BEFORE THE ARKANSAS SOIL AND WATER CONSERVATION COMMISSION

IN RE: THE DESIGNATION OF THE SPARTA AQUIFER WITHIN BRADLEY, CALHOUN, COLUMBIA, OUACHITA AND UNION COUNTIES AS A CRITICAL GROUND WATER AREA

NO. 1995-1

FINDINGS OF FACT, CONCLUSIONS OF LAW AND COMMISSION ORDER

On February 21, 1996, the Commission met to consider the Administrative Hearing Officer's proposed Findings of Fact and Conclusions of Law. Based upon the record submitted and the arguments presented, the Commission, upon proper motion, adopted the Administrative Hearing Officer's Proposed Findings of Fact and Conclusions of Law as contained in his report dated January 22, 1996, including without limitation the Proposed Order. This action represents final Commission action with respect to the designation.

This Commission Findings of Fact, Conclusions of Law and Commission Order issued this 11th day of March, 1996.

ARKANSAS SOIL & WATER
CONSERVATION COMMISSION

BY: _____
James Neal Anderson
Chairman

ATTEST:

_____
J. Randy Young, P.E.
Executive Director and Secretary

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ADMINISTRATIVE HEARING OFFICER'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

INTRODUCTION

After review of evidence contained in the record of this matter, the Administrative Hearing Officer recommends that the Commission adopt the following findings of fact and conclusions of law and enter the order that follows:

PROPOSED FINDINGS OF FACTS AND CONCLUSIONS OF LAW

Based upon the record, the Administrative Hearing Officer recommends adoption of the following findings of fact and conclusions of law:

1. As required by the Arkansas Groundwater Protection and Management Act and in compliance with the Administrative Procedures Act (A.C.A. § 25-15-201 *et seq.)* the following hearings were held:

DATE	TIME	CITY	PLACE
September 5, 1995	1:00 p.m.	Hampton	Calhoun County Courthouse Administration Building Second and Main Streets
September 5, 1995	7:00 p.m.	El Dorado	AP&L Reddy Room 2415 Northwest Avenue
September 6, 1995	1:00 p.m.	Camden	Ouachita County Courthouse Conference Room 145 Jefferson Avenue
September 6, 1995	7:00 p.m.	Magnolia	Southern Arkansas University Wilson Hall, Room 216
September 7, 1995	1:00 p.m.	Warren	Bradley Co. Municipal Courtroom 104 North Myrtle Street

2. The Sparta aquifer is located in the south and southeast regions of Arkansas, as well as portions of Texas, Louisiana, and Mississippi. It outcrops in Dallas, Hot Spring, Saline, Grant, and Nevada counties outside the study area and in Columbia and Ouachita counties inside the study area and is located below ground surface throughout the area. Within the area, the Sparta aquifer is the primary aquifer system and is the basal fresh water bearing unit. The Sparta thickness averages approximately 600 feet, ranging from a thickness of approximately 200 to 300 feet thick in the outcrop area to about 900 feet thick in the southeastern part of the state. In the study area, it is a confined aquifer, underlain by the Cane River Formation and overlain by the Cook Mountain Formation, both of which are effective confining units. The ground-water flow system in the Sparta is complex due to the extensive demands made on the system, but during pre-development times the flow was generally toward the east-southeast.

3. There are 48 registered ground-water users in the area that utilize the Sparta aquifer for industrial, and water supply purposes. These represent approximately 90% of Sparta aquifer withdrawals in the area.

4. The Commission's Ground Water Management and Protection Planning staff completed a hydrogeologic review of the Sparta aquifer. The findings are contained in a report entitled *Analysis of Ground-Water Conditions of the Sparta -- South Arkansas Hydrogeolgic Basin.*

5. The City of Warren, Arkansas, has presented a report prepared by Tanner Engineering Consultants, Inc. entitled *Hydrologic Conditions of the Sparta Sand in Bradley County* which does not contradict the findings of the ASWCC staff regarding the critical area designation.

6. This data indicates that ground-water levels in the Sparta aquifer are declining at a rate greater than one foot per year in a large portion of the area. The maximum rate of drawdown for the

seven year data period was seven feet per year near El Dorado. Data also shows that water levels are currently below the top of the formation in much of Union and Columbia Counties where cones of depression in the potentiometric surface have developed because of large volumes of pumpage for municipal and industrial use. In Bradley County, the declines are not as severe by comparison.

7. Ground-water flow modeling indicates that any future increases in ground-water use within the area could cause an increase in saline-water encroachment. Modeling also indicates that even with reductions in pumpage, the aquifer may not fully recover for a long period of time.

8. Section 403.1 of the Commission rules provides that an analysis for critical area designation is based on the following criteria:

(a) For a confined aquifer, such as the Sparta, the water levels are declining at the rate of at least one foot per year for at least a five year period [§403.1A1(b)], or

(b) The water levels are at or below the top of the formation [§403.1A1(b)], or

(c) Water quality is degraded or trends indicate probable future degradation that would render the water unusable for the beneficial uses of the aquifer [§403.1A2].

9. The area's chief delineating feature is a persistent area of extremely depressed water levels in wells installed in the Sparta (El Dorado) aquifer in the vicinity of the cities of Magnolia and El Dorado. This area of depression in the past has consisted of two cones of depression beneath each city caused by municipal and industrial pumping. Continued pumpage has resulted in the overlap of these cones of depression forming one large area of depressed water levels. This area of depression now extends north and east from the two cities covering

most of Columbia and Union Counties and extends into the southern portions of Ouachita, Calhoun, and Bradley Counties.

10. In addition to potentiometric declines and aquifer interception concerns, portions of the area also have water-quality problems with some regions experiencing increased salinity and total dissolved solids levels.

11. The Sparta aquifer is composed mainly of sand with considerable amount of silt, clay, shale, and lignite found in lenses. Lithologically, it is highly variable both vertically and laterally, with predominantly sandy sections grading into mostly shaly sections within very short distances. The sand is composed almost entirely of gray, rounded to subrounded, fine to medium-grained, well-sorted quartz with coarse sand and fine gravel. Glauconite is sometimes found in the Sparta aquifer, usually in the upper portions of the unit, hence the name "Greensand" from the green color of the sediment. The shales and clays are gray, dark brown, or black (contingent upon the amount of carbonaceous material present) and are commonly sandy to silty.

12. The Sparta sand formation in the area is characterized by the well-developed lineation of sand concentrations in a general northerly direction, which are thought to be normal to the orientation of the ancient depositional shoreline. This was generated by several anastomosing stream channels in a deltaic fluvial plain environment, having lakes, marshes and swamps. The Sparta aquifer represents continental erosion and subsequent deposition and the glauconite and fossiliferous shales were created by short-lived ocean transgressions.

13. In the 1920s total flow through the Sparta was assumed to be approximately 20.4 Mft^3/d. In 1985 the flow was calculated to be 38.6 Mft^3/d with approximately two-thirds of the water flowing into the Sparta coming from rainfall infiltrating into the unconfined portion of the aquifer. Approximately 59 percent of the aquifer outflow was to the local eight rivers. A net rate of 1.6 Mft^3/d of water entered the confined portion of the aquifer from combined rainfall and river inflow. The net rate of flow from the Sparta to the overlying aquifers was 7.2 Mft^3/d. In 1985, data indicated that the influx of water into the Sparta due to rainfall recharge and river inflow was 6.3 Mft^3/d. This increase was caused by partly by pumpage from the aquifer and the fact that less water was being discharged locally to rivers. In 1985, 14.5 Mft^3/d flowed from the overlying formations to the Sparta and upward flow occurred only in localized areas. Pumpage accounted for approximately 70 percent of total outflow from the Sparta in 1985.

14. The major source for ground-water in the study area is the Sparta aquifer. Use from the Sparta in 1993 is as follows:

COUNTY	Sparta Mft^3/d
Bradley	.91
Calhoun	.70
Columbia	4.50
Ouachita	1.23
Union	10.83

15. In 1990, approximately 84 percent of the water used in this five-county region was ground-water. Approximate total available water in the Sparta aquifer is calculated to be about 79,000 acre-feet. The total amount of ground-water used by the five county study area in 2030 is projected to be 391 Mg/d.

16. In 1985, about 18.25 Mg/d was pumped from the Sparta aquifer by Camden, El Dorado, and Magnolia. These areas correspond to the cones of depression in the Sparta aquifer. Other declines and regional changes in ground-water gradient are noted near well fields for water associations around El Dorado, Magnolia, Smackover, and the eastern part of Union County.

17. The Magnolia water system's use of the Sparta has been drastically reduced due to the use of surface water from Lake Columbia, which went on line in March of 1993. The change to this alternate source of water has resulted in the City of Magnolia obtaining approximately 80 percent of its water from Lake Columbia and utilizing only four Sparta aquifer wells. Magnolia's surface water treatment capacity is 2.5 Mg/d, and is expected to double to 5.0 Mg/d in 1996. Several area rural water associations are presently obtaining a portion of their water from the Magnolia water system and blending it with ground-water from their existing Sparta aquifer wells. Other water associations in the vicinity are expected to connect to the Magnolia system as economics allow. It is anticipated that the cone of depression in this area will eventually be reduced because of the lessened demand on the Sparta aquifer.

18. The El Dorado water system uses approximately 5 Mg/d water which is derived entirely from eleven Sparta aquifer wells located in and around the city, nine of which are used daily.

19. The Greensand aquifer, the upper sand unit of the Sparta formation, is moderately stressed by ground-water withdrawals in Union County with the generalized potentiometric surface indicating a predominantly southward flow. The El Dorado aquifer, the lower sand unit of the Sparta formation, is heavily stressed by withdrawals in both Union and Columbia Counties.

The generalized potentiometric surface of the aquifer flows toward the centers of the coalescing cones of depression located beneath the cities of El Dorado and Magnolia.

20. More than 200 feet, and as much as 450 feet, of hydrostatic head remain in the aquifer in Bradley County. Water level declines have exceeded one foot per year for the most recent five year period. Specifically, the City of Warren Well No. 5 has declined an average of 1.18 feet per year over the past 22 years and 1.6 feet per year for the past two years. The City of Warren Well No. 3 has declined an average of 3.7 feet per year for the five year period ending in 1993; the Knickerbocker Well has declined an average of 1.3 feet per year for the five year period ending in 1993; the Town of Banks Well has declined an average of 1.3 feet per year for the five year period ending in 1993.

21. In Bradley County, the analysis of the City of Warren's water indicated an increase in sodium from 65 mg/L in 1988 to 92.1 mg/L in 1994. The Arkansas Department of Health has established a 20 mg/L advisory level for sodium. This would indicate that continued water use at existing levels will likely render the Sparta water unusable as a public water supply in the future.

22. Removal of ground-water from the framework of a sedimentary formation will reduce the hydrostatic support of the formation framework and can contribute to settling of the sediments under the pressure of overlying strata. In the event that this happens, compaction and settling of the formation can result in the permanent reduction of the formation's storativity. This will also reduce the amount of water produced by wells tapping into the formation. Even with the resaturation of the upper portion of the formation, the compaction caused by the temporary unsaturated condition permanently decreases the formation storativity and permanently

reduces the transmissivity of the compacted unit which, in turn, reduces the ability of the unit to release ground-water to the wells.

23. The acceleration of ground-water level declines indicates that the rate of recharge to the Sparta aquifer has and is being exceeded. If this demand continues, the aquifer will not be able to sustain either the quantity or the quality of ground-water supplied in the past. In order to guarantee the long term protection of the Sparta aquifer, a sustainable yield must be determined and pumpage reduced to that level. In the event that the current level of use continues, degradation of the Sparta aquifer will occur. This will result in: increased pumping costs; decreased well yields; expensive deepening or redrilling of wells; increased well interference; and the increased possibility of the threat of additional salt water intrusion.

24. Recharge of the Sparta aquifer is primarily from direct infiltration in the outcrop area and from leakage from alluvium and other formations having higher heads. In southern Arkansas, direct seepage from streams is negligible due to the high amount of stream drainage.

PROPOSED COMMISSION ORDER

Based upon the findings of fact and conclusions of law contained herein, the Administrative Hearing Officer recommends that the Commission enter the following order:

Section 1. Having met the requirements of Section 403.1A of the Commission's rules, the Sparta formation within Bradley, Calhoun, Columbia, Ouachita, (except for that portion within Township 11 South, Range 19 West) and Union Counties are designated as a critical ground-water

area pursuant to Arkansas Groundwater Protection and Management Act. This designation does not include institution of the regulatory authority.

Section 2. Because of this designation, the Commission and staff should take the following actions:

(a) With respect to the Technical Review Committee, review water projects with emphasis of not increasing and, when possible, reducing the use of the Sparta formation within the critical ground-water area.

(b) With respect to Water Plan Compliance under A.C.A. § 15-22-503(e) and Title VI of the Commission rules, approve water development projects that make additional use of the Sparta formation within the critical ground-water area, only when there is no other economically or technically feasible alternative, or when human health requires.

(c) With respect to the Commission's financial assistance programs authorized pursuant to various laws and Title V of the Commission's rules, give priority to projects within the critical ground-water area that utilize surface water, other less stressed aquifers and ground-water conservation.

(d) With respect to the reporting of ground-water use within the critical ground-water area pursuant to A.C.A. § 15-22-302, at the time of reporting give ground-water users notice that they are in a critical ground-water area and encourage the conjunctive use of both ground and surface water.

(e) With respect to the conservation, education and information program required pursuant to A.C.A. § 15-22-907, focus a portion of the program within the critical ground-water area by utilizing technology transfer, training, technical assistance, research and demonstration projects. A portion of the water use fees collected pursuant to A.C.A. § 15-22-913 and 914 will be used to encourage conjunctive water use including, when appropriate, the substitution of surface water, use of less stressed aquifer, and water conservation for Sparta aquifer water within the critical ground-water area.

(f) With respect to conversion from Sparta aquifer water use to surface water use, make water users aware and encourage the use of state income tax credits available pursuant to the *Water Resources Conservation and Development Incentives Act* (A.C.A. § 26-51-1001, *et seq.*).

Section 3. (a) As required by Commission rule 403.2A, the staff is directed to continue monitoring the situation within the critical ground-water area and to report back to the Commission periodically.

(b) The Commission shall maintain jurisdiction over this matter and shall enter additional orders as it deems necessary.

RECOMMENDATION

The Administrative Hearing Officer recommends that after review of the administrative record in this matter, the Commission adopt a findings of fact, conclusions of law and Commission order similar to those presented herein.

Dated: January 22, 1996

Respectfully submitted,

J. Randy Young, P.E.
Administrative Hearing Officer