if the City's water appropriations are decreased, it could interfere with the City's ability to grow economically and existing businesses and industries could leave the City. (Transcript, Pages 3803 through 3804)
- 201. That Mr. Myers testified that the City of Hoisington has undertaken the following water conservation measures: (1) water pumped from the City's wells and water used by the water utility customers is metered; (2) the rate structure for water; (3) monthly customer usage is monitored to watch for household or service line water leaks; (4) the City purchased leak location equipment; (4) the City adopted an ordinance which requires customers to repair significant leaks within 24 hours and the City attempts to repair water main leaks within the same period; (5) the City includes water conservation tips for its customers on their utility bills. (Transcript, Page 3808)
- 202. That Mr. Myers testified that it is a high priority of the City to adopt a water conservation plan. (Transcript, Page 3814)

- 203. That Rollan W. Stukenholtz, General Manager, Servi-Tech, Inc., Dodge City, Kansas, testified regarding a report titled "The Economic Impact of Irrigation Water for Crop Production in Rush and Barton Counties, Kansas. Effective Water Loss in Rush and Barton Counties." (Exhibit 73) that he prepared in conjunction with Mr. John Hecht. (Pre-filed Testimony, Page 4)
- 204. That the report estimates that the potential loss in commodity sales under the assumption that no irrigation is permitted in that portion of the IGUCA in Rush and Barton Counties is \$6.32 million; that the estimate ignores the likelihood of land once irrigated being fallowed every other year. (Exhibit 73, Page 5; Pre-filed Testimony, Pages 22 through 23)
- 205. That the report summarizes the potential impact of reductions in farmer input costs assuming that no irrigation is permitted in the portion of the IGUCA in Rush and Barton Counties; that that estimate is a loss of input costs of \$3.59 million; that that loss of input costs is an estimate of the economic impact on suppliers of agricultural products. (Exhibit 73, Page 6; Pre-filed Testimony, Page 25)
- 206. That Mr. Stukenholtz testified based upon conversations with three or four farmers in the IGUCA area that most of those farmers buy fertilizer, chemicals and seed locally; that it is rare for a producer to go outside of the area to make an agricultural purchase. (Transcript, Pages 3904 through 3905)

- 207. That Mr. Stukenholtz testified that yield of irrigated crops are nearly always higher than the yield of dry land crops. (Transcript, Page 3906)
- 208. That he testified that farmers must exceed a certain break-even yield in order to sustain themselves on the land; that this break-even yield is necessary in order to cover expenses; and that irrigation is important to the net income of farmers in the area. (Transcript, Pages 3907 through 3908)
- 209. That Mr. Stukenholtz testified that the basis of federal farm deficiency payments is proven farm yields which are lower on dry land fields than on irrigated land and therefore payments for irrigated crops are higher. (Transcript, Page 3911)
- 210. That he further testified that it is virtually impossible to survive in agriculture without federal deficiency payments. (Transcript, Page 3913)
- 211. That Mr. Stukenholtz testified that in general higher yields produce more profitable farming operations. (Transcript, Page 3974)
- 212. That he testified that property tax rates on irrigated land are most often two to three times higher than the property taxes on dry land farms. (Transcript, Pages 3914 through 3915)
- 213. That Mr. Stukenholtz testified that if water use reductions are ordered in the IGUCA area, producers will have to invest in more efficient

irrigation technology; that to make such investments irrigators need to know how much water they will have available over a long period of time; that Mr. Stukenholtz recommended long term allocations to encourage more efficient use of water, that he recommended allocations be based on a five year period. (Transcript, Pages 3916 through 3917)

- 214. That he further testified that yields comparable with those achieved with inefficient irrigation methods can be achieved with less water using more efficient irrigation technology. (Transcript, Page 3976)
- 215. That Mr. Stukenholtz testified that flood irrigation efficiencies using water saving technologies might be as good as 80% or 85%. (Transcript, Page 4065)
- 216. That Mr. Stukenholtz recommended metering to better measure water use followed by the implementation of water saving technologies and, some time in the future, a determination of how much water use can be reduced without causing severe economic hardship. (Transcript, Page 3988)
- 217. That he further testified that under certain circumstances reduced water use may have only a small impact on yields although the economic impact may not be small. (Transcript, Page 4066)
- 218. That the hearing concluded on April 18, 1991, after 18 days of hearing; that the Chief Engineer ordered that all written statements and evidentiary materials requested by the Chief Engineer be submitted by May

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1, 1991; that the participants were given until July 1, 1991, to submit Proposed Findings of Fact and Conclusions of Law and Briefs on various issues of Law; that the Chief Engineer set the deadline for responses to the Proposed Findings of Fact and Conclusions of Law and to Briefs on Legal Issues as August 1, 1991; that on June 18, 1991, the Chief Engineer extended the deadline for participants to submit Proposed Findings of Fact and Conclusions of Law and Briefs on Legal Issues until July 10, 1991 and extended the deadline for Reply Briefs until August 10, 1991; that on July 3, 1991, the time for filing materials was extended until July 19, 1991, and the deadline for filing Reply Briefs was extended until August 19, 1991; that on August 19, 1991, the Record in this matter was closed.

CONCLUSIONS

- That overall groundwater levels in the area have declined on a long-term 1. basis and, in certain parts of the area, have declined excessively.
- 2. That withdrawals of groundwater in the area exceed recharge in the area as evidenced by the declining groundwater levels.
- That Walnut Creek and its valley alluvium are hydraulically connected; 3. that declining groundwater water levels are at least in part responsible for declines in baseflow in Walnut Creek; that streamflow in Walnut Creek, depending on the amount and timing of streamflow and groundwater levels in the aquifer, provides some recharge to the aquifer.

overland runoff and consequently declines in streamflow in Walnut Creek.

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- 5. That Walnut Creek historically has been an intermittent stream that, depending upon climatological cycles, had periods of little or no baseflow.
- 6. That the long-term sustainable yield of the aquifer within the boundaries of the proposed control area as set forth in Conclusion No. 8 is no more than approximately 22,700 acre-feet per year.
- 7. That an intensive groundwater use control area (IGUCA) should be established.
- 8. That the area to be included within the IGUCA should be reduced by excluding that area within the proposed boundaries generally south of Dry Walnut Creek; that all other land originally proposed to be included in the IGUCA should remain in the IGUCA since the surface water drainage and the valley aquifer are hydrologically part of the stream-aquifer system in Walnut Creek valley; that the land to be included within the IGUCA should be as follows:

4.

Barton County

T18S, R13W, Sections 28 through 33

T18S, R14W, Sections 4 through 10 and 14 through 36

T18S, R15W, Sections 1 through 36

T19S, R13W, Sections 3 through 11 and 14 through 23

T19S, R14W, Sections 1 through 6, 9 through 15, and 22 through 24

T19S, R15W, Section 1

Rush County

- T17S, R16W, Sections 31 through 35
- T17S, R17W, Sections 19 through 36
- T17S, R18W, Sections 19 through 36
- T17S, R19W, Sections 23 through 26 and 31 through 36
- T17S, R2OW, Sections 35 and 36
- T18S, R16W, Sections 1 through 36
- T18S, R17W, Sections 1 through 36
- T18S, R18W, Sections 1 through 36
- T18S, R19W, Sections 1 through 36
- T18S, R2OW, Sections 1 through 36
- T19S, R16W, Sections 3 through 6
- T19S, R17W, Sections 1 through 6
- T19S, R2OW, Sections 1, 2, 11 and 12

Ness County

- T17S, R25W, Sections 32 through 34
- T18S, R21W, Sections 1 through 36
- T18S, R22W, Sections 1 through 4 and 7 through 36
- T18S, R23W, Sections 19, 25 through 36
- T18S, R24W, Sections 13 through 27, 35 and 36
- T18S, R25W, Sections 1 through 5, 10 through 13, 24, 33, and 34
- T19S, R21W, Sections 4 through 9
- T19S, R22W, Sections 1 through 12, 17 and 18
- T19S, R23W, Sections 1 through 23
- T19S, R24W, Sections 1, 2 and 7 through 29
- T19S, R25W, Sections 1 through 3 and 11 through 13
- 9. That the IGUCA should be closed to further appropriations of groundwater and surface water except for domestic use, any surface water use that will divert flood flows that would not otherwise be usable, any use authorized by temporary permit granted under the authority of K.S.A. 82a-727, any appropriation of groundwater or surface water that may be authorized on a non-renewable term basis not to exceed one year when deemed by the Chief Engineer to be necessary for emergencies or to protect the public health, safety or welfare.
- 10. That under the Kansas Water Appropriation Act, K.S.A. 82a-701 <u>et seq.</u>, all water rights in the state of Kansas, both groundwater and surface water, are administered in accordance with a single priority system; that the Kansas Water Appropriation Act also gives the Chief Engineer the authority

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to conjunctively administer groundwater and surface water that are in hydraulic connection when necessary to prevent impairment and protect the public interest.

11. That in addition to authority within the Kansas Water Appropriation Act to conjunctively regulate surface water and groundwater, K.S.A. 82a-1038(b)(5) specifically provides that as one of the corrective control provisions, the Chief Engineer may adopt "any one or more other provisions making such additional requirements as are necessary to protect the public interest"; that K.S.A. 82a-1039 provides,

Nothing in this [IGUCA] act shall be construed as limiting or affecting any duty or power of the Chief Engineer granted pursuant to the Kansas Water Appropriation Act;

that in imposing controls in an IGUCA, the Chief Engineer may utilize powers granted to the Chief Engineer by both the K.S.A. 82a-701 <u>et seq</u>. and K.S.A. 82a-1036 <u>et seq</u>.

- 12. That it is in the public interest to conjunctively regulate groundwater and surface water in a hydrologic system where groundwater and surface water are in hydraulic connection and use of groundwater affects surface water and vice versa; that such a resource cannot be effectively regulated without regulating both groundwater and surface water.
- 13. That the nature of surface water may, however, require different controls in order to allow surface water to be captured during periods when adequate flow is available while still providing for efficient use and regulation when necessary to prevent impairment.

- 14. That in a water-short hydrologic system, such as the proposed IGUCA, use of water by any water user from either groundwater or surface water, may affect the amount of water available to some or all other users in the water-short system.
- 15. That it is in the public interest to allow the aquifer to recharge to a level that, other than due to fluctuations in water levels caused by climatic variations, would essentially be full (water levels in the aquifer at or above streambed elevation); that baseflow would be present more often in an essentially full aquifer than in an aquifer that is depleted because water levels in the aquifer would be at or above streambed elevation more often despite climatic fluctuations; that when baseflow is present, any runoff that would make its way into Walnut Creek would be more likely to travel farther downstream than if baseflow was not present; that to allow the aquifer to recharge and to be maintained in an essentially full state requires that the total average annual groundwater withdrawals be limited to no more than the long-term sustainable yield.
- 16. That the time it will take to recharge the aquifer so that groundwater levels are at or above streambed elevation is dependent not only on groundwater withdrawals, but also available recharge which is dependent, in part, on both precipitation and runoff which makes its way into the mainstem of Walnut Creek.

- 17. That K.S.A. 82a-707(e) provides that "[a]ppropriation rights in excess of the reasonable needs of the appropriators shall not be allowed."
- 18. That K.A.R. 5-5-7 provides that:

Each person shall not commit a waste of water as defined in these regulations. Upon a finding by the chief engineer that waste of water has occurred, the chief engineer may suspend use of that water right until the owner shows to the satisfaction of the chief engineer that the waste of water will no longer occur.

19. That K.A.R. 5-1-1(z) provides that:

'Waste of water' means any act or omission which causes:

(1) Water to be diverted or withdrawn from a source of supply and not used or reapplied to a beneficial use on or in connection with land authorized as the place of use by a vested right, an appropriation right or an approved application for permit to appropriate water for beneficial use;

(2) The unreasonable deterioration of the quality of water in any source of supply thereby causing impairment of a person's right to the use of water;

(3) Water intended for irrigation use to escape and drain from the authorized place of use; or

(4) Water to be applied to an authorized beneficial use in excess of the needs for such use.

20. That water use requirements for various types of beneficial use can vary from year-to-year based on factors such as: climatic variability, location, types of crops grown and water use efficiency; that what is currently a reasonable amount of water for beneficial use in the IGUCA is less than what may have been authorized and perfected historically.

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- 21. That a reasonable average annual amount of water needed to be diverted for irrigation within the IGUCA is approximately 12 inches for Barton County, 13 inches for Rush County and 14 inches for Ness County; that it is in the public interest to allow flexibility to meet varying water demands; that this flexibility can be accomplished by setting allocations on a fiveyear basis which are five times the reasonable average annual amount and allowing use in any given year to exceed the reasonable average annual amount to the degree necessary to meet water demands without waste or excess use, as long as the total amount allocated for the five year period is not exceeded within the five year period; that the amount available for use in any one year cannot legally exceed the maximum annual quantity authorized by the water right or permit to appropriate water.
- 22. That water users should be efficient in the use of water for all beneficial purposes.
- 23. That the vested rights and appropriation rights authorizing the use of groundwater, in order of priority date, with a total accumulated authorized quantity of approximately 22,700 acre-feet per year should be considered senior rights for purposes of determining the allocations of water to be allowed in the IGUCA; that at least for the initial five year period such senior rights should include priority dates on or before October 1, 1965; that junior appropriation rights should be defined as those appropriation rights or permits to appropriate water with priority dates subsequent to October 1, 1965.

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- 24. That vested rights authorizing the use of groundwater should be allocated their full authorized quantities; that senior appropriation rights authorizing the use of groundwater should be allocated an amount of water deemed reasonable for the circumstances that exist in the IGUCA; that junior appropriation rights authorizing the use of groundwater should be allocated the remaining portion of the long-term sustainable yield of the aquifer.
- 25. That Cheyenne Bottoms is an extremely important wetland; that water is essential to its successful maintenance.
- 26. That it is in the public interest to regulate and manage water in the IGUCA to allow maximum benefits from the use of water in the area consistent with the long-term sustainability of the area's water resources.
- 27. That information in the record is inadequate to determine what additional management criteria, if any, should be implemented for the surface water impoundments in the basin; that the natural inflow to these structures may be required to be bypassed in accordance with the provisions of the Water Appropriation Act, if necessary to prevent direct impairment of senior downstream water rights.
- 28. That while there is adequate information to establish an IGUCA, more and better data is needed to refine the management of the IGUCA in order to achieve aquifer recovery and maximize long-term benefits for all water

users in the area; that flow meters on all diversions authorized under vested rights, appropriation rights and approved applications for permit to appropriate water within the IGUCA are necessary to determine groundwater and surface water withdrawals.

29. That an advisory committee should be appointed to make recommendations to the Chief Engineer concerning the types, locations, and frequency of data to be collected to monitor groundwater levels, streamflow, aquifer recharge, groundwater withdrawals, surface water diversions, and any other data it might deem necessary to refine and evaluate the management of the IGUCA and to provide recommendations on potential changes to the corrective control provisions after the collection and review of such data.

ORDER

NOW, THEREFORE, it is the decision and order of the Chief Engineer, Division of Water Resources, Kansas State Board of Agriculture, that an Intensive Groundwater Use Control Area (hereinafter referred to as the "IGUCA") should be and is hereby established in Barton, Rush and Ness Counties, Kansas, within the boundaries set forth below, and the following corrective control provisions shall be in full force and effect within the area described from and after the date of this Order:

1. That the boundaries of the IGUCA shall be as follows:

<u>Barton County</u>

T18S, R13W, Sections 28 through 33

 \checkmark T18S, R14W, Sections 4 through 10 and 14 through 36

wT18S, R15W, Sections 1 through 36

✓T19S, R13W, Sections 3 through 11 and 14 through 23

rT19S, R14W, Sections 1 through 6, 9 through 15, and 22 through 24

✓T19S, R15W, Section 1

<u>Rush County</u>

- T17S, R16W, Sections 31 through 35
- T17S, R17W, Sections 19 through 36
- T17S, R18W, Sections 19 through 36
- T17S, R19W, Sections 23 through 26 and 31 through 36
- T17S, R2OW, Sections 35 and 36
- T18S, R16W, Sections 1 through 36
- T18S, R17W, Sections 1 through 36
- T18S, R18W, Sections 1 through 36
- T18S, R19W, Sections 1 through 36
- T18S, R2OW, Sections 1 through 36
- T19S, R16W, Sections 3 through 6
- T19S, R17W, Sections 1 through 6
- T19S, R2OW; Sections 1, 2, 11 and 12

Ness County

- T17S, R25W, Sections 32 through 34
- T18S, R21W, Sections 1 through 36
- T18S, R22W, Sections 1 through 4 and 7 through 36
- T18S, R23W, Sections 19, 25 through 36
- T18S, R24W, Sections 13 through 27, 35 and 36
- T18S, R25W, Sections 1 through 5, 10 through 13, 24, 33, and 34
- T19S, R21W, Sections 4 through 9
- T19S, R22W, Sections 1 through 12, 17 and 18
- T19S, R23W, Sections 1 through 23
- T19S, R24W, Sections 1, 2 and 7 through 29
- T19S, R25W, Sections 1 through 3 and 11 through 13
- 2. That this IGUCA shall be closed to further groundwater appropriation except for domestic use, any use authorized by temporary permit granted under the authority of K.S.A. 82a-727, and any appropriation of groundwater that may be authorized on a non-renewable term basis not to exceed one year when deemed by the Chief Engineer to be necessary for emergencies or to protect the public health, safety or welfare; that the Chief Engineer shall refuse to accept any other application for a permit to appropriate groundwater within the IGUCA; that this IGUCA shall be closed to further surface water appropriation except for domestic use, any diversion of flows that would not otherwise be usable, any use authorized by temporary permit granted under the authority of K.S.A. 82a-727, and any appropriation of surface water that may be authorized on a non-renewable term basis not to exceed one year when deemed by the Chief Engineer to be

necessary for emergencies or to protect the public health, safety or welfare.

- 3. That all applications to appropriate water filed on or after March 13, 1990, and prior to the date of this Order declaring an IGUCA that do not fall within the exceptions listed in paragraph 2 shall be dismissed.
- 4. That by June 1, 1992, or within any authorized extension of time thereof for good cause shown by the water user, flow meters shall be installed on all water wells and surface water diversion facilities authorized in the IGUCA except on those wells and surface water diversion facilities used solely for domestic purposes and those uses authorized by temporary permits; that these meters shall meet or exceed the specifications for flow meters adopted by the Chief Engineer on March 27, 1980, and amended on February 27, 1985, unless a written waiver is obtained from the Chief Engineer prior to the use of the well or surface water diversion facilities.
- 5. That the meters required to be installed in accordance with paragraph number 4 shall be maintained in a condition satisfactory to the Chief Engineer.
- 6. That in accordance with K.S.A. 82a-732, each water right holder in the IGUCA shall file water use reports no later than March 1 of the year following the usage or at such other times as may be required by the Chief Engineer; that in addition to reporting the information normally required

in the water use reports, each water right holder shall also report: (a) the depth to static water level in each of his or her wells in the IGUCA to be measured at a time and in a manner acceptable to the Chief Engineer, (b) the serial number of the water meter, (c) the meter reading at the beginning and end of the calendar year, and (d) any additional information necessary to administer the provisions of this Order;

7. That water shall be allocated to all existing water rights and permits to appropriate water authorizing the use of groundwater within the IGUCA based on a five year allocation; that the five year allocation will be determined based on an average year amount for each water user as set forth in more detail below; that the five year allocation will be the average year amount multiplied by five.

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- 8. That the amount allocated to a water user for a five year period may be used at the water user's discretion within the five year period, provided that the water user shall not exceed the certified or permitted amount in any one year under the water right under which the water is diverted and all other terms, limitations, and conditions of the water rights or permits to appropriate water shall be adhered to.
- 9. That the five year allocations are set up with the first five years being calendar years 1992 through 1996, the second being 1997 through 2001, and so on.
- 10. That an average annual volume of approximately 22,700 acre-feet of groundwater shall be allocated to the groundwater rights as follows:
 - a. That all vested rights shall be allocated their current authorized quantities;
 - b. That senior appropriation rights shall be defined as those appropriation rights with priority dates on or before October 1, 1965; that junior appropriation rights shall be defined as those appropriation rights or permits to appropriate water with priority dates subsequent to October 1, 1965;
 - c. That senior appropriation rights for irrigation shall be allocated 12 inches in Barton County, 13 inches in Rush County and 14 inches in Ness County on either the maximum number of acres actually irrigated in any one year from 1985 through 1990 or the maximum acres authorized, whichever is less;
 - d. That junior appropriation rights for irrigation shall be allocated approximately 44% of the allocations for senior appropriation rights for irrigation: 5 1/4 inches in Barton County, 5 3/4 inches in Rush County and 6 1/4 inches in Ness County on either the maximum number of acres actually irrigated between 1985 and 1990 or the maximum acres authorized, whichever is less;

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- e. That water use reports filed with the Chief Engineer for the years 1985 through 1990 will be the primary source of information to determine irrigated acreage, but other records may be utilized if needed;
- f. That non-vested rights for municipal use shall be allocated water based upon each entity's 1989 population and a reasonable per capita use or the quantity authorized under the entity's rights, whichever is less; that the per capita use considered to be reasonable is 90% of the average per capita per day use for the period 1986 through 1989 for municipalities of similar size within the region an entity is located as shown in the series of publications titled "Kansas Municipalities Water Use" published by the Kansas Water Office and the Division of Water Resources for 1986 through 1989;
- g. That holders of municipal rights who have reported to the Chief Engineer wholesale deliveries of water to other entities or sales to industries of 1,000,000 gallons per year or more not included in the per capita per day figures referred to in the previous paragraph shall be provided an additional allocation so that the reasonable current needs of those customers can be met;
- h. That non-vested water rights for all other types of beneficial uses shall be allocated the lessor of the following:

(1) 90% of their maximum use reported to the Chief Engineer for the period 1985 through 1990, or

(2) the sum of the annual quantity of vested and senior appropriation rights and 44% of the junior appropriation rights authorized for the entity.

- 11. That a groundwater user may divert his or her allocation for any specific authorized place of use from a combination of any of the wells authorized to divert water on that place of use as long as: (1) the total allocation for the five year period for the authorized place of use is not exceeded, and (2) the conditions and limitations on the water right or permit authorizing the well or wells being used are not exceeded; that the Chief Engineer may require any special reports or management plans to be submitted as deemed necessary to efficiently monitor and enforce this provision.
- 12. That approximately each five years the Chief Engineer may evaluate the information collected from additional studies conducted in the IGUCA and the status of the water rights and permits to appropriate water in the IGUCA and make adjustments in the corrective control provisions as necessary to allocate water so that the use of groundwater does not exceed the long-term sustainable yield of the aquifer.
- 13. That if a water user uses in excess of the amount of groundwater allocated during any five year period, the amount allocated for the next five year

period shall be reduced by twice the amount by which the water user exceeded the amount allocated for the five period in which the excess use occurred.

- 14. That approval of applications for changes to existing water rights shall not result in increases in allocations otherwise provided for in this Order.
- 15. That the Division of Water Resources will, as soon as practical, transmit a statement to each non-domestic groundwater user within the IGUCA setting forth the user's first five year allocation of water.
- 16. That all holders of: (1) vested rights for groundwater use, (2) municipal and industrial appropriation rights for groundwater use and (3) vested or appropriation rights for surface water use, except for domestic use, within the IGUCA shall be required to adopt and implement a conservation plan in accordance with the guidelines adopted by the Kansas Water Office pursuant to K.S.A. 74-2608(c), and amendments thereto, except that the additional provisions included in paragraph 17 of this Order shall apply to recreation use where no guidelines currently exist; that such plans shall be submitted to the Chief Engineer by October 1, 1992, or any extension of time allowed for good cause, for approval by the Chief Engineer.
- 17. That the conservation plans to be developed by the holders of recreation rights for surface water use shall set forth plans and practices that will

avoid waste, minimize losses and optimize the efficient use of water for the authorized purpose; that in the case of Water Right, File No. 439, held by the Kansas Department of Wildlife and Parks, such plan shall also include the development of an operational plan for the improved conservation and management of water for the Cheyenne Bottoms Wildlife Refuge, along with a schedule for the implementation of the plan.

- 18. That the Chief Engineer may adopt any special policies and procedures, as deemed in the public interest and consistent with the provisions of this Order, necessary to allow the marketing or transfer of water rights or their associated allocations between users in the IGUCA to minimize shortages of water to individual users; that any such rights or allocations acquired may be used in addition to the allocations provided for herein so long as such water is not wasted and is used with reasonable conservation practices.
- 19. That the corrective control provisions included herein are hereby incorporated as conditions of each water right authorized in the IGUCA.
- 20. That the violation of any of the IGUCA's other corrective control provisions by a water user may result in the suspension of the use of water allocated herein for such periods of time and on such conditions as deemed necessary by the Chief Engineer to enforce this Order.
- 21. That an advisory committee is hereby established to make recommendations to the Chief Engineer concerning:

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- a. The types, locations and frequency of data to be collected to monitor groundwater levels, streamflow, aquifer recharge, groundwater withdrawals, surface water diversions and any other data it might deem necessary to evaluate and refine the management of the IGUCA.
- b. Modifications to the corrective control provisions as deemed appropriate to optimize the efficient use of water and benefits from the use of water in the area consistent with the protection of existing water rights and the public interest.
- 22. That the advisory committee shall be constituted as follows: Each of the formal participants at the conclusion of the hearing conducted in this matter shall be invited to designate a representative; that the Chief Engineer shall select the Chairperson and such additional members as deemed necessary.
- 23. That pursuant to the provisions of K.S.A. 2-1915 and K.S.A. 2-1919, the Chief Engineer hereby designates the Walnut Creek IGUCA as being an area in need of aquifer restoration and the Walnut Creek and its tributaries located within the boundaries of the Walnut Creek IGUCA are hereby designated as streams being in need of stream recovery.
- 24. That in all other respects not inconsistent with this Order, the Chief Engineer shall continue to administer water rights and process

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applications filed pursuant to the Kansas Water Appropriation Act in accordance with the Kansas Water Appropriation Act, Groundwater Management District Act and rules and regulations and policies of the Division of Water Resources, Kansas State Board of Agriculture and Big Bend Groundwater Management District No. 5, where applicable.

25. That the Chief Engineer specifically retains jurisdiction in this matter with authority to make such changes in the boundaries of the IGUCA or the corrective control provisions which have been instituted or any other provisions of this Order, and to hold any subsequent hearings in the matter of the IGUCA or the corrective control provisions which he or she may deem to be in the public interest.

Dated at Topeka, Kansas this 29th day of January, 1992.

WATER DAVID Pope, Ρ.Ε. **శ**నిరిలు Chief Engineer CHIEF ENGINEE ion of Water Resources tate Board of Agriculture E BOARD

State of Kansas County of Shawnee

The foregoing instrument was acknowledged before me this 22^{-} day of January, 1992, by David L. Pope, P.E., Chief Engineer, Division of Water Resources, Kansas State Board of Agriculture.



SS

(Denise J. Rolfs) С

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CERTIFICATE OF MAILING

I, Leland E. Rolfs, hereby certify that I caused a copy of the Findings, Conclusions and Order to be placed in the United States mail, postage prepaid on January 30, 1992, to the following:

DeAnn E. Hupe-Seib 502N Landon State Office Building 900 SW Jackson Topeka, KS 66612 Attorney for the Kansas Department of Wildlife and Parks

H. Philip Martin Martin and Gatterman P. O. Box D Larned, KS 67550 Attorney for the Big Bend Groundwater Management District No. 5

Richard Boeckman Keenan and Boeckman, P.A. P. O. Drawer 459 Great Bend, KS 67530 Attorney for the Walnut Creeks Basin Association

Robert G. Suelter P. O. Box 2026 Great Bend, KS 67530 Attorney for the City of Great Bend

Frank Austenfeld The Mission Bank Building 5201 Johnson Drive, Suite 400 Mission, KS 66205 Attorney for the Kansas Wildlife Federation

Mark Calcara P. O. Drawer 1110 Great Bend, KS 67530 Attorney for the Mid-Kansas Quality Water Association

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Charles S. Arthur 2627 KFB Plaza Manhattan, KS 66502 Attorney for the Kansas Farm Bureau

Thomas L. Toepfer 114 West 11th Street P.O. Box 417 Hays, KS 67601 Attorney for the Wet Walnut Creek Watershed Joint District No. 58

R. P. Ro e

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