REDACTED VERSION

PRELIMINARY ASSESSMENT

ICI BURIAL PIT
AKA: ICI OF AMERICA, ICI AGRICULTURAL, AND STAUFFER CHEMICAL COMPANY
NORTH LITTLE ROCK, ARKANSAS
(PA-18)

EPA I.D. NO.: ARD983285255

12/17/92

Prepared By: Arkansas Department of Pollution Control and Ecology

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TABLE OF CONTENTS

TABLE OF CONTENTS

ICI Burial Pit Site

Introduction . . . . . Page 2

Site Description . . . . . Page 4

Operational History . . . . . Page 6

Waste Characteristics . . . . . Page 6

Ground Water Hydrogeologic Setting . . . . . Page 11

Ground Water Targets . . . . . Page 14

Ground Water Conclusions . . . . . Page 15

Surface Water Hydrologic Setting . . . . . Page 16

Surface Water Targets . . . . . Page 18

Surface Water Conclusions . . . . . Page 22

Physical Conditions of the Soil . . . . . Page 23

Soil and Air Targets . . . . . Page 24

Soil Exposure and Air Pathway Conclusions . . . . . Page 25

Summary and Conclusions . . . . . Page 25

References . . . . . Page 28

List of Figures . . . . . Page 31

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December 17,1992

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

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Site: ICI Burial Pit
824 East 12th Street
North Little Rock, Arkansas 72115

EPA ID No.: ARD983285255

1. INTRODUCTION

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Arkansas Department of Pollution Control and Ecology (ADPC&E), Hazardous Waste Division, Superfund Branch, conducted a Preliminary Assessment (PA) at ICI Burial Pit ("ICI"), also known as ICI of America, ICI Agricultural, and Stauffer Chemical Company, in North Little Rock, Arkansas. The purpose of this investigation was to collect information concerning conditions at the ICI Burial Pit site sufficient to assess the threat posed to human health and the environment and to determine the need for additional CERCLA/SARA or other appropriate action. The scope of the investigation included review of available file information, a comprehensive target survey, and an onsite and offsite reconnaissance (December 11, 1992).

2. SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

2.1 Location

ICI, a agricultural chemical manufacturing plant, is located at 824 East Twelfth Street in North Little Rock, Arkansas (Figure 1). North Little Rock, Arkansas is located in central Pulaski County. Pulaski County is located in central Arkansas and is somewhat triangular in shape (Figure 2). The area of the county is 489,408 acres, or about 765 square miles, including approximately 1,298 acres of water. North Little Rock, Pulaski County, Arkansas is located within the Gulf Coastal Plain and bordered by six (6) Arkansas counties (Reference 1, pp. 1; Figure 2; Figure 3).

The population of Pulaski County is 349,660. North Little Rock, Arkansas has a population of 61,741 (Reference 2, pp. 3, 14). The geographic coordinates of ICI are 34^0 45′ 58" latitude and 92^0 15′ 17" longitude (Reference 3; Reference 4, pp. 1). To reach the site from Little Rock travel Interstate 30 East, take the Broadway Street exit and stay on the access road (Locust Street). After crossing the bridge on Locust Street take a right onto Thirteenth (13th) Street. Proceed on 13th Street and turn right onto Cedar Street. Travel Cedar Street, which is one block long, to Twelfth Street and turn left. ICI is located at 824 East Twelfth Street (Figure 1).

The climate in Pulaski County is characterized by hot and humid summers and short, mild winters. In summer months, the average daily temperature is 82^0 Fahrenheit. In winter months, the average daily temperature is 41^0 Fahrenheit. Heavy snowfall occurs occasionally, but only remains on the ground for a few days (Reference 1, pp. 3). A climatic summary from the United States Weather Bureau station at North Little Rock, Arkansas is attached as Reference 5.

Precipitation is fairly well distributed throughout the year and is generally adequate for most crops. The 1990 annual precipitation for North Little Rock, Arkansas, was 64.26 inches, with a deviation of 17.99 inches from the normal. Spring time is the wettest season, and May is normally the wettest month. Winter and spring rains are associated with frontal systems and are of a general, or widespread, character. Summer and fall rains are mainly thundershowers from convective clouds. The evaporation rate in summer may be as high as one-third (1/3) inch per day (Reference 1, pp. 3; Reference 5, pp. 4, 5; Figure 4).

2.2 Site Description

The ICI site, within Pulaski County, is located in Range 12 West Township 2 North Section 35 (Reference 3). The legal description of the property on which the ICI site is located is attached as Reference 6.

The property is relatively flat with approximately a 1/2 percent slope to the northeast. The property is rectangular in shape and bordered on the south by commercial, industrial and transportation (railroad), on the west by commercial and residential, on the north by residential, commercial, and industrial, and on the east by industrial and open urban area. The facility covers approximately 7 acres. The entire perimeter of the site is fenced (chain-link) with entrances off of 12th Street that are locked after hours. The facility operates on one shift five days a week (Reference 7, pp. 1; Figure 5).

Current structures onsite include four (4) granular silo tanks, a granular holding tank, two (2) charcoal filter tanks, two (2) dust collector tanks, three (3) granular product storage buildings, an office complex containing the site laboratory, a worker's breakroom and shower building, a maintenance shop, two (2) packaging buildings, six (6) process tanks, a boiler building, a covered loading dock, a liquid tank farm, and two (2) underground tanks utilized for solvent storage (Reference 7, pp. 4, 5; Figure 5).

In addition to the above mentioned structures there is a 80' by 160' burial area, located underneath the northeast corner of one of the three granular storage buildings, of "sevin dust". This area is discussed in further detail in Section 2.3 of this report (Reference 7, pp. 4,5; Reference 8; Figure 5).

ICI had an incinerator onsite that was used to incinerate empty bags, paper refuse, and wooden pallets. This unit was disassembled about two (2) months ago because it had not been utilized for many years (Reference 7, pp. 4).

The ICI facility has two (2) active permits, a State Air Permit (# 1030-AR-1) and a National Pollutant Discharge Elimination System (NPDES) Permit (# AR0042901). The specifics of these permits are discussed in further detail within the appropriate sections of this report (Reference 9; Reference 10).

2.3 Operational History and Waste Characteristics

ICI is a Delaware corporation located in the City of North Little Rock, Pulaski County, Arkansas. Prior to 1987, the facility operated under the name of Stauffer Chemical Company. On November 23, 1987, Arkansas Department of Pollution Control and Ecology received written correspondence from Stauffer Chemical Company stating as of January 1, 1988, the plant would resume operation under the management of ICI of Americas, Inc. ICI mixes and formulates liquid and granular herbicides for agricultural usage. As a result of manufacturing agricultural chemicals, ICI generates a considerable amount of hazardous wastes. In 1991, ICI reported a generation rate of 1,590 pounds of hazardous waste. Waste streams generated in 1991 included ignitable characteristic wastes (D001) and spent laboratory solvents (F003 and F005). All

hazardous waste generated in 1991 by ICI was transported via a permitted hazardous waste transporter to an approved treatment, storage, and disposal (TSD) facility. In addition to the hazardous waste generated, ICI generates on an average of 292,640 pounds of non-hazardous waste per year consisting of laboratory glassware, quality control samples, non-regulated liquids and filter cakes, granular production refuse, and floor sweepings. All non-hazardous waste is managed accordingly and shipped offsite to an approved facility to handle such waste. A listing of chemicals used by ICI to manufacture agricultural chemicals is attached as Reference 11 (Reference 7, pp. 2; Reference 12).

On February 1, 1980, Environmental Protection Agency contractors conducted a Site Investigation (SI) at ICI. The SI addressed the burial site and mentioned the area had a concrete cover and therefore presented no threat. As a result of a complaint received at the Arkansas Department of Pollution Control and Ecology (November 5, 1991), this site has been reopened to further investigate the potential threats posed by the burial site (Reference 13; Reference 14).

On December 17, 1990, Water Inspectors from the Arkansas Department of Pollution Control and Ecology conducted an inspection at ICI pursuant to the federal and state water pollution regulations. The inspection revealed the facility several violations pertaining to the site's NPDES permit. Originally ICI had three (3) discharge

areas designated within their NPDES permit. In order to simplify matters, ICI arranged through Arkansas Department of Pollution Control and Ecology in April, 1992, to route all three of the effluents to one location. Currently, this fourth discharge area is referred to as outfall 004. All effluent leaving the site exits through outfall 004 via underground piping. Site effluent consists of stormwater runoff from various locations onsite. No process water is released from the plant. The facility is required to monitor the flow, chemical oxygen demand (COD), total suspended solids (TSS), oil and grease content, total phenols, total arsenic, total zinc, and acute biomonitoring. In addition, the effluent discharge pH shall not be less than 6.0 standard units or greater than 9.0 standard units and shall be monitored once per day per discharge (Reference 10; Reference 15; Figure 6).

On April 16, 1991, Arkansas Department of Pollution Control and Ecology issued a Consent Administrative Order (LIS 91-074) pursuant to the authority of the Arkansas Water and Air Pollution Act to ICI. The Order was initiated as a result of ICI failing to meet the limitations set forth within their NPDES permit (Reference 16).

On July 2, 1991, Counsel for the Arkansas Wildlife Federation notified ICI of Arkansas Wildlife Federation's intent to file a citizen suit in a federal district court against the facility. The Arkansas Wildlife Federation believed ICI, which discharges to an unnamed tributary of the West Branch of Dark Hollow Canal, a

tributary of the Arkansas River, violated effluent standards by failing to comply with NPDES permit ARD0042901 on a number of instances. On August 5, 1991, ICI responded to the Counsel for the Arkansas Wildlife Federation regarding NPDES permit compliance at ICI's plant in North Little Rock, Arkansas. ICI informed the Counsel of a multi-step action plan that they developed and have implemented to address the compliance issues. In addition, ICI notified the Counsel of the Consent Administrative Order they had entered into with Arkansas Department of Pollution Control and Ecology. In summary, ICI requested the Counsel for Arkansas Wildlife Federation recognize the facility's progress and positive intentions and select a course of action consistent with a mutual goal of environmental compliance (Reference 17, pp. 1; Reference 18; Reference 19).

On September 6, 1991, an Air Inspector from Arkansas Department of Pollution Control and Ecology performed a routine inspection of the ICI site pursuant to the Arkansas Air Pollution Control regulations. The inspection revealed the facility was in compliance with their permit at the time of the inspection. ICI's current air permit addresses eight (8) emission sources. These sources are as follows:

Source 01	Granular herbicide production
Source 02	Liquid herbicide production
Source 03	Vapam production
Source 04	Bulk loading/unloading and storage areas

Source 05	Herbicide technical grade storage area
Source 06	Kerosene storage area
Source 07	Tenneco storage area
Source 08	Emulsifier

The pollutants being monitored are volatile organics. Only source 01 has a control feature, which is baghouse filters and adsorbers. ICI's air permit outlines allowable emission rates specific for each source (Reference 9; Reference 20).

A series of non-compliance notification reports, for failure to meet NPDES permit specifications, have been submitted from ICI to Arkansas Department of Pollution Control and Ecology. The notification reports range in date from January, 1991 to February, 1992. Effluent characteristics which exceeded permit requirements varied from zinc, COD, TSS, oil and grease, and total phenols (Reference 21).

On December 11, 1992, an onsite reconnaissance was conducted by an Arkansas Department of Pollution Control and Ecology representative. Facility information was obtained regarding site operations, site structures, permits, and the history of the burial site. The inspection included review of available file information, discussion of targets, and a site inspection (Reference 7, pp. 1 through 7; Reference 8).

3. GROUND WATER PATHWAY

3.1 Hydrogeologic Setting

The ICI site, Pulaski County, North Little Rock, Arkansas, is in the north central part of the West Gulf Coastal Plain Physiographic Province (Figure 3). The Gulf Coastal Plain of Arkansas, which occupies about 27,370 square miles, or about 52 percent of the total area of the State, ranges in elevation from 100 to 700 feet above sea level. It is a southward sloping plain whose western part is a rolling, slightly hilly country, most of whose surface stands at elevations of approximately 200 to 400 feet above sea level. Most of the rocks of the Coastal Plain are of sedimentary origin composed of clay, sandstone, marl, chalk, conglomerate, and lignite, and range in age from early Cretaceous to Quaternary. Most of the rocks of the Coastal Plain are poorly cemented, and none of the beds have been greatly deformed (Reference 22, pp. 7, 8).

There are nine geologic units exposed in the Coastal Plain portion of Pulaski County. However, only three units (Unit 3, 7, and 9) are of major importance as sources of water. The three units of importance within Pulaski County consists of the Tertiary and Quaternary Age. The remaining units do not yield adequate water (Reference 23, pp. 4, 11).

Unit 3, one of the three major aquifers, consists mainly of intergrading and interfingering beds of claystone, calcareous sandstone, sandy limestone, marl, and conglomerate and includes minor beds of arkose, kaolin, and lignite. This units measured thickness ranges from 7 1/2 to nearly 60 feet. At depth the unit is thin or locally absent along the flanks of buried hills of igneous rock. The unit thickens rapidly eastward and attains a maximum thickness of 185 feet (Reference 23, pp. 4, 12; Figure 7).

Unit 7, the second of the three major aquifers, consists of a homogeneous tan or gray fine to medium, loosely packed sand, containing some interbedded gray clay lenses. A lignite bed is present locally at the base. The thickness of this unit ranges from 207 to 412 feet and averages 320 feet (Reference 23, pp. 4, 12, 13; Figure 7).

Unit 9, the third of the three major aquifers, consists of terrace deposits and alluvium. The terrace deposits consist of maximum thickness of about 60 feet of dark-brick to salmon-red clay, containing a variable amount of fine silt that grades locally to sand. The sand is common toward the top of the unit. The alluvium consists of a relatively thick sequence of fluvial deposits which cover the eastern part of Pulaski County. The alluvium was deposited by the Arkansas and Mississippi Rivers, and it blankets much of the eastern half of Arkansas and adjacent States. It also includes the flood-plain deposits of the Saline River, Fourche

Creek, and the Arkansas River northwest of Little Rock. The predominant characteristic of the alluvium is the change from gravel or coarse sand at the base, to fine material at the top. The alluvium attains a maximum thickness of 120 feet in eastern Pulaski County but is much thinner along the Saline River, Fourche Creek, and the Arkansas River northwest of Little Rock (Reference 23, pp. 13; Figure 7).

Table 1 reflects the usage of ground water in Pulaski County, Arkansas (Reference 24, pp. 10).

TABLE 1

GROUND WATER USE IN PULASKI COUNTY, ARKANSAS *
(in million gallons per day)

Public Supply	Self-Supplied industry	Rural Use	Irrigation	Fish and Minnow Farms	Electric Energy	County Total
3.38	0.71	6.91	23.30	1.25	1.03	36.58

* Reference 24 - Use of Water in Arkansas, pp. 10.

The City of North Little Rock obtains drinking water from surface water intakes. There are no municipal waterwork facilities or private residents located within 4 miles of the site that relies on ground water for drinking water supplies (Reference 25; Reference 26).

3.2 Ground Water Targets

There are approximately 1936 homes within a 4-mile radius of the ICI site. Approximately 75 percent of the population within this 4-mile radius obtains their drinking water supply from North Little Rock Waterworks in North Little Rock, Arkansas. North Little Rock Waterworks serves a total population of 116,610. The remaining 25 percent obtain their drinking water from Little Rock Municipal Waterworks. Little Rock Municipal Waterworks serves a total population of 345,485. Drinking water from both municipalities is obtained from surface water intakes, Lake Maumelle and Lake Winona. There are no individual private wells located within a 4 mile radius of the site. There are no municipal ground water wells, utilized for drinking water, within 4 miles of the site. The number of homes and population within a 4-mile radius of ICI site in North Little Rock, Arkansas are summarized in Table 2 (Reference 25; Reference 27; Reference 28; Figure 8).

TABLE 2

TOTAL POPULATION WITHIN A 4-MILE RADIUS

Distance Ring	No. of Homes*		Persons/Home**		Population
0-1/4 mile	25	X	2.42	=	60.50
1/4-1/2 mile	40	X	2.42	=	96.80
1/2-1 mile	390	X	2.42	=	943.80
1-2 mile	489	X	2.42	=	1183.38
2-3 mile	463	X	2.42	=	1120.46
3-4 mile	529	X	2.42	=	1280.18
TOTAL	1936 (#)	X	2.42	=	4685.12

*Pulaski County Map, Arkansas, Arkansas Highway Department Planning Division, 1987 (Figure 8).

**Arkansas Data Center, Little Rock, Arkansas, 1990 Census (Reference 28).

(#) 0 Homes have private wells.

3.3 Ground Water Conclusions

A release of hazardous substances from ICI to the ground water is probable. Due to the high conductivity of the chemicals onsite, the potential for widespread migration of the contaminants is high. However, ground water is not used for drinking water within 4 miles of the site. Precipitation in the general area is moderate and evenly distributed throughout the year, soil permeability is very slow, runoff is very slow, and the available water capacity is high. The depth to the shallowest aquifer is approximately 7 1/2 feet deep (Reference 1, pp. 2, 8, 21; Reference 23, pp. 12).

4. SURFACE WATER PATHWAY

4.1 Hydrologic Setting

Pulaski County lies within the Arkansas River Basin of the Gulf Coastal Ecoregion. The Gulf Coastal Ecoregion is located east of the Arkansas River and south of the Ouachita Mountains Ecoregion of Arkansas. Major streams in the Gulf Coastal Ecoregion originate in the Ouachita Mountains Ecoregion. Some areas have perennially flowing streams of various watershed sizes while in other areas, streams with the largest watershed sizes have only intermittent flow during the summer and early fall (Reference 29, pp. 6, 9; Figure 9).

The total population within a 4-mile radius of ICI depends exclusively upon surface water to meet their drinking water needs. Table 3 reflects the usage of surface water in Pulaski County, Arkansas (Reference 24, pp. 10, Reference 25).

TABLE 3

SURFACE WATER USE IN PULASKI COUNTY, ARKANSAS *
(in million gallons per day)

Public Supply	Self-Supplied Industry	Rural Use (Livestock)	Irrigation	Fish and Minnow Farms	County Total
52.30	1.44	6.07	13.85	1.59	75.25

* Reference 24 - Use of Water in Arkansas, pp. 10.

Overland drainage from the ICI site and the facility's authorized discharge points in accordance with their NPDES permit flows northeast into a drainage ditch that flows into an unnamed tributary of the West Branch of Dark Hollow Canal; thence to West Branch of Dark Hollow Canal; thence to Dark Hollow Canal; thence into the Arkansas River in Segment 3C of the Arkansas River Basin. The Arkansas River flows south through Pulaski County; thence Jefferson County; thence Lincoln County; thence Desha County; thence into the Mississippi River in Bolivar County, Mississippi (Reference 10; Reference 30; Figure 6; Figure 8).

There is no flow data available for the drainage ditch that directly receives site stormwater runoff. The ditch travels approximately east and enters the unnamed tributary of the West Branch of Dark Hollow Canal. The unnamed tributary flows into West Branch of Dark Hollow Canal. The West Branch of Dark Hollow Canal travels for approximately 1/2 miles, enters Dark Hollow Canal, which flows for approximately 1 1/2 miles and merges into the Arkansas River. There is no flow data available for the unnamed tributary, the West Branch of Dark Hollow Canal, or Dark Hollow Canal. The Arkansas River, whose watershed size is 158,288 square miles, has an average flow rate of 42,320 cubic feet per second (cfs). This information is recorded at David D. Terry Lock and Dam below Little Rock about 10.7 miles downstream from Main Street bridge at Little Rock. The Arkansas River flows through four Arkansas counties and enters the Mississippi River.

The Mississippi River, whose watershed size averages 932,800 square miles, has an average flow rate of 484,500 cfs (Reference 30; Figure 10).

There are no surface water intakes utilized for drinking water within 15-miles downstream of the site (Reference 30).

The ICI site lies within a special flood hazard area inundated by the 100-year flood. The specific zone in which the ICI site is located is classified as Zone AH. Zone AH indicates areas where the flood depths are of 1 to 3 feet. These areas are usually areas of ponding during heavy periods of rainfall (Figure 11).

4.2 Surface Water Targets

A total of 102,000 residents within North Little Rock city limits are served drinking water from North Little Rock Waterworks. North Little Rock Waterworks purchases surface water from Little Rock Waterworks, which obtains drinking water from two surface water intakes: Lake Maumelle and Lake Winona. Both surface water intakes are located west of the site (Figure 10). North Little Rock Waterworks also supplies drinking water to a consecutive population of 14,610. A total population of 116,610, within a 4-mile radius of the ICI site, are served drinking water obtained from North Little Rock Waterworks (Reference 25; Reference 27). Remaining residents who are not served drinking

water from municipal supplies obtain drinking water from individual private drinking water wells. However, there are no individual private wells located within 4 miles of the ICI site (Reference 26). The number of homes and population within a 4-mile radius of the site are summarized in Table 2 of this report.

The Arkansas Natural Heritage Commission maintains a database on the status and location of rare species and significant ecological communities in Arkansas. Within a 15-mile radius of the ICI site in North Little Rock, Arkansas, there are a total of 62 occurrences of elements of special concern. An occurrence represents a location which provides habitat for sensitive species (both state and federal species), is an outstanding example of a natural community, or is a colonial bird nesting site. The Bald Eagle, Interior Least Tern, Ozark Chinquapin, which are Federal Listed and/or Endangered species, and the Small-headed Pipewort, Winterberry Holly, and Purple Fringeless Orchid, which are State Endangered or Threatened plants are known to occur within a 15-mile radius of ICI. Natural Communities occurring within a 15-mile radius of the site are Cattail Marsh, Nepheline Syenite Glade, and the Willow Oak Forest. Federal and State managed areas that fall within a 15-mile radius of the site are listed below (Reference 31; Figure 10):

Federally Managed Areas

Camp Joseph T. Robinson National Guard Training Area (Department of Defense)

State Managed Areas

Bell Slough Wildlife Management Area (AR Game & Fish)
Camp Robinson Wildlife Management Area (AR Game & Fish and Dept. of Defense)
Holland Bottoms Wildlife Management Area (AR Game & Fish)
Holland Bottoms Willow Oak Forest Preserve (AR Natural Heritage Commission and AR Game & Fish)
Pinnacle Mountain State Park (AR Parks & Tourism)

Designated uses have been established for surface water areas present within a 15-mile radius of North Little Rock, Arkansas. Designated uses include primary and secondary contact recreation, perennial fisheries, and agricultural, and irrigation supplies. In addition to these uses, the Ouachita River has been designated as an Ecologically Sensitive Waterbody due to the presence of Flat floaters, Ouachita rock pocketbook mussels, and Pink mucket mussels. The Ecologically Sensitive waterbody identifies segments known to provide habitat for threatened, endangered, or endemic species of aquatic or semi-aquatic life forms. The Saline River, located within the same section of the Gulf Coastal Ecoregion as the ICI site, has been designated as an extraordinary resource of waterbody (Reference 32, pp. 55 through 61).

There are two substantially different types of streams within the Gulf Coastal Ecoregion, springwater influenced streams (SWI) and typical (T) Gulf Coastal streams. The springwater influenced streams have a significantly different fishery from the typical Gulf Coastal streams. These differences are primarily a result of the critical season flow differences. The springwater influenced streams are further differentiated by their greater abundance of sensitive species. Dominant key species of the Gulf Coastal Ecoregion fish population includes redfin shiner (T and SWI), spotted sucker (T), blacktail redhorse (SWI), yellow bullhead (T), flier (T), freckled madtom (SWI), longear (SWI), slough darter (T), grass pickerel (T and SWI), and creole darter (SWI). Key indicator species of the Gulf Coastal Ecoregion includes pirate perch (T and SWI), warmouth (T), golden redhorse (SWI), spotted sunfish (T), spotted bass (SWI), dusky darter (T), scaly sand darter (SWI), creek chubsucker (T), striped shiner (SWI), and banded pygmy sunfish (T and SWI) (Reference 29, pp. 106, 107, 110; Figure 9).

Within a 15-mile radius of the ICI site, located in North Little Rock, Pulaski County, Arkansas, the predominant forest types are loblolly pine, shortleaf pine, and upland and bottomland hardwood. The central portion of Pulaski County consist of prairie areas (Figure 12).

4.3 Surface Water Conclusions

A release of hazardous substances to surface water pathway is suspected. The facility has had several instances in which they have been in non-compliance with the facility's NPDES permit. ICI's NPDES permit discharge consists only of stormwater drainage, not process water. The shortest overland distance to surface water from the ICI site is into the drainage ditch located northeast of the site. Overland drainage from the site travels for about 1 1/4 miles and enters the Arkansas River (Figure 8). Fisheries located along the surface water migration pathway are Arkansas River and Mississippi River. Site drainage is predominately to the northeast (Reference 7; Reference 15; Reference 21; Reference 29, pp. 106, 107, 110; Reference 30; Reference 32, pp. 55 through 61).

There are no drinking water surface intakes within 15 miles downstream of the site. North Little Rock Waterworks, serving a total population of 116,610, purchases drinking water from Little Rock Waterworks. Little Rock Waterworks obtains drinking water from two surface intakes, Lake Maumelle and Lake Winona, both which are located 20 miles or greater west of the site. Natural Communities occurring within a 15-mile radius of the site are Cattail Marsh, Nepheline Syenite Glade, and the Willow Oak Forest (Reference 30; Reference 31; Figure 10).

5. SOIL EXPOSURE AND AIR PATHWAYS

5.1 Physical Conditions

The predominant soil found in North Little Rock, Arkansas and surrounding areas is classified as part of the Perry Norwood Association. Soil types within this association are classified as poorly drained and well drained, level, deep, clayey, and loamy soils on bottom lands (Figure 13). The soil appearing on and around the ICI site is classified as Perry-Urban land complex (Pu) (Figure 14). Perry-Urban land complex soils consists of Perry soils, and of areas of material, mainly from Perry soils, that has been modified by urban development. Slopes are less than 1 percent. Included with this complex in mapping are spots of Latanier and Moreland soils, areas of clayey Umbraqualfs, and spots subject to frequent flooding (Reference 1, pp. 21).

The Perry series consists of poorly drained, level soils on bottom lands. These soils formed in thick beds of clayey slack-water deposits laid down by the Arkansas River. The native vegetation is mixed hardwoods. In a representative profile, the surface layer is dark yellowish-brown clay about 3 inches thick. The subsoil extends to a depth of 72 inches or more. Its upper 27 inches is mottled, dark-gray and gray clay, and the lower part is dark reddish-brown clay that is mottled below a depth of 61 inches (Reference 1, pp. 20).

Runoff is very slow on the Perry soil. Permeability is very slow, and available water capacity is high. Because of wetness and poor aeration, the soils in the Perry-Urban land complex are suited to only a limited number of water-tolerant landscaping plants. Because of wetness, low bearing capacity, and high shrink-swell potential, these soils are severely limited for most urban uses. Perry soils are moderate to high in natural fertility (Reference 1, pp. 20, 21).

5.2 Soil and Air Targets

ICI employs 31 people. There are no residents onsite. The nearest residence is approximately 1/4 block north of the site (Reference 7, pp. 1; Reference 8). There are approximately 25 homes within 0.25 miles of the site. The site is accessible to the public off of Twelfth Street. Public access is limited. The site is fenced around the entire perimeters (Reference 7, pp. 3; Figure 5; Figure 8). Located within a 15-mile radius of the site, there are several sensitive environments including Cattail Marsh, Nepheline Syenite Glade, and Willow Oak Forest. Federally and State managed areas exist within 15 miles of the site. In addition, Federal and State endangered species reside within the 15-mile radius of the site. There are no occurrences of wetlands within a 15-mile radius of the site (Reference 31).

5.3 Soil Exposure and Air Pathway Conclusions

The soil exposure pathway appears to pose a threat at the ICI site due to the burial site consisting of approximately 40,000 pounds of "sevin dust". The burial pit is unlined and capped with donofil. Currently, there is a granular storage building, with a concrete foundation, on top of the burial site (Reference 8). The burial site covers an area of approximately 80′ by 160′. The grounds around the perimeter of the building showed no signs of stress. The majority of the site is either concrete or has adequate vegetative cover. No out of the ordinary odors or excessive dust were observed during the onsite reconnaissance (Reference 7, pp. 1 through 7).

The air pathway does not appear to pose a threat at the ICI site. The latest air inspection report did not reveal any non-compliance problems pertaining to the facility's permit (Reference 9; Reference 20).

6.0 SUMMARY AND CONCLUSIONS

ICI is an agricultural products formulator. They specialize in the formulation of herbicides. The facility generates hazardous wastes from the operational processes associated with the manufacturing of agricultural chemicals.

A release of hazardous substances into the ground water is probable. The depth to the shallowest aquifer is approximately 7 1/2 feet deep. Due to the high conductivity of the chemicals onsite, the potential for widespread migration of the contaminants is high. Precipitation in the general area is moderate, the soil permeability is very slow, and the available water capacity is high. There are no private wells located within a 4-mile radius of the site that utilizes groundwater for drinking water purposes.

A release of hazardous substances to the surface water migration pathway is suspected. ICI has had several instances of non-compliance with their NPDES permit for stormwater runoff. The entire population located within a 4-mile radius of the site relies solely upon surface water for drinking water. There are no private residential wells within a 4-mile radius of the site. The population within this 4-mile radius is served drinking water from North Little Rock Municipal Waterworks, who serves a total population of 116,610. North Little Rock Municipal Waterworks purchases surface water which comes from Lake Winona. Lake Winona is located greater than 20 miles west of the site. There are fisheries located along the surface water migration pathway leaving the site. The shortest overland distance to surface water from the ICI site is into a drainage ditch located on the northeast boundary of the property. There are no drinking water intakes within 15 downstream miles of the site. There are three

(3) natural communities and several federal and state elements of concern located within a 15-mile radius of the site. There are no wetlands within a 15-mile radius of the site.

A release of hazardous substances to the soil is suspected to have occurred because of the 40,000 pounds of "sevin dust" buried within an unlined pit onsite. The air pathway does not appear to pose a threat at this time. ICI employs 31 people. The nearest resident is located approximately 1/4 block north of the site. There are approximately 25 homes within a 0.25 mile of the site. Public access is limited. The site is fenced around the entire perimeters.

Surface water samples and air monitoring have been conducted at the site as a requirement of facility permits. Ground water or soil samples could not be located during subsequent file review. Due to the presence of a shallow aquifer and the nature of the soil onsite, further investigative sampling is warranted on this site to determine the extent of contamination, if any, in all the medias.

OMB Approval Number: 2050-0095
Approved for Use Through: 1/92

EPA Potential Hazardous Waste Site Preliminary Assessment Form

Identification

State: AR
CERCLIS Number: ARD983285255
CERCLIS Discovery Date: May 5, 1992

1. General Site Information

Name: ICI Burial Pit
AKA: ICI Americas

Street Address: 824 East 12th Street

City: North Little Rock
State: AR
Zip Code: 72115
County: Pulaski
Co. Code: 1
Cong. Dist: 2

Latitude: 34° 45' 58._"
Longitude: 92° 15' 17._"

Approximate Area of Site: 6.99 Acres
_____ Square Ft

Status of Site:
- [x] Active
- [ ] Not Specified
- [ ] Inactive
- [ ] NA (GW plume, etc.)

2. Owner/Operator Information

Owner: ICI of Americas
Street Address: DCC II, Wrighters Parkway
City: Wilmington
State: DE
Zip Code: 19897
Telephone: 1- (302) 886-3000

Operator: Irwin Wheeler
Street Address: 824 East 12 th Street
City: North Little Rock
State: AR
Zip Code: 72115
Telephone: 1 -(501) 374-7445

Type of Ownership:
- [x] Private
- [ ] Federal Agency
  Name_____
- [ ] State
- [ ] Indian
- [ ] County
- [ ] Municipal
- [ ] Not Specified
- [ ] Other_____

How Initially Identified:
- [x] Citizen Complaint
- [ ] PA Petition
- [ ] State/Local Program
- [ ] RCRA/CERCLA Notification
- [ ] Federal Program
- [ ] Incidental
- [ ] Not Specified
- [ ] Other_____

3. Site Evaluator Information

Name of Evaluator: Tammie J. Hynum
Agency/Organization: State/ADPC&E
Date Prepared: December 18, 1992

Street Address: 8001 National Drive
City: Little Rock
State: AR

Name of EPA or State Agency Contact: Devon Hobby, State Superfund Mgr.
Street Address: 8001 National Drive
City: Little Rock
State: AR
Telephone: 1-(501) 562-7444

4. Site Disposition (for EPA use only)

Emergency Response/Removal Assessment Recommendation:
- [ ] Yes
- [ ] No

Date: _____

CERCLIS Recommendation:
- [ ] Higher Priority SI
- [ ] Lower Priority SI
- [ ] NFRAP
- [ ] RCRA
- [ ] Other_____

Date: _____

Signature:

Name (typed):

Position:

EPA

Potential Hazardous Waste Site
Preliminary Assessment Form - Page 2 of 4

CERCLIS Number: ARD983285255

5. General Site Characteristics

Predominant Land Uses Within 1 Mile of Site (check all that apply):

- [x] Industrial
- [x] Commercial
- [x] Residential
- [ ] Forest/Fields
- [ ] Agriculture
- [ ] Mining
- [ ] DOD
- [ ] DOE
- [ ] DOI
- [ ] Other Federal Facility _____
- [ ] Other _____

Site Setting:

- [x] Urban
- [ ] Suburban
- [ ] Rural

Years of Operation:

Beginning Year _____

Ending Year _____

- [x] Unknown

Type of Site Operations (check all that apply):

- [x] Manufacturing (must check subcategory)
  - [ ] Lumber and Wood Products
  - [ ] Inorganic Chemicals
  - [ ] Plastic and/or Rubber Products
  - [ ] Paints, Varnishes
  - [ ] Industrial Organic Chemicals
  - [x] Agricultural Chemicals (e.g., pesticides, fertilizers)
  - [ ] Miscellaneous Chemical Products (e.g., adhesives, explosives, ink)
  - [ ] Primary Metals
  - [ ] Metal Coating, Plating, Engraving
  - [ ] Metal Forging, Stamping
  - [ ] Fabricated Structural Metal Products
  - [ ] Electronic Equipment
  - [ ] Other Manufacturing
- [ ] Mining
  - [ ] Metals
  - [ ] Coal
  - [ ] Oil and Gas
  - [ ] Non-metallic Minerals
- [ ] Retail
- [ ] Recycling
- [ ] Junk/Salvage Yard
- [ ] Municipal Landfill
- [ ] Other Landfill
- [ ] DOD
- [ ] DOE
- [ ] DOI
- [ ] Other Federal Facility _____
- [x] RCRA
  - [ ] Treatment, Storage, or Disposal
  - [ ] Large Quantity Generator
  - [x] Small Quantity Generator
  - [ ] Subtitle D
    - [ ] Municipal
    - [ ] Industrial
  - [ ] "Converter"
  - [ ] "Protective Filer"
  - [ ] "Non- or Late Filer"
- [ ] Not Specified
- [ ] Other _____

Waste Generated:

- [x] Onsite
- [ ] Offsite
- [ ] Onsite and Offsite

Waste Deposition Authorized By:

- [x] Present Owner
- [ ] Former Owner
- [ ] Present & Former Owner
- [ ] Unauthorized
- [ ] Unknown

Waste Accessible to the Public:

- [ ] Yes
- [x] No

Distance to Nearest Dwelling, School, or Workplace:

1/4 ~~Feet~~ Block

6. Waste Characteristics Information

Source Type: (check all that apply)	Source Waste Quantity: (include units)	Tier*:
[x] Landfill		
[ ] Surface Impoundment		
[x] Drums		
[ ] Tanks and Non-Drum Containers		
[ ] Chemical Waste Pile		
[ ] Scrap Metal or Junk Pile		
[ ] Tailings Pile		
[ ] Trash Pile (open dump)		
[ ] Land Treatment		
[ ] Contaminated Ground Water Plume (unidentified source)		
[ ] Contaminated Surface Water/Sediment (unidentified source)		
[ ] Contaminated Soil		
[ ] Other _____		
[ ] No Sources		

* C = Constituent, W = Wastestream, V = Volume, A = Area

General Types of Waste (check all that apply)

- [ ] Metals
- [ ] Organics
- [ ] Inorganics
- [ ] Solvents
- [ ] Paints/Pigments
- [ ] Laboratory/Hospital Waste
- [ ] Radioactive Waste
- [ ] Construction/Demolition Waste
- [x] Pesticides/Herbicides
- [ ] Acids/Bases
- [ ] Oily Waste
- [ ] Municipal Waste
- [ ] Mining Waste
- [ ] Explosives
- [ ] Other _____

Physical State of Waste as Deposited (check all that apply):

- [ ] Solid
- [x] Sludge
- [x] Powder
- [x] Liquid
- [ ] Gas

EPA Potential Hazardous Waste Site
Preliminary Assessment Form - Page 3 of 4

CERCLIS Number: ARD983285255

7. Ground Water Pathway

Is Ground Water Used for Drinking Water Within 4 Miles:
- ☐ Yes
- ☒ No

Type of Drinking Water Wells Within 4 Miles (check all that apply):
- ☐ Municipal
- ☐ Private
- ☒ None

Is There a Suspected Release to Ground Water:
- ☒ Yes
- ☐ No

Have Primary Target Drinking Water Wells Been Identified:
- ☐ Yes
- ☒ No

If Yes, Enter Primary Target Population: N/A People

List Secondary Target Population Served by Ground Water Withdrawn From:

0 - ¼ Mile	60.50
> ¼ - ½ Mile	96.80
> ½ - 1 Mile	943.80
> 1 - 2 Miles	1183.38
> 2 - 3 Miles	1120.46
> 3 - 4 Miles	1280.18
Total Within 4 Miles	4685.12

Depth to Shallowest Aquifer: _____ Feet

Karst Terrain/Aquifer Present:
- ☐ Yes
- ☒ No

Nearest Designated Wellhead Protection Area:
- ☐ Underlies Site
- ☐ > 0 - 4 Miles
- ☒ None Within 4 Miles

8. Surface Water Pathway

Type of Surface Water Draining Site and 15 Miles Downstream (check all that apply):
☒ Stream ☒ River ☐ Pond ☐ Lake
☐ Bay ☐ Ocean ☐ Other _____

Shortest Overland Distance From Any Source to Surface Water:
— — — Feet
1/2 Miles

Is There a Suspected Release to Surface Water:
- ☒ Yes
- ☐ No

Site is Located in:
- ☐ Annual - 10 yr Floodplain
- ☒ > 10 yr - 100 yr Floodplain
- ☐ > 100 yr - 500 yr Floodplain
- ☐ > 500 yr Floodplain

Drinking Water Intakes Located Along the Surface Water Migration Path:
- ☐ Yes
- ☒ No

Have Primary Target Drinking Water Intakes Been Identified:
- ☐ Yes
- ☒ No

If Yes, Enter Population Served by Primary Target Intakes: _____ People

List All Secondary Target Drinking Water Intakes:

Name	Water Body	Flow (cfs)	Population Served
N/A			

Total within 15 Miles N/A

Fisheries Located Along the Surface Water Migration Path:
- ☒ Yes
- ☐ No

Have Primary Target Fisheries Been Identified:
- ☐ Yes
- ☒ No

List All Secondary Target Fisheries:

Water Body/Fishery Name	Flow (cfs)
Arkansas River	42,320

CERCLIS Number: ARD983285255

8. Surface Water Pathway (continued)

Wetlands Located Along the Surface Water Migration Path:
- ☐ Yes
- ☒ No

Have Primary Target Wetlands Been Identified:
- ☐ Yes
- ☒ No

List Secondary Target Wetlands:

Water Body	Flow (cfs)	Frontage Miles
N/A		

Other Sensitive Environments Located Along the Surface Water Migration Path:
- ☒ Yes
- ☐ No

Have Primary Target Sensitive Environments Been Identified:
- ☐ Yes
- ☒ No

List Secondary Target Sensitive Environments:

Water Body	Flow (cfs)	Sensitive Environment Type
N/A		

9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare on or Within 200 Feet of Areas of Known or Suspected Contamination:
- ☐ Yes
- ☒ No

If Yes, Enter Total Resident Population:

N/A People

Number of Workers Onsite:
- ☐ None
- ☒ 1 - 100
- ☐ 101 - 1,000
- ☐ >1,000

Have Terrestrial Sensitive Environments Been Identified on or Within 200 Feet of Areas of Known or Suspected Contamination:
- ☐ Yes
- ☒ No

If Yes, List Each Terrestrial Sensitive Environment:

N/A

10. Air Pathway

Is There a Suspected Release to Air:
- ☐ Yes
- ☒ No

Enter Total Population on or Within:

Onsite	31*
0 - ¼ Mile	60.50
> ¼ - ½ Mile	96.80
> ½ - 1 Mile	943.80
> 1 - 2 Miles	1183.38
> 2 - 3 Miles	1120.46
> 3 - 4 Miles	1280.18
Total Within 4 Miles	4685.12

*Workers onsite daily

Wetlands Located Within 4 Miles of the Site:
- ☐ Yes
- ☒ No

Other Sensitive Environments Located Within 4 Miles of the Site:
- ☒ Yes
- ☐ No

List All Sensitive Environments Within ½ Mile of the Site:

Distance	Sensitive Environment Type/Wetlands Area (acres)
Onsite	N/A
0 - ¼ Mile	N/A
> ¼ - ½ Mile	N/A

REFERENCES

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2. United States Department of Commerce, " United States Census Arkansas, 1990, Population by County and city," pp. 3, 14.

3. United States Geological Survey, 7.5-Minute Topographic Quadrangle map of North Little Rock, Arkansas, 1961, photorevised 1970 and 1975.

4. United States Environmental Protection Agency, "Standard Operating Procedure to Determine Site Latitude and Longitude Coordinates," 1991. Calculation worksheet for ICI Burial site.

5. United States Department of Commerce, "Climatological Data Annual Summary, Arkansas, Volume 95, Number 13," 1990, pp. 4, 5, 11.

6. Fred Days, Safety and Training Specialist for ICI, telephone conversation with Tammie Hynum, Arkansas Department of Pollution Control and Ecology, November 18, 1992. Re: Legal description of ICI Burial Pit.

7. Tammie Hynum, Arkansas Department of Pollution Control and Ecology, Field Logbook No. 1589 for onsite and offsite reconnaissance of ICI Burial Pit, ARD983285255, December, 1992.

8. Tammie Hynum, Arkansas Department of Pollution Control and Ecology, Photodocumentation Log of ICI Burial Pit Preliminary Assessment, December, 1992.

9. James B. Jones, Jr. of Arkansas Department of Pollution Control and Ecology, written correspondence with R. Hayes Baber of ICI, May 26, 1992. Re: ICI Air Permit No. 1030-AR-1.

10. Vince Blubaugh of Arkansas Department of Pollution Control and Ecology, written correspondence with ICI, September 30, 1988. Re: ICI NPDES Permit No. AR0042901.

11. Arkansas Department of Pollution Control and Ecology, Central Files Number 42901, December, 1992. Re: Material Safety Data Sheets for technical grade chemicals used onsite.

12. Hayes Baber and Fred Days of ICI, written correspondence with Arkansas Department of Pollution Control and Ecology, November 23, 1987 and February 26, 1992 respectively. Re: New Management and 1991 Hazardous Waste Annual Report.

13. United States Environmental Protection Agency, CERCLIS Region 6 Report 3, November, 12, 1992, pp. 39. Re: Superfund Status of ICI site.

14. (b) (6) [redacted], Complainant, telephone conversation with Tammie Hynum of Arkansas Department of Pollution Control and Ecology, November 5, 1991. Re: Citizen Complaint Report on ICI site.

15. Samuel Sawyer, Water Inspector, Arkansas Department of Pollution Control and Ecology, written correspondence with Irwin Wheeler of ICI, January 3, 1991. Re: Water Inspection conducted at ICI relating to NPDES Permit AR0042901.

16. Mark Bradley of Arkansas Department of Pollution Control and Ecology, written correspondence with Irwin Wheeler of ICI, April 22, 1991. Re: Consent Administrative Order LIS 91-074.

17. James Hecker, representative council for Arkansas Wildlife Federation, written correspondence with Irwin Wheeler of ICI, July 2, 1991. Re: Notice of intent to the filing of a citizen suit in Federal court for non-compliant NPDES discharges.

18. Hayes Baber of ICI, written correspondence with James Hecker, council for Arkansas Wildlife Federation, August 5, 1991. Re: Response to Federal court suit.

19. Hayes Baber of ICI, written correspondence with Arkansas Department of Pollution Control and Ecology, July 17, 1991. Re: NPDES compliance project action plan status report.

20. Hank Wright, Air Inspector for Arkansas Department of Pollution Control and Ecology, written correspondence with Hayes Baber of ICI, September 12, 1991. Re: Inspection report relating to Air Permit 1030-A.

21. Irvin Wheeler and Hayes Baber of ICI, written correspondence with Arkansas Department of Pollution Control and Ecology Water Division, January '91 through February '92. Re: Non-compliance notification letters pertaining to NPDES permit AR0042901.

22. Carey Croneis, "Geology of the Arkansas Paleozoic Area," Arkansas Geological Survey, Bulletin 3, 1930, pp. 7, 8.

23. Arkansas Geological Commission, "Water Resources of Pulaski and Saline Counties, Arkansas," Geological Survey Water-Supply Paper 1839-B, 1967, pp. B1 through B25.

24. Arkansas Geological Commission, "Use of Water in Arkansas, 1980," Water Resources Summary No. 14, pp. 10.

25. Fred Glover, manager of North Little Rock Waterworks, telephone conversation with Tammie Hynum, Arkansas Department of Pollution Control and Ecology, November 20, 1992. Re: North Little Rock Water Systems.

26. Tamara Almand, North Little Rock Sanitarian, telephone conversation with Tammie Hynum, Arkansas Department of Pollution Control and Ecology, December 17, 1992. Re: Private wells within 4-miles of ICI site.

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28. United States Department of Commerce, "1990 Census of Population and Housing, Summary Population and Housing Characteristics, Arkansas," Arkansas Census, 1990, pp. 103.

29. Arkansas Department of Pollution Control and Ecology, "Volume II, Data Analysis," 1987, pp. 6, 9, 106, 107, 110.

30. Elton Porter, Senior Technician for United States Geological Commission, telephone conversation with Tammie Hynum, Arkansas Department of Pollution Control and Ecology, December 9, 1992. Re: Surface water migration pathway for ICI Burial Pit site.

31. Cindy Osborne, Arkansas Natural Heritage Commission, written correspondence with Tammie Hynum, Arkansas Department of Pollution Control and Ecology, December 16, 1992. Re: Wetlands and Endangered/Threatened Species within 15-mile radius of ICI site.

32. State of Arkansas Department of Pollution Control and Ecology, "Regulations No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas," October, 1991, pp. 55, 56, 57, 58, 59, 60, 61.

FIGURES

1. City of North Little Rock, Arkansas Map

2. State of Arkansas Map depicting counties

3. Physiographic Provinces Map of Arkansas

4. Mean Annual Precipitation and Average Annual Lake Evaporation Map for the State of Arkansas

5. ICI Site Map

6. ICI Site Map depicting site drainage pathways

7. Relationship of the rocks of the Coastal Plain

8. Pulaski County Map

9. Ecoregion Map for the State of Arkansas

10. State of Arkansas Highway Map depicting location of Federal and State Managed areas within 15 miles of ICI

11. Flood Insurance Rate Map of North Little Rock, Arkansas

12. State of Arkansas Forest Map highlighting Pulaski County

13. Soil Type Map for Pulaski County

14. Soil Type Map for general vicinity of ICI site

FIGURE 1

NORTH LITTLE ROCK CITY MAP

FIGURE 2

BENTON
CARROLL
BOONE
MARION
BAXTER
FULTON
RANDOLPH
CLAY
WASHINGTON
MADISON
NEWTON
SEARCY
IZARD
SHARP
GREENE
LAWRENCE
STONE
INDEPENDENCE
CRAIGHEAD
MISSISSIPPI
JACKSON
CRAWFORD
FRANKLIN
JOHNSON
POPE
VAN BUREN
CLEBURNE
POINSETT
CONWAY
WHITE
CROSS
CRITTENDEN
SEBASTIAN
LOGAN
FAULKNER
WOODRUFF
YELL
ST FRANCIS
PERRY
SCOTT
PRAIRIE
PULASKI
LONOKE
MONROE
LEE
SALINE
GARLAND
MONTGOMERY
POLK
PHILLIPS
ARKANSAS
JEFFERSON
GRANT
HOT SPRING
HOWARD
PIKE
CLARK
SEVIER
DALLAS
CLEVELAND
LINCOLN
DESHA
HEMPSTEAD
NEVADA
OUACHITA
CALHOUN
DREW
LITTLE RIVER
BRADLEY
MILLER
CHICOT
LAFAYETTE
COLUMBIA
UNION
ASHLEY
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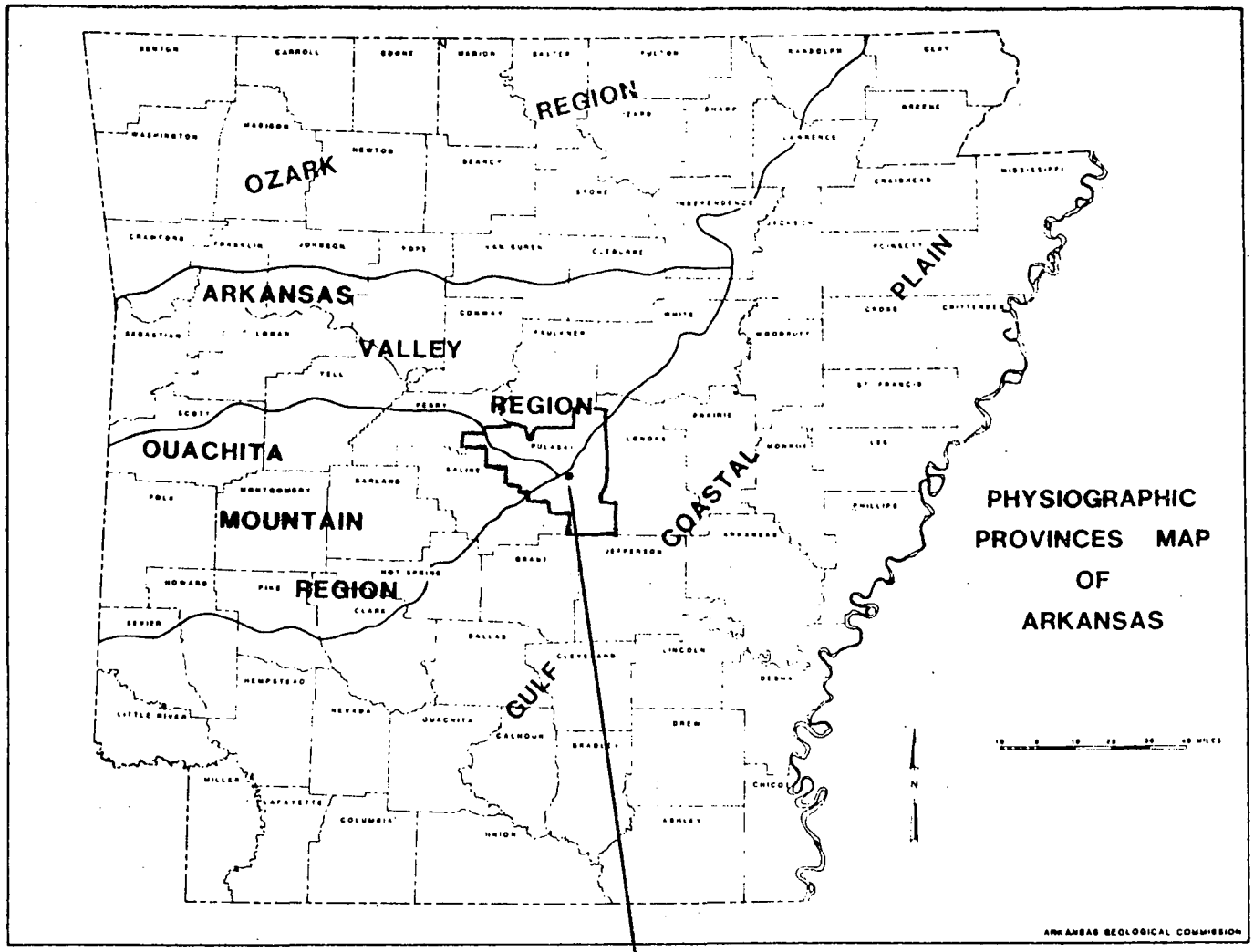
MILES
MILES
0
10
15
20
25
30
40
ARKANSAS
NORTH LITTLE ROCK

FIGURE 3



NORTH LITTLE ROCK

FIGURE 4

MEAN ANNUAL PRECIPITATION, Inches (Solid Lines) VS. AVERAGE ANNUAL LAKE EVAPORATION, Inches (Dashed Lines)

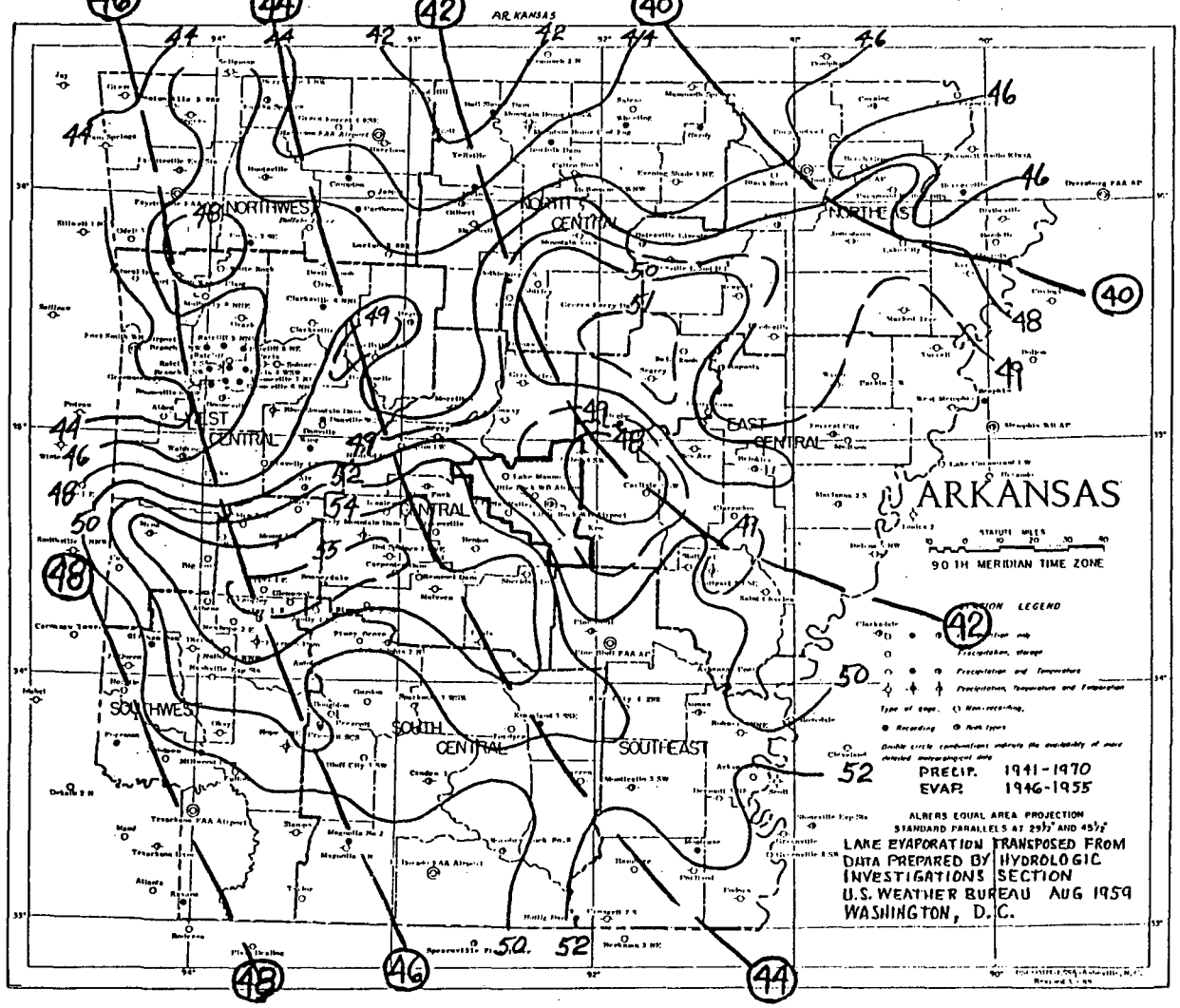


FIGURE 5

ICI AMERICAS 824 EAST 12th. ST. NLR,AR.

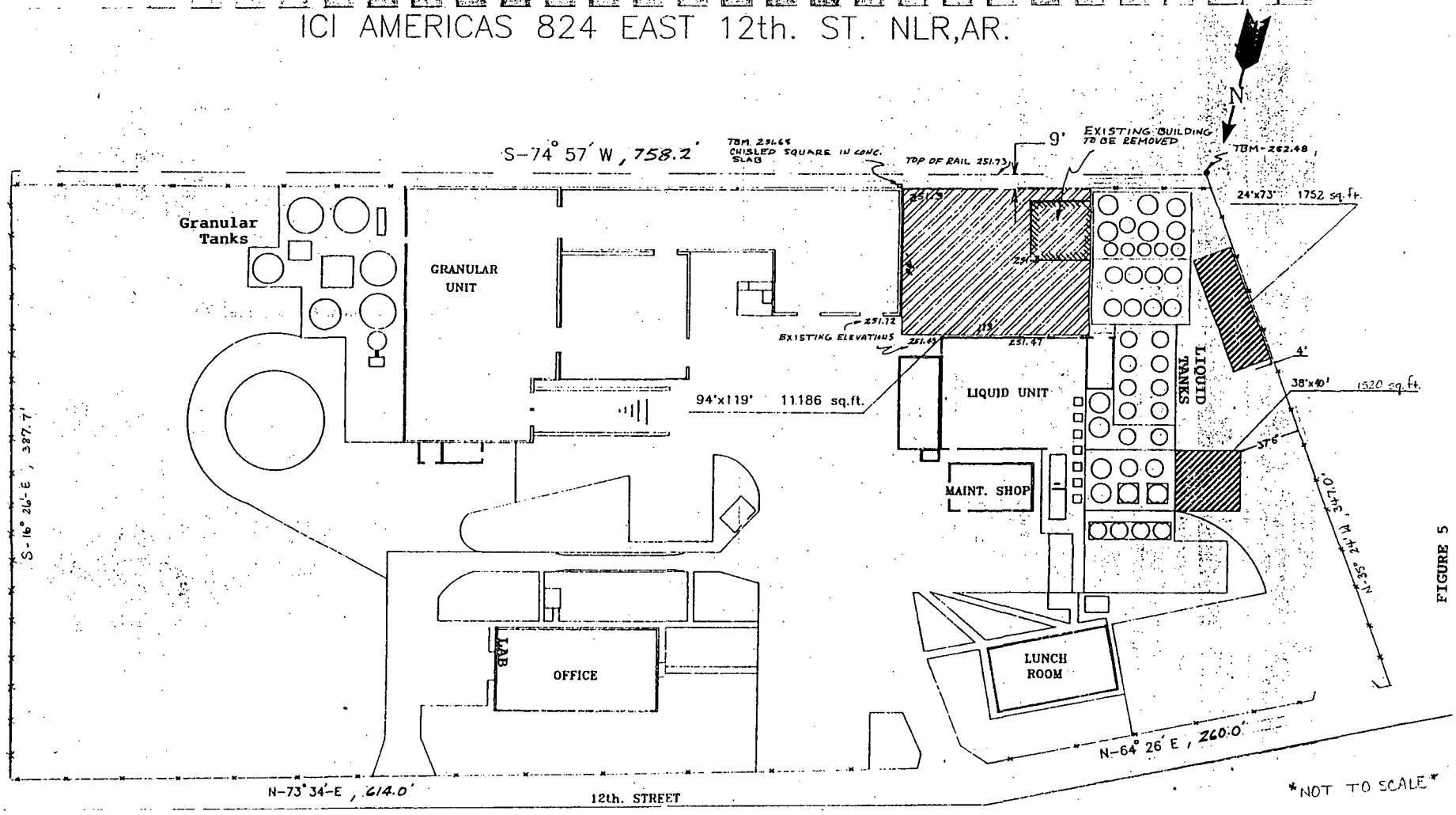


FIGURE 5

FIGURE 6

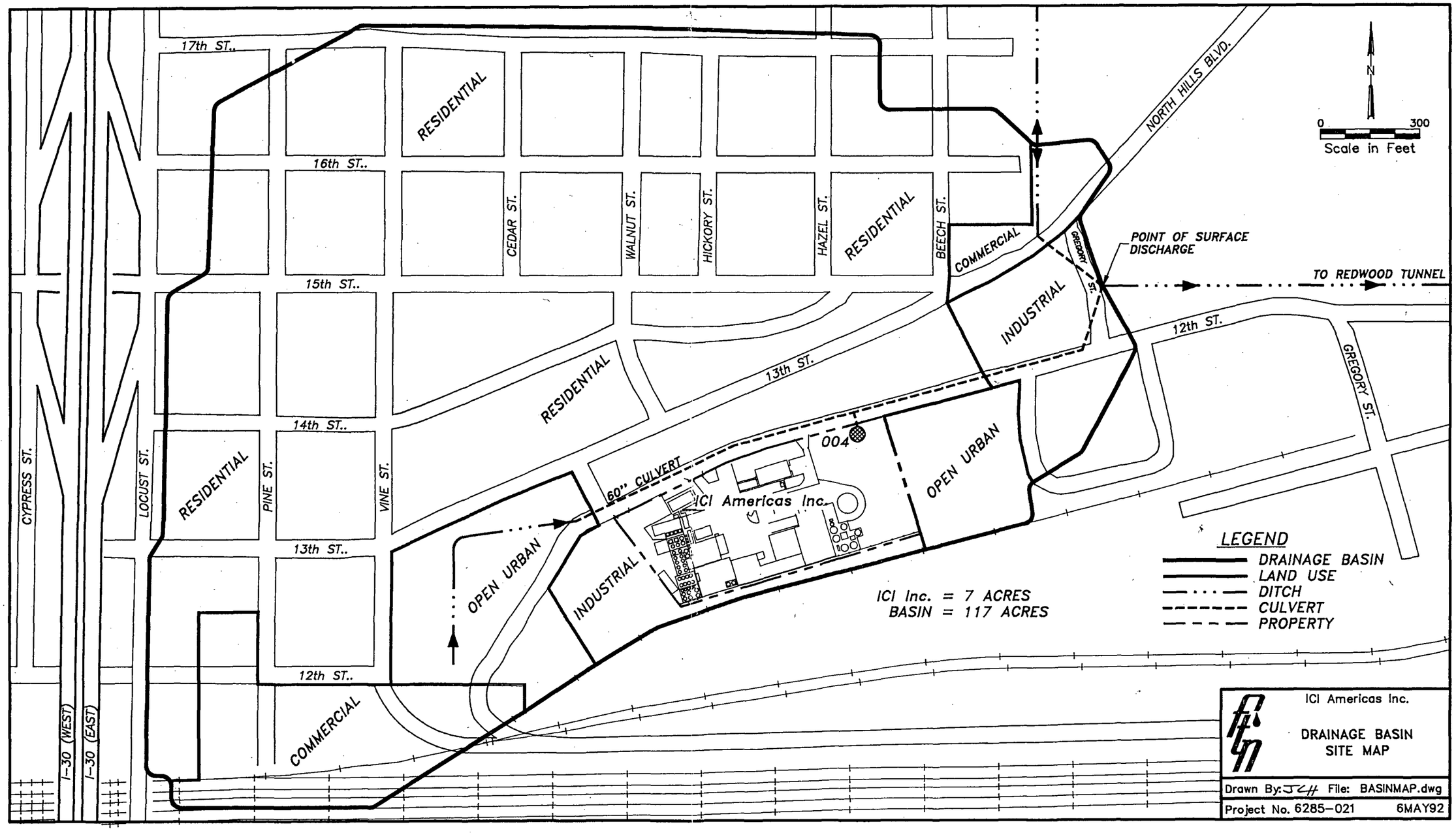


Figure 6 Drainage Basin Site Map

FIGURE 7

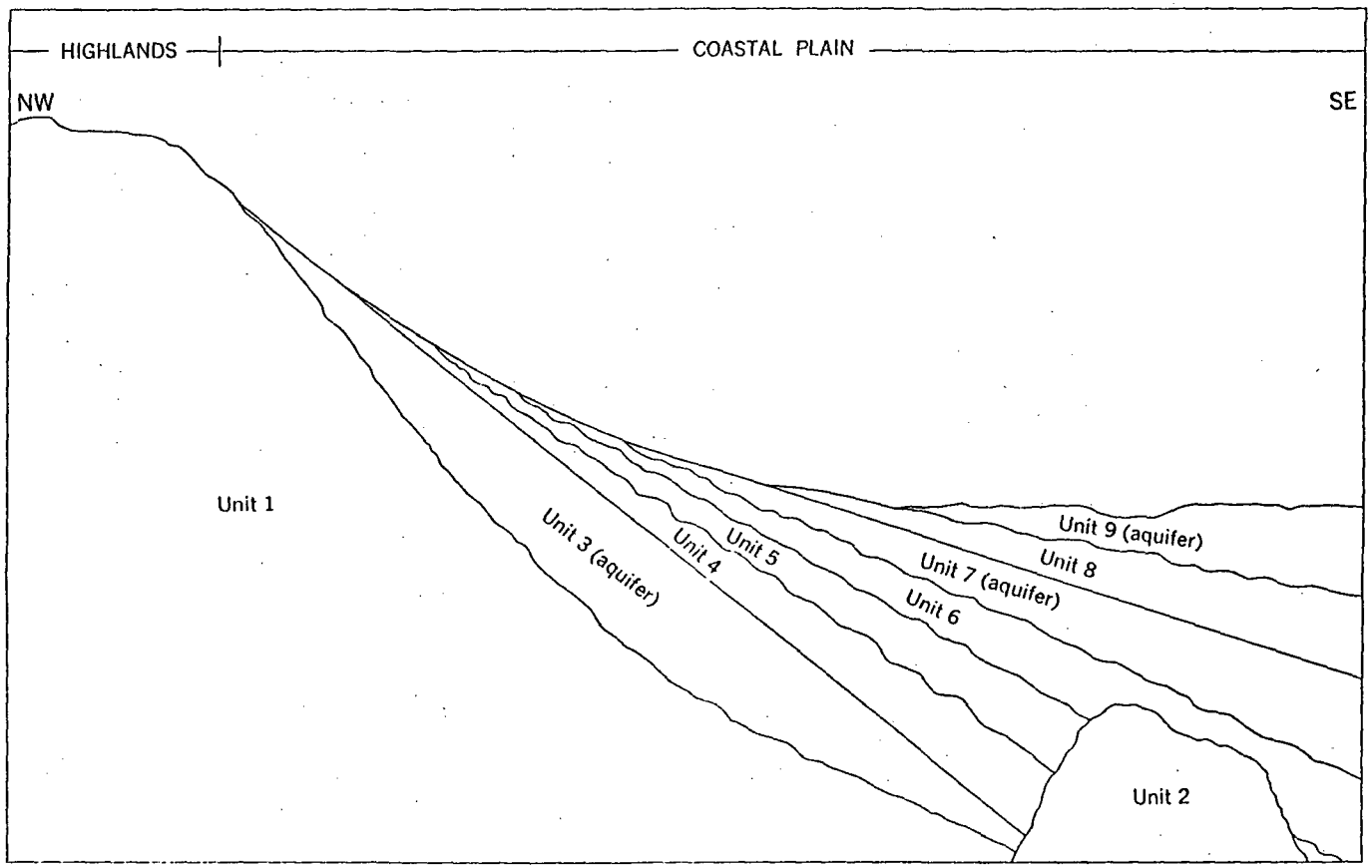
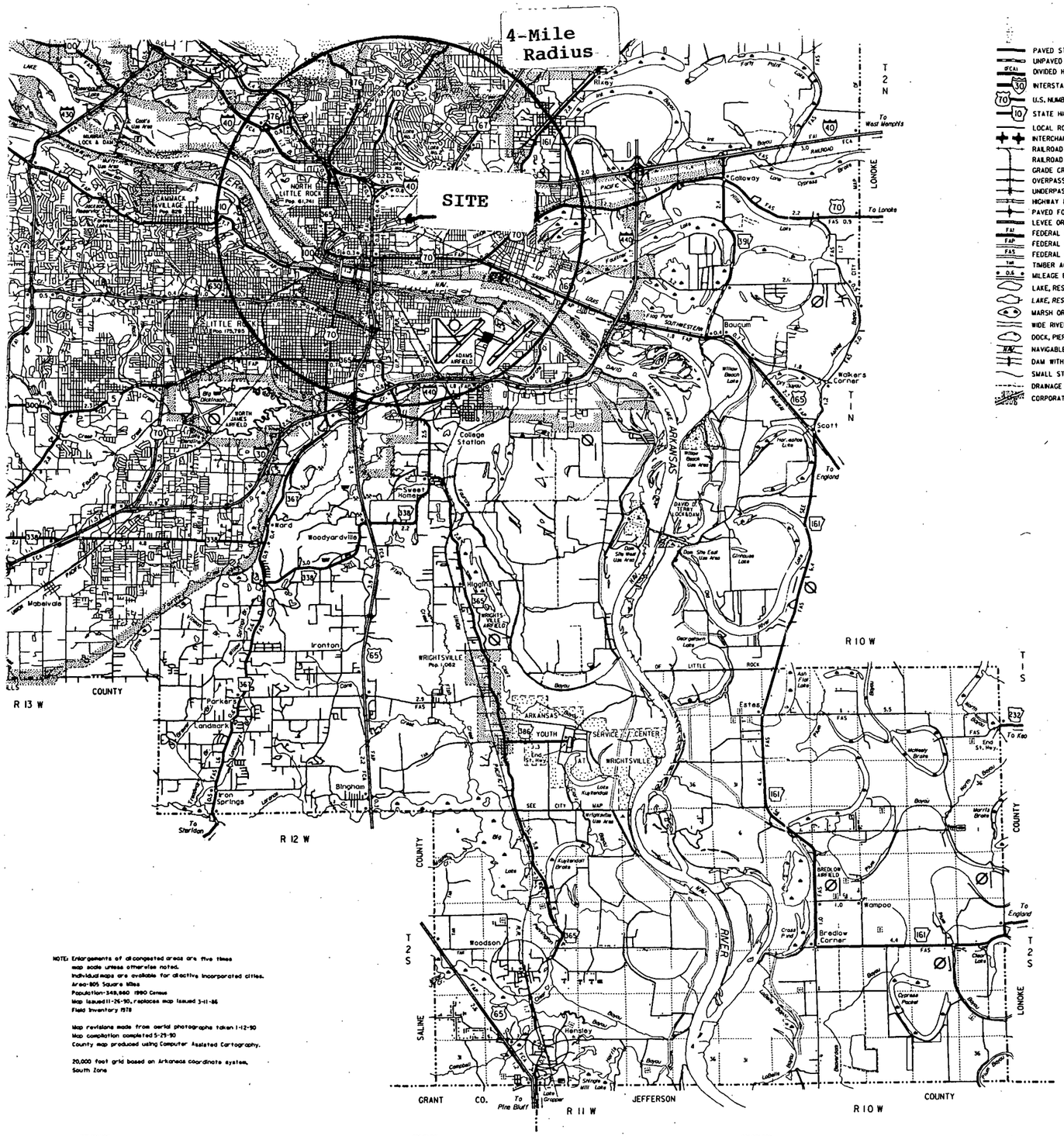


FIGURE 2.—Relationship of the rocks of the Coastal Plain to those of the Interior Highlands.

235-614—66——2

FIGURE 8



- PAVED STATE OR U.S. HIGHWAY
- UNPAVED STATE OR U.S. HIGHWAY
- DIVIDED HIGHWAY (FOUR OR MORE LANES (FAI) INDICATED FULL CONTROL OF ACCESS)
- INTERSTATE HIGHWAY
- U.S. NUMBERED HIGHWAY
- STATE HIGHWAY
- LOCAL ROAD
- INTERCHANGE
- RAILROAD (WITH NUMBER OF TRACKS USED BY A SINGLE OPERATING COMPANY)
- RAILROAD STATION
- GRADE CROSSING
- OVERPASS
- UNDERPASS
- HIGHWAY BRIDGE (100 FEET OR MORE IN LENGTH)
- PAVED FORD OR LOW WATER BRIDGE
- LEVEE OR DIKE
- FAI FEDERAL AID INTERSTATE ROUTE
- FAP FEDERAL AID PRIMARY ROUTE
- FAS FEDERAL AID SECONDARY ROUTE
- TIM TIMBER ACCESS ROAD (NOT PUBLICLY MAINTAINED)
- 0.6 MILEAGE BETWEEN POINTS
- LAKE, RESERVOIR OR POND
- *LAKE, RESERVOIR OR POND WITH DAM*
- MARSH OR SWAMP
- WIDE RIVER OR STREAM
- DOCK, PIER OR LANDING
- N.N. NAVIGABLE STREAM
- DAM WITH LOCK
- SMALL STREAM
- DRAINAGE DITCH
- CORPORATE LIMITS AND ROADS THROUGH TOWN

- MUNICIPAL AIRPORT
- PRIVATE AIRFIELD
- FARM UNIT OR DWELLING
- GROUP OF CLOSELY SPACED DWELLINGS (IF NO PLACE SHOWN)
- *CHURCH OR OTHER RELIGIOUS INSTITUTION*
- SCHOOL
- POST OFFICE & POST OFFICE AND BUSINESS
- CEMETERY
- CHURCH WITH CEMETERY ADJACENT
- BUSINESS ESTABLISHMENT
- FACTORY OR INDUSTRIAL PLANT-COTTON GIN
- SAWMILL
- GRAVEL PIT QUARRY
- NURSERY
- TOWN OR COMMUNITY HALL
- COUNTY OR STATE PRISON
- POWER PLANT
- RADIO OR TELEVISION STATION AND CALL LETTERS
- FOREST RANGER STATION
- FIRE ENGINE HOUSE
- GAUGING OR PUMPING STATION
- POWER SUBSTATION
- TRAILER PARK
- *FISH HATCHERY*
- CAMP OR LODGE
- GOLF COURSE OR COUNTRY CLUB
- ATHLETIC FIELD OR AMUSEMENT PARK
- SMALL PARK (SP-STATE, CP-COUNTY, MP-MUNICIPAL, RP-RESTORED)
- WATER SUPPLY STANDPIPE OR TANK
- SEWAGE DISPOSAL PLANT
- AUTO JUNK YARD
- CHICKEN HOUSE
- SCENIC SITE OR OVERLOOK
- PICNIC GROUND

NOTE: Enlargements of discongested areas are five times map scale unless otherwise noted.
Individual maps are available for directive incorporated cities.
Area-805 Square Miles
Population-349,660 1990 Census
Map Issued 11-26-90, replaces map issued 3-11-86
Field Inventory 1978

Map revisions made from aerial photographs taken 1-12-90
Map compilation completed 5-29-90
County map produced using Computer Assisted Cartography.

20,000 foot grid based on Arkansas Coordinate system, South Zone

GENERAL HIGHWAY MAP

PULASKI COUNTY
ARKANSAS

PREPARED BY
ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
PLANNING DIVISION
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

MILES
KILOMETERS

Copies of this map are available at a nominal fee from the Arkansas State Highway and Transportation Department, P.O. Box 2261-Little Rock, Ark. 72203

Polyconic Projection-North American Datum

FIGURE 8

FIGURE 9

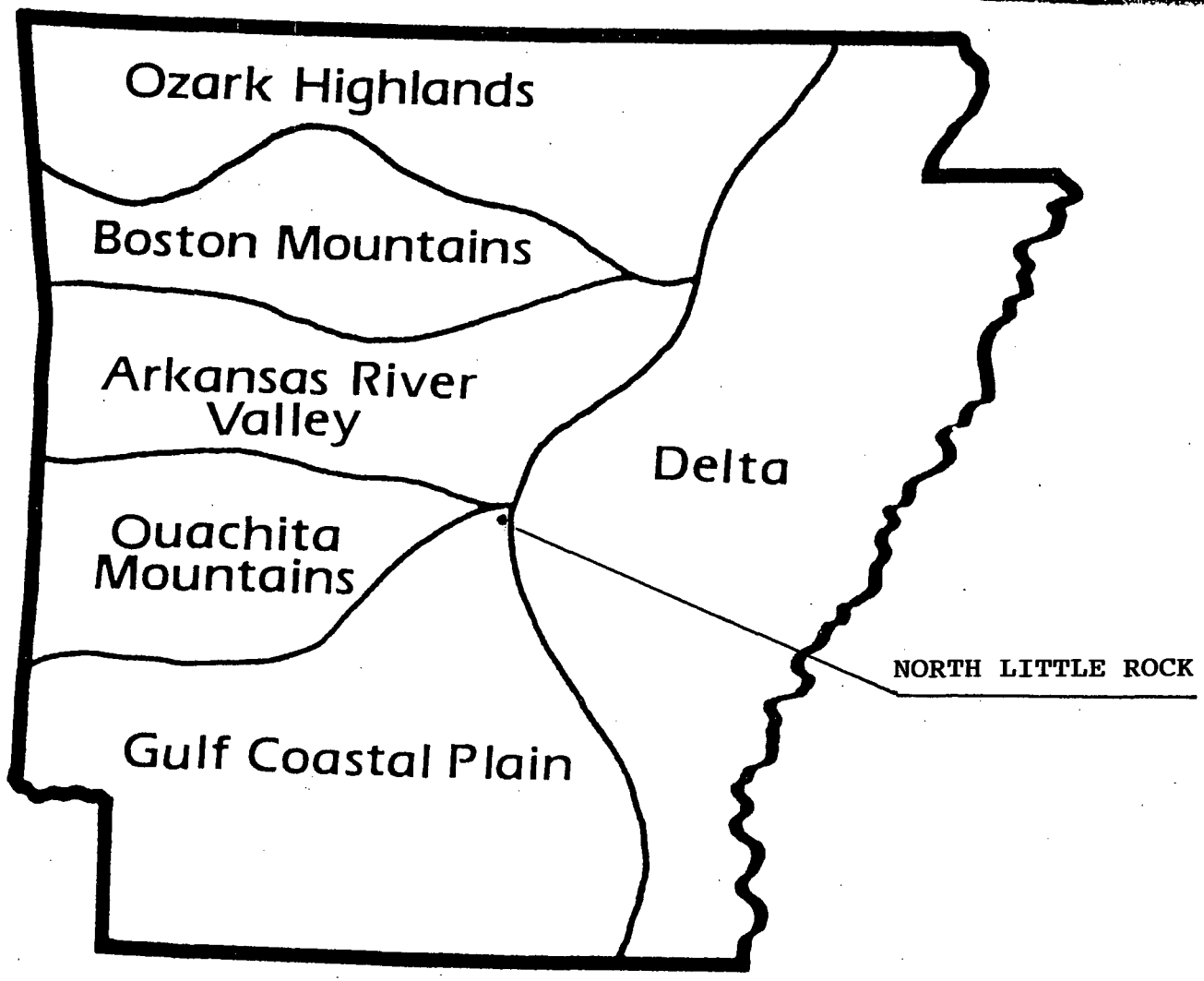

Ozark Highlands
Boston Mountains
Arkansas River Valley
Ouachita Mountains
Gulf Coastal Plain
Delta
NORTH LITTLE ROCK

FIGURE 10

STATE OF ARKANSAS HIGHWAY MAP

N

Not to Scale

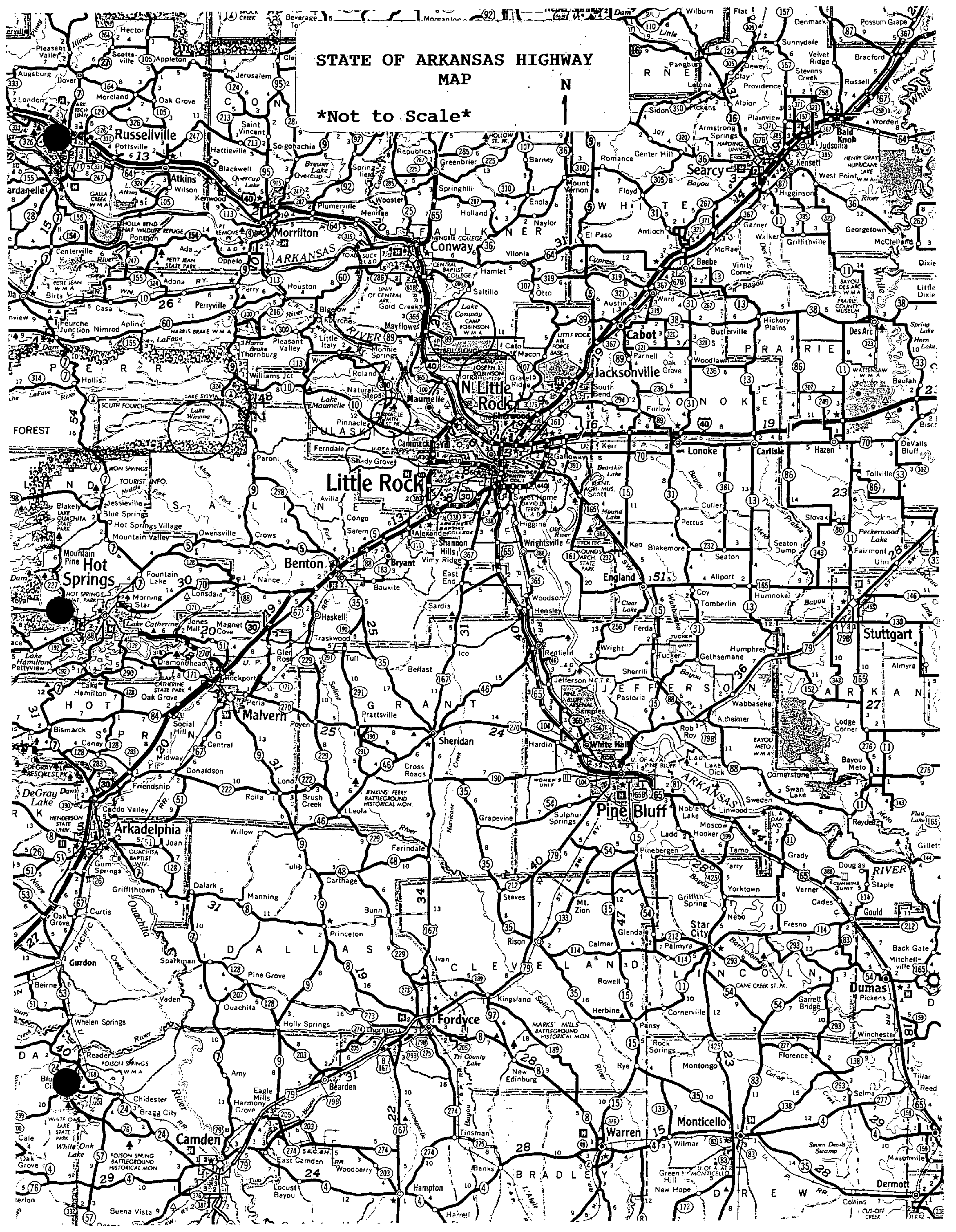
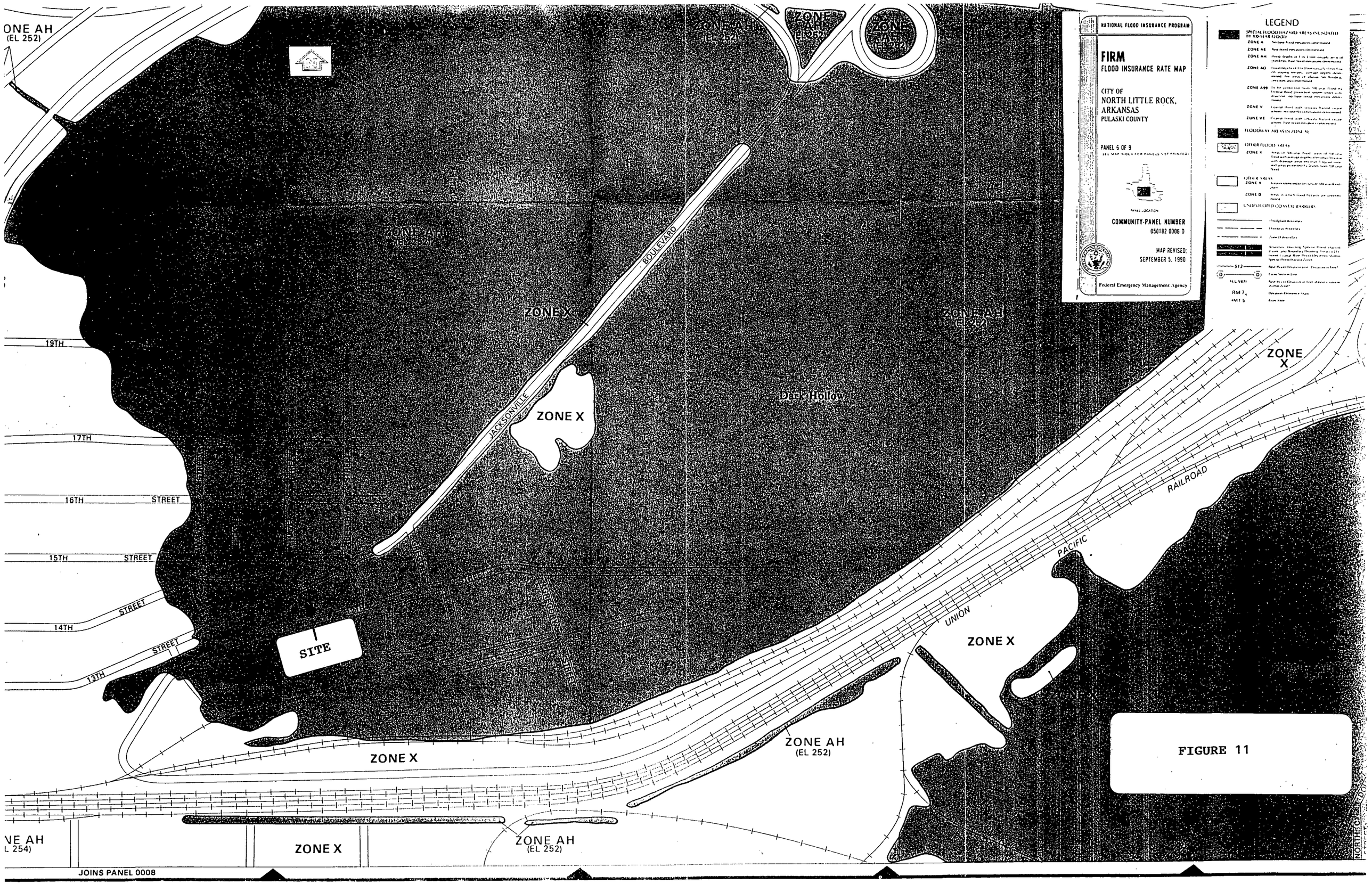


FIGURE 11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NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CITY OF
NORTH LITTLE ROCK,
ARKANSAS
PULASKI COUNTY
PANEL 6 OF 9
COMMUNITY-PANEL NUMBER
050182 0006 0
MAP REVISED:
SEPTEMBER 5, 1990
Federal Emergency Management Agency
LEGEND
ZONE X
ZONE X
ZONE X
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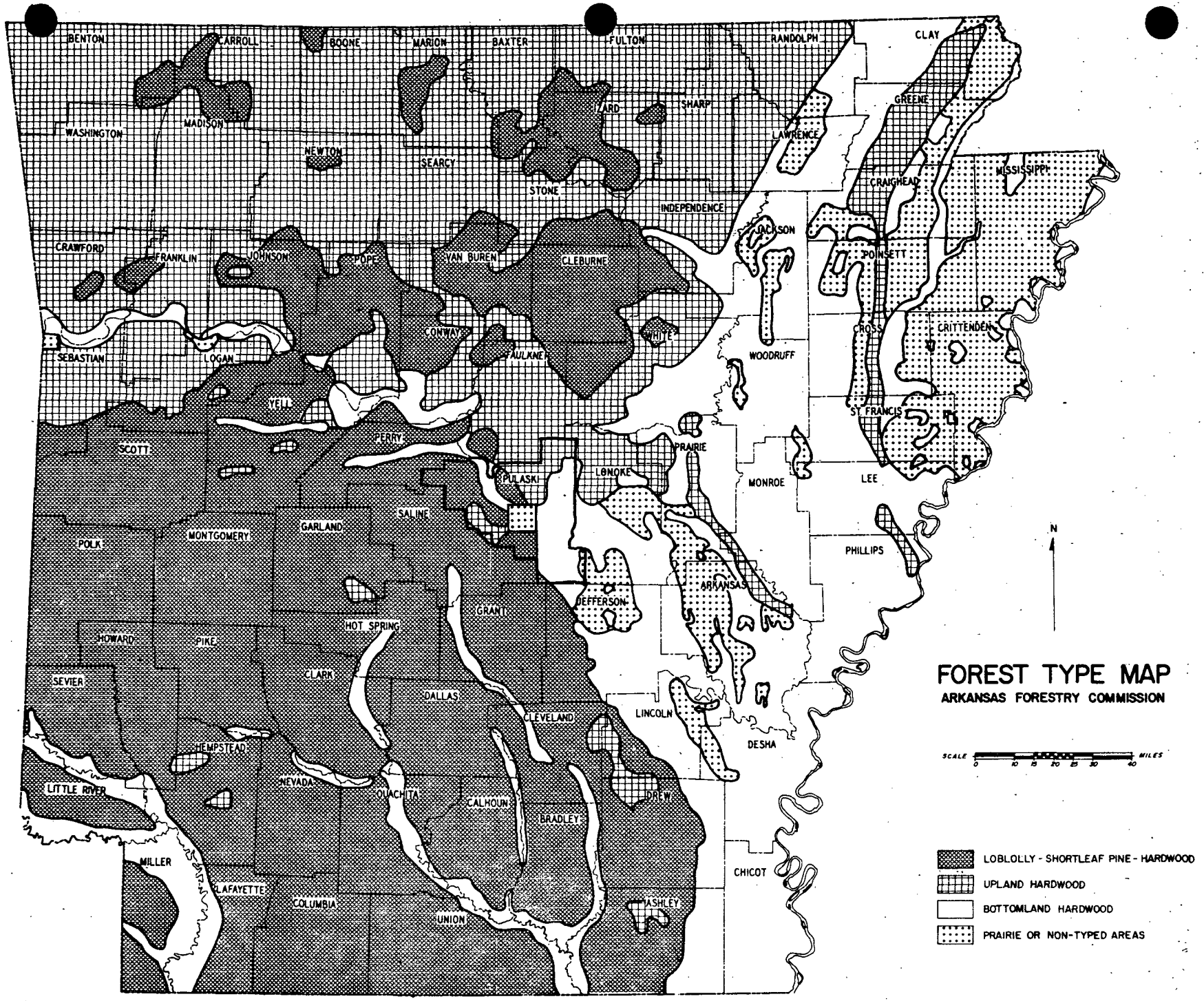
ZONE AH
(EL 252)
ZONE AH
(EL 252)
ZONE AH
(EL 252)
BOULEVARD
JACKSONVILLE
Park Hollow
RAILROAD
PACIFIC
UNION
SITE
19TH
17TH
16TH STREET
15TH STREET
STREET
14TH
STREET
13TH
JOINS PANEL 0008
NORTH LITTLE ROCK

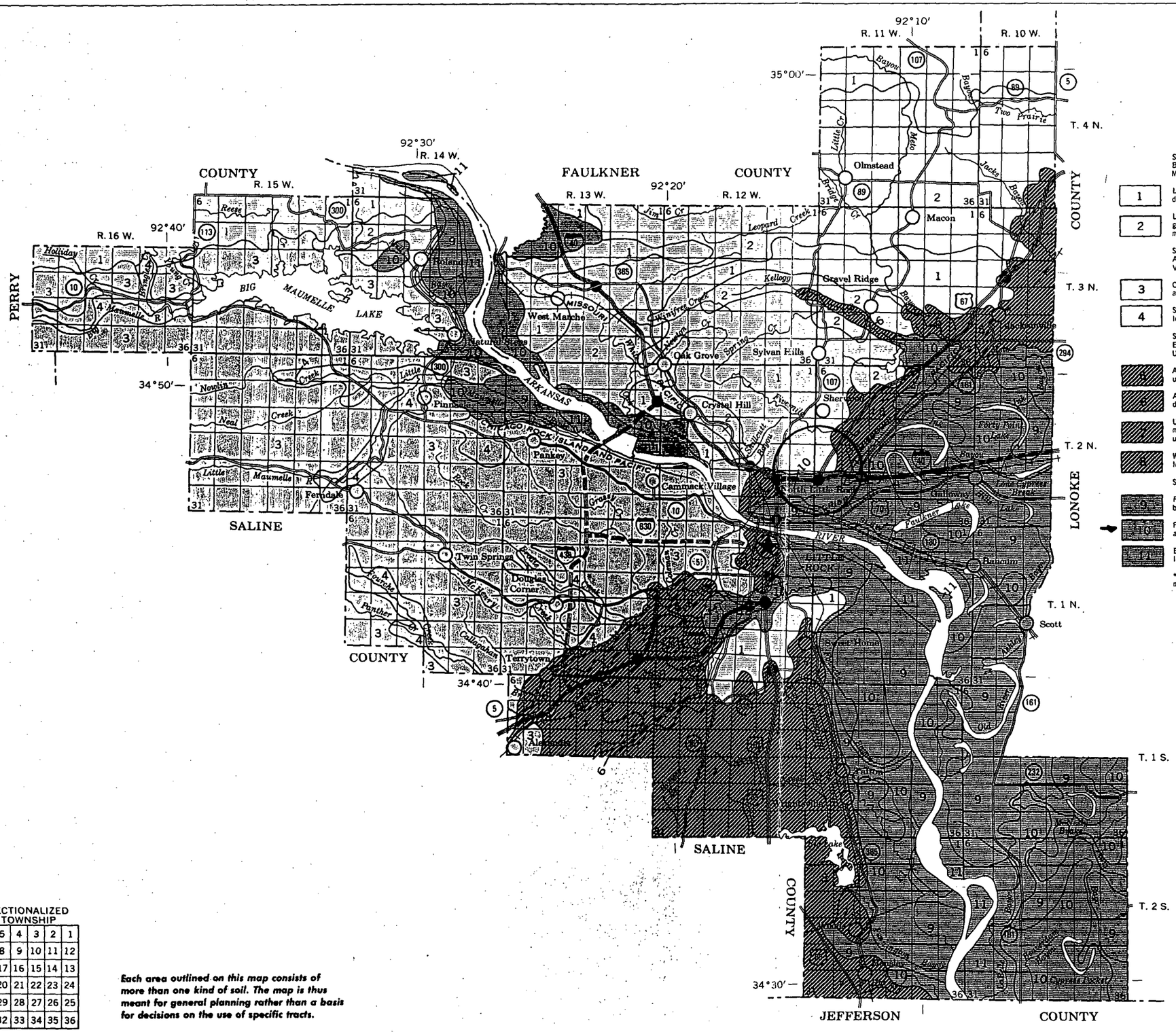
FIGURE 11

FIGURE 12



SOURCE: FOREST SURVEY RELEASE 84

FIGURE 13



SOIL ASSOCIATIONS *

SOILS FORMED IN MATERIAL WEATHERED FROM PREDOMINANTLY LEVEL-BEDDED, ACID SANDSTONE AND SHALE, AND IN VALLEY FILL WASHED MAINLY FROM LOCAL HIGHLANDS

1 — Linker-Mountainburg association: Well-drained, gently sloping to steep, moderately deep and shallow, loamy and stony soils on hills, mountains, and ridges

2 — Leadvale-Guthrie-Linker association: Poorly drained to well drained, level to gently sloping, deep and moderately deep, loamy soils in valleys and on tops of low mountains

SOILS FORMED IN MATERIAL WEATHERED FROM PREDOMINANTLY FOLDED AND FRACTURED, ACID SHALE, SANDSTONE, AND QUARTZITE, AND IN VALLEY FILL WASHED MAINLY FROM LOCAL HIGHLANDS

3 — Carnasaw-Mountainburg association: Well-drained, gently sloping to steep, moderately deep and shallow, loamy and stony soils on hills, mountains, and ridges

4 — Sallisaw-Leadvale association: Well drained and moderately well drained, nearly level and gently sloping, deep, loamy soils in valleys

SOILS FORMED ON UPLANDS IN SEDIMENT DEPOSITED IN AN OLD COASTAL EMBAYMENT, AND IN LOCAL SEDIMENT WASHED FROM THESE AND NEARBY UPLANDS

5 — Amy association: Poorly drained, predominantly level, deep, loamy soils, on broad upland flats

6 — Amy-Rexor association: Poorly drained and well drained, level to gently undulating, deep, loamy soils on flood plains of local drainageways

7 — Urban land-Smithdale-Leadvale association: Built-up areas, and well drained and moderately well drained, nearly level to moderately sloping, deep, loamy soils on uplands

8 — Wrightsville-Leadvale association: Poorly drained and moderately well drained, level to gently sloping, deep, loamy soils on broad upland flats

SOILS FORMED IN ALLUVIUM DEPOSITED BY LARGE RIVERS

9 — Rilla-Keo association: Well-drained, level to gently sloping, deep, loamy soils on bottom lands

10 — Perry-Norwood association: Poorly drained and well drained, level, deep, clayey and loamy soils on bottom lands

11 — Bruno-Crevasse association: Excessively drained, level to nearly level, deep, loamy and sandy soils on bottom lands

* Unless otherwise stated, the texture given is that of the surface layer of the major soil or soils in the association.

Compiled 1975

N

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ARKANSAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

PULASKI COUNTY, ARKANSAS

Scale 1:253,440

1 0 1 2 3 4 Miles

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

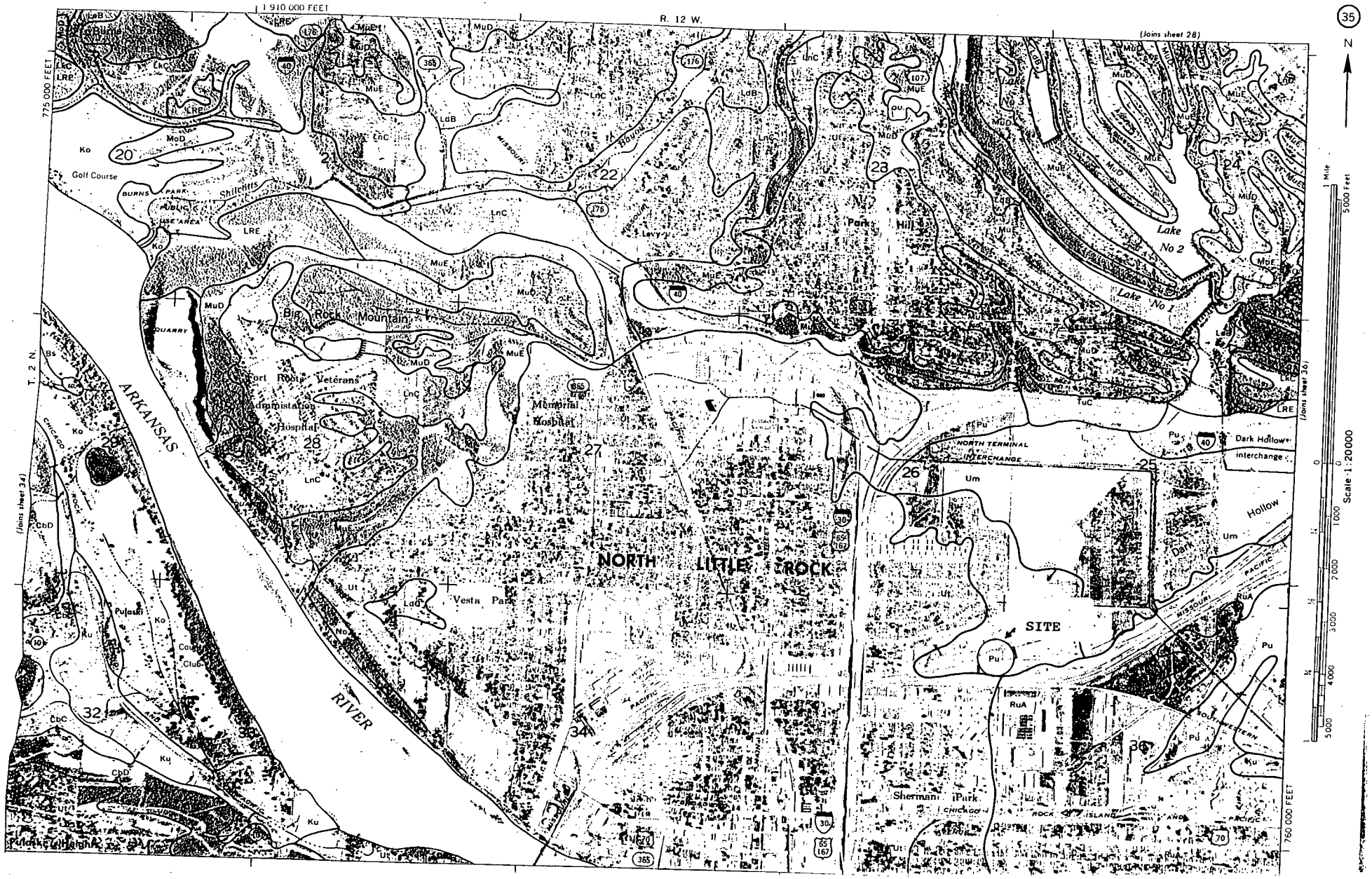
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

FIGURE 13

FIGURE 14

PULASKI COUNTY, ARKANSAS — SHEET NUMBER 35

FIGURE 14

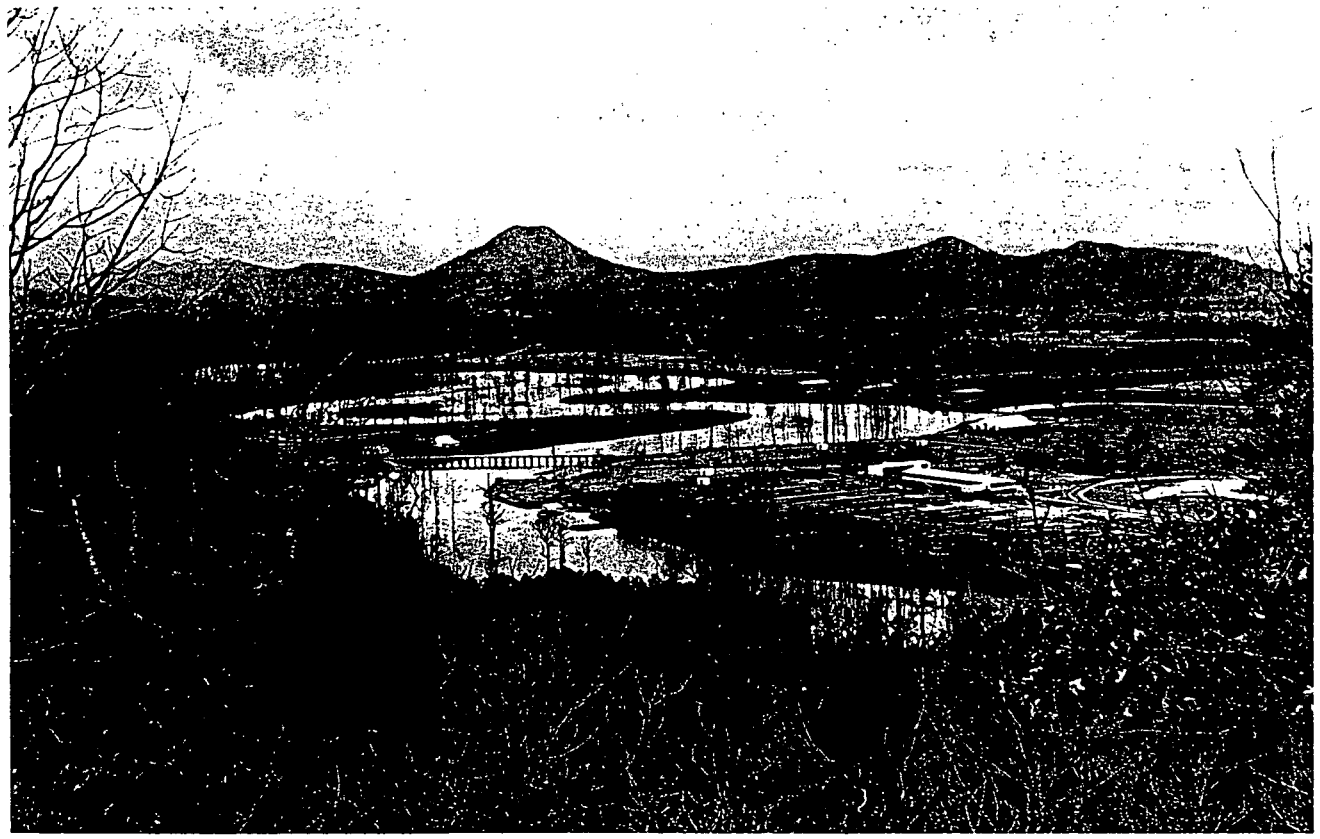


REFERENCE 1

SUPERFUND

SOIL SURVEY OF

Pulaski County, Arkansas



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Arkansas Agricultural Experiment Station

SOIL SURVEY OF PULASKI COUNTY, ARKANSAS

BY GEORGE J. HALEY, RANDLE O. BUCKNER, AND DORRIS F. FESTERVAND, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE ARKANSAS AGRICULTURAL EXPERIMENT STATION

PULASKI COUNTY is in the central part of Arkansas (fig. 1). It is almost triangular. The area of the county is 489,408 acres, or about 765 square miles, including about 1,298 acres of water. Little Rock is the county seat, as well as the State capital.

In 1970 the population of the county was 287,189. Little Rock had a population of 132,483, North Little Rock 60,040, and Jacksonville 19,832.

Farming is an important enterprise in the eastern part of the county, and forestry is important in the western part. Manufacturing, construction, government, defense, transportation, merchandising, banking, and supporting businesses are the most important factors in the economy of the county. Urban expansion is proceeding rapidly in the Little Rock metropolitan area. Outside the incorporated areas, many tracts are now held for future urban expansion. Most of these areas are idle and have been withdrawn from farm use. There are many small hobby farms. Most rural residents are employed full time or part time in businesses in the metropolitan area.

General Nature of the County

This section discusses, in a general way, how the land is used, and then, in more detail, farming, physiography and drainage, and climate in Pulaski County.

Land Use

About 25 percent of the county is taken up by areas of water, mine pits and dumps, and urban and built-up areas. In addition, transportation facilities, nonfarm rural housing, and reserved areas such as Camp Joseph T. Robinson, Little Rock Air Force Base, and Maumelle New Town make up many thousands of acres in the county.

Excluding the urban areas, the mountains in the western part and the hills and ridges in the northern part make up about 30 percent of the land in the county. The valleys in uplands, together with the coastal plain area, make up about 20 percent of the land area, and the bottom lands of the Arkansas River make up about 25 percent.

The elevation above sea level ranges from 213 feet at the normal waterline of the Arkansas River at the south county line to 1,068 feet atop Shinall Mountain. Most of the higher points in the county are lower than 850 feet, and north of the Arkansas River most are lower than 500 feet. The elevation of the valleys and the coastal plain area ranges from about 250 feet in the southeastern part of the county to about 450 feet in the western part. The highest part of the bottom lands of the Arkansas River is about 270 feet, but most of this area is between 220 and 250 feet higher than the Gulf of Mexico.

Most areas of the soils on mountains, hills, and ridges are too steep or too stony for intensive farming. They are used mainly for production of wood crops, as wildlife habitat, and for grazing of livestock. Some of the less sloping soils that are not stony are suitable for improved pasture. Although the limitations of the soils generally are severe, many tracts in this area have been developed for urban uses.

The rest of the soils in the county are level to moderately sloping soils that formed in valley fill and in coastal plain and alluvial sediment. Most of the urban development is in this part of the county. Except for the soils on the bottom lands of the Arkansas River, most of this area that is not developed for urban uses is used for producing livestock forage and wood crops. The less sloping soils are suited to cultivation, but there is little row cropping in the county except on the bottom lands along rivers.

Farming

Early settlers in Pulaski County farmed the soils that had good natural drainage and were above the flood plain of the

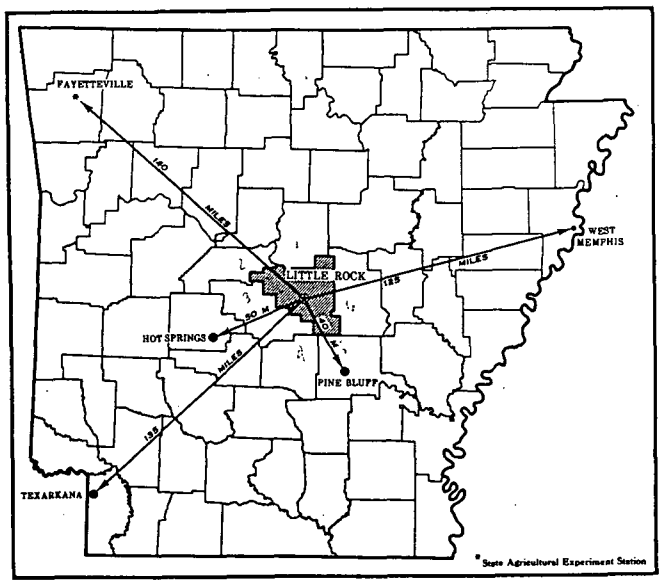


Figure 1.—**Location of Pulaski County in Arkansas.**

TABLE 1.—*Temperature and precipitation*

[All data from Little Rock. Period of record, 1942–71]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Two years in 10 will have— Maximum temperature equal to or higher than—	Temperature: Two years in 10 will have— Minimum temperature equal to or lower than—	Precipitation: Average total	Precipitation: One year in 10 will have— Less than—	Precipitation: One year in 10 will have— More than—	Precipitation: Average number of days with snow cover of 1 inch or more
	°F	°F	°F	°F	Inches	Inches	Inches	
January	50.6	30.5	78	9	5.22	1.05	8.06	1
February	54.6	34.1	79	15	4.33	1.55	7.19	1
March	62.7	40.9	85	20	4.81	2.14	8.07	(1)
April	73.5	51.2	89	34	4.93	1.81	7.58	0
May	81.5	59.5	93	43	5.28	1.60	9.67	0
June	89.7	68.0	101	54	3.61	.63	7.20	0
July	92.7	71.1	104	58	3.34	1.77	5.54	0
August	92.4	70.1	104	58	2.82	.62	6.01	0
September	86.3	62.2	100	47	3.23	1.07	7.02	0
October	76.0	50.2	91	32	2.88	.31	5.57	0
November	61.3	37.6	83	21	4.12	1.54	6.84	(1)
December	52.1	31.7	77	14	4.09	1.91	7.15	(1)
Year	72.8	52.6			48.66			2

[1] Less than one-half day.

Arkansas River, chiefly in the valleys on uplands. The early settlers were subsistence farmers, but they soon started to grow cotton as the main cash crop. Subsequently, those people engaged in intensive farming migrated to the more fertile, older soils on natural levees that were above the normal overflow level of the river, then spread out to include the better drained soils on the flood plain, and more recently to include the more poorly drained soils. The steep, stony ridges and mountains were left as woodland. They were little used except as range for livestock and as wildlife habitat, until a commercial demand for wood products developed.

Farming has become more diversified. It is generally more intensive on the soils on bottom lands and less intensive on the soils on uplands. In the upland areas, beef and dairy cattle, hogs, and laying hens now provide most of the farm income. Some farms have small acreages that produce fruit and berry crops.

On the bottom lands of the Arkansas River, flood control, improved crop varieties, mechanization, insecticides, and other technological advances have led to expansion of crops and pasture into most of the area. On many tracts the natural drainage has been improved to attain a reliable growth of crops on wet soils. In 1969, 46 farms had irrigation systems to supplement rainfall.

On the farms on bottom lands, the most important crop is soybeans, and cotton is second. Wheat and other small grain, including rice, and corn, grain sorghum, and alfalfa, are also grown. Some farmers grow spinach, okra, green beans, melons, and other truck crops, and there are several commercial pecan groves.

According to the U.S. Census of Agriculture for 1969, about 34 percent of the land area of the county was in farms, a decrease of nearly 2 percent from that in 1964. The rest of the area was mainly cities and built-up areas, transportation facilities, public land in Camp Joseph T. Robinson and Little Rock Air Force Base, tracts reserved for urban expansion, and commercial forest land.

Between 1964 and 1969, the number of farms decreased by 28 percent, or from 876 farms to 640. The average size of the farms increased by 30 percent, or from 202 acres to 263. Of the net loss in the number of farms, 202 of them, or 86 percent, were smaller than 100 acres.

Of the farm operators in the county in 1969, 415 were full owners, 131 were part owners, and 94 were tenants. Of these operators, 367, or about 57 percent, held jobs off the farm; and 266, or about 42 percent, of the operators worked off the farm 200 days or more.

According to the U.S. Census of Agriculture, the acreage of principal crops and pasture in 1964 and 1969 was as follows:

	Acres (1964)	Acres (1969)
Crop:		
Soybeans for beans	37,211	46,265
Cotton	12,825	11,610
Wheat	3,468	1,999
Other small grain, including rice	3,160	3,154
Corn for grain	834	294
Sorghum for grain or seed	499	392
Truck crops, including potatoes	678	462
Fruits, nuts, and berries	770	668
Cropland pastured	13,416	26,367
Hay	9,704	7,720

The number of livestock in the county in 1964 and 1969 was as follows:

	Number (1964)	Number (1969)
Livestock:		
All cattle and calves on farms and sold	31,523	31,867
Milk cows	1,854	1,179
Hogs and pigs on farms and sold	5,013	3,328
Horses and ponies on farms and sold	No data	812
Chickens 3 months old or older, on farms and sold	230,840	122,687

Physiography and Drainage

The Arkansas River divides the county diagonally from northwest to southeast. Bottom land is in a narrow strip parallel to the river as far downstream as Little Rock, where the river debouches onto a lowland plain. The many oxbow lakes on this plain are evidence that the river has meandered from northeast to south. In addition, there are many sloughs and bayous. The main drainageways are Ink, Plum, and Pennington Bayous.

The flow of the Arkansas River is partly controlled by large flood-control impoundments in its upstream watershed. A series of lakes and dams form navigable pools, and the river is open year-round to barge traffic. This river provides recreation in the form of fishing, boating, and waterfowl hunting. It yields sand and gravel in quantities large enough to be profitably dredged. All the streams in Pulaski County eventually drain into the Arkansas River.

The alluvial soils on lowlands are level to undulating, and some of these soils are subject to flooding. The most fertile soils in the county, Keo, Norwood, and Rilla, formed on these bottom lands.

Undulating uplands formed in coastal plain sediment and terraces of the Arkansas River lie between the eastern bottom lands and the foothills of the hilly uplands. Most of this area is already a part of, or is in the path of, urban development. This area of loamy and clayey unconsolidated sediment is level to moderately sloping, and the dominant gradient is less than 8 percent. Leadvale, Smithdale, and Tiak are the main soils on the sloping parts, and Amy and Wrightsville soils are on the flats. This area is drained by streams that flow out of the hilly uplands.

The topography of the hilly or mountainous part of the county that lies generally south of Lake Maumelle is that of nearly parallel ridges and valleys that trend from the northwest to the southeast as Shinall Mountain. Westward from this point, the trend is nearly east and west. Intense folding and faulting were major factors in shaping the landscape in this area. The rocks are tilted, and some are nearly vertical. A series of cone-shaped mountains, known as Maumelle Pinnacles, extends westward from the mouth of Big Maumelle River. Together with Shinall Mountain, the highest point in the county, these mountains are striking features of the landscape. With few exceptions, valleys in this area are quite narrow, as are the ridgetops and mountaintops. There is a relatively small amount of arable land in this area. The principal streams that drain this area are the Big Maumelle and Little Maumelle Rivers and Fourche Creek.

In the area north of Lake Maumelle, and north of the Arkansas River, the mountains and ridges have lower elevations than they have to the south. Folding and faulting have been less acute. Many of the broader ridges have gently rolling tops and a significant amount of arable land. The valleys in this area also are broader and commonly have gentler slopes than the valleys to the south. The principal streams are White Oak Bayou and Bayou Meto.

Most of the tributary streams in the uplands are intermittent, but some flow the year around. Livestock water is obtained from the creeks and from wells and ponds. Domestic water supplies are from wells, though in most places the ground water supply is insufficient for irrigation. Water for irrigation on the bottom lands is obtained from deep wells, from oxbow lakes, and from surface water impounded in reservoirs.

Climate[1]

The topography of Pulaski County has a limited effect upon the climate. Air moving downslope from the higher elevations is warmed slightly, which results in somewhat higher temperatures at lower elevations. There is slightly more rainfall at the higher elevations, because of the lifting effect imparted to moist air by the ridges and mountains.

The climate of the county is affected by exposure to all of the North American airmass types. Winters generally are mild. Although polar and arctic-type outbreaks are common, they generally are short. Summers are hot, and there are long periods of high humidity. Table 1 is a summary of temperatures and precipitation at Little Rock, which are considered representative of those for the county.

Winters are relatively free of severe cold, although a low of 10° F frequently occurs in January, the coldest month. The lowest temperature ever recorded in the county was −13° in February 1899. Snowfall averages 5.7 inches per year, almost half of which falls in January. Heavy snowfall occurs occasionally but remains on the ground for only a few days. The greatest monthly snowfall of record was 12 inches in January 1966. There have been years when only traces were recorded. The average daily temperature in winter is 41°, so outdoor work can be done during most of the winter.

Summers are hot and humid. The average daily temperature is 82°. July and August are the hottest months. A high temperature of 100° is frequently exceeded. The highest temperature recorded was 110° in August 1936.

The average length of the growing season is 233 days. The average date of the first freezing temperature in fall is November 9, and the average date of the last freeze in spring is March 21. The earliest freezing temperature in fall occurred on October 21, and the latest in spring on April 13. November 19 is the average date of the first 28° reading in fall, and the latest in spring is March 8. The earliest that a temperature of 28° has been recorded in fall is November 2, and the latest in spring is April 7.

Precipitation is fairly well distributed throughout the year and is generally adequate for most crops. Spring is the wettest season, and May is normally the wettest month. During the 3 months of March, April, and May, slightly more than 15 inches of rainfall, or nearly 31 percent of the annual total, commonly occurs. August, September, and October are the driest months, but about 3 inches of rainfall in each of these months can be expected in a normal year. Winter and spring rains are associated with frontal systems and are of a general, or widespread, character. Summer and fall rains are mainly thundershowers from convective clouds. The thundershowers commonly are of relatively small extent, but they occasionally produce very heavy rainfall.

The evaporation rate in summer may be as high as one-third inch per day. A 1-inch rain can be dissipated within 3 or 4 days. Thus, periods of abundant sunshine and high temperatures may result in a significant loss of soil moisture. Short periods of drought occur frequently. Severe to extreme droughts are rare. They occur on an average of once every 10 to 15 years.

Thunderstorms occur on about 56 days each year and are sometimes accompanied by large hail and damaging wind. In the 10-year period from 1958 to 1968, hail three-fourths

[1] By ELDEN V. JETTON, meteorologist for Arkansas, National Weather Service, U.S. Department of Commerce.

inch in diameter or larger occurred 13 times, and windstorms that caused damage of $10,000 or more occurred 12 times. In the same period, five tornadoes went through the county.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Pulaski County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Mountainburg and Carnasaw, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Carnasaw gravelly silt loam, 3 to 8 percent slopes, is one of several phases within the Carnasaw series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Pulaski County, soil complexes and soil associations.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Guthrie-Leadvale complex, undulating, is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Sallisaw-Leadvale association, undulating, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Urban land is a land type in this county.

Some mapping units include soils unlike any known series. Such soils are named according to nomenclature from a higher level of the soil classification system. Umbraqualfs, clayey, is an example in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Pulaski County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

septic tank absorption fields, but they are severe for most nonfarm uses where there is a hazard of flooding.

10. Perry-Norwood association

Poorly drained and well drained, level, deep, clayey and loamy soils on bottom lands

This association extends from the northwest to the east-central and southeastern parts of the county. It makes up about 11 percent of the county. Perry soils make up about 45 percent of the association, and Norwood soils about 31 percent. The remaining 24 percent is Moreland, Keo, and Bruno soils, Umbraqualfs, clayey, Urban land, and areas of water.

Perry soils formed in clayey sediment in slightly depressed back-swamp areas. These soils are poorly drained. The surface layer is dark yellowish-brown clay. The upper part of the subsoil is dark-gray and gray, mottled clay, and the lower part is dark reddish-brown clay that is mottled below a depth of 61 inches.

Norwood soils formed in loamy sediment on young natural levees. These soils are well drained. The surface layer is dark-brown silty clay loam. The underlying material is brown to dark reddish-brown, thinly stratified silty clay loam, silt loam, and very fine sandy loam.

The soils in this association are suited to farming, and most of the acreage is cultivated. This association is within the major area of soybean, cotton, and rice farming. The Perry soils need surface drainage for efficient farm management. Crops that leave a large amount of residue can be grown year after year. Farms range from about 100 acres to several thousand acres in size and are highly mechanized. Most farms are operated by the owners. There are a few areas of pasture for beef cattle. Some areas within this association have been developed for urban uses. On the Perry soils, limitations are severe for most urban uses and septic tank absorption fields because of soil wetness, a slow percolation rate, and low bearing capacity. On the Norwood soils, limitations are generally slight to moderate for urban uses and septic tank absorption fields, but limitations are severe for most nonfarm uses where there is a hazard of flooding.

11. Bruno-Crevasse association

Excessively drained, level to nearly level, deep, loamy and sandy soils on bottom lands

This association is in relatively small areas that extend diagonally across the county from the northwest to the southeast. The soils formed in loamy and sandy sediment deposited on young natural levees along the Arkansas River.

This association makes up about 4 percent of the county. Bruno soils make up about 48 percent of the association, and Crevasse soils about 32 percent. The remaining 20 percent is Keo and Norwood soils, Urban land, and areas of water.

Bruno soils have a surface layer of dark-brown fine sandy loam. The upper part of the underlying material is brown sandy loam; next is pale-brown fine sand; below is dark-brown silt loam and light yellowish-brown and brown loamy fine sand.

Crevasse soils have a surface layer of yellowish-brown fine sand. The underlying material is yellowish-brown sand.

The soils in this association are poorly suited to most crops because of low available water capacity and a hazard of flooding in some tracts. Some areas are used for pasture, others are wooded, and some tracts have been developed for urban uses. Limitations are generally slight to moderate for most urban uses, but where there is a hazard of flooding limitations are severe both for urban uses and for septic tank absorption fields. Where the limitations are slight for septic tank absorption fields, areas are protected from flooding, provided a hazard of ground water contamination does not exist.

Descriptions of the Soils

This section describes the soil series and mapping units in Pulaski County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile; that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Umbraqualfs, clayey, for example, do not belong to a soil series, but nevertheless are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland group in which the mapping unit has been placed. The page for the description of each mapping unit can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 2. Many of the terms used in describing the soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual *(11)*[2]

Amy Series

The Amy series consists of poorly drained, level soils on broad upland flats and on flood plains of local drainageways. These soils formed in loamy sediment in valleys and on the coastal plain. The native vegetation is mixed pine and hardwoods on the upland flats and hardwoods on the flood plains.

[2] Italic numbers in parentheses refer to Literature Cited, p. 63.

TABLE 2.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Amy silt loam	8,500	1.7
Amy silt loam, frequently flooded	8,180	1.7
Amy complex, undulating	3,030	.6
Amy-Urban land complex	3,430	.7
Bruno fine sandy loam	9,690	2.0
Bruno-Urban land complex	790	.1
Carnasaw gravelly silt loam, 3 to 8 percent slopes	2,350	.5
Carnasaw gravelly silt loam, 8 to 12 percent slopes	980	.2
Carnasaw-Urban land complex, 3 to 8 percent slopes	10,750	2.2
Carnasaw-Urban land complex, 8 to 12 percent slopes	5,190	1.1
Carnasaw-Mountainburg association, undulating	21,510	4.4
Carnasaw-Mountainburg association, steep	62,860	12.8
Crevasse fine sand	6,810	1.4
Guthrie-Leadvale complex, undulating	15,450	3.2
Keo silt loam	19,940	4.1
Keo-Urban land complex	3,610	.7
Latanier silty clay	6,770	1.4
Leadvale silt loam, 1 to 3 percent slopes	24,700	5.1
Leadvale silt loam, 3 to 8 percent slopes	15,100	3.1
Leadvale-Urban land complex, 1 to 3 percent slopes	10,130	2.1
Leadvale-Urban land complex, 3 to 8 percent slopes	4,510	.9
Linker gravelly fine sandy loam, 3 to 8 percent slopes	20,770	4.2
Linker-Urban land complex, 3 to 8 percent slopes	7,890	1.6
Linker-Mountainburg association, moderately steep	42,730	8.7
Moreland silty clay	10,480	2.1
Mountainburg stony fine sandy loam, 3 to 12 percent slopes	5,520	1.1
Mountainburg-Urban land complex, 3 to 12 percent slopes	3,620	.7
Mountainburg-Urban land complex, 12 to 40 percent slopes	3,420	.7
Norwood silty clay loam	20,420	4.2
Perry clay	31,100	6.4
Perry-Urban land complex	1,680	.3
Rexor silt loam, frequently flooded	4,150	.9
Rexor-Urban land complex, frequently flooded	190	(1)
Rilla silt loam, 0 to 1 percent slopes	16,560	3.4
Rilla silt loam, 3 to 5 percent slopes	5,870	1.2
Rilla-Perry complex, undulating	3,420	.7
Rilla-Urban land complex, 0 to 1 percent slopes	4,190	.8
Saffell-Urban land complex, 3 to 8 percent slopes	860	.2
Sallisaw gravelly silt loam, 1 to 3 percent slopes	4,930	1.0
Sallisaw gravelly silt loam, 3 to 8 percent slopes	690	.1
Sallisaw-Urban land complex, 3 to 8 percent slopes	1,690	.3
Sallisaw-Leadvale association, undulating	6,640	1.4
Smithdale fine sandy loam, 3 to 8 percent slopes	8,220	1.7
Smithdale fine sandy loam, 8 to 12 percent slopes	1,630	.3
Smithdale-Urban land complex, 3 to 8 percent slopes	7,670	1.6
Tiak fine sandy loam, 1 to 3 percent slopes	1,840	.4
Tiak-Urban land complex, 3 to 8 percent slopes	1,950	.4
Umbraqualfs, clayey	1,540	.3
Urban land	12,820	2.6
Wrightsville silt loam	8,120	1.7
Wrightsville-Urban land complex	860	.2
Mine spoil, pits, and quarries	2,360	.5
All water	1,298	.3
Total	489,408	100.0

[1] Less than 0.1 percent.

In a representative profile the surface layer is brown silt loam about 6 inches thick. The subsurface layer is gray, mottled silt loam about 6 inches thick. The upper part of the subsoil is gray, mottled silt loam about 8 inches thick, and the lower part is gray, mottled silty clay loam about 34 inches thick. The underlying material is light-gray, mottled silty clay loam.

Amy soils are low in natural fertility. Permeability is slow, and available water capacity is high.

Where these soils are adequately drained, they are suited to use as pasture. Areas that are not subject to flooding are suited to crops. Most areas of these soils are wooded, but many tracts have been developed for urban uses.

Representative profile of Amy silt loam in a moist, wooded spot in an area of Amy-Urban land complex, in the NE¼ SW¼SE¼ sec. 6, T. 1 S., R. 12 W:

O1—1 inch to 0, leaves and other decomposing vegetation.

A1—0 to 6 inches, brown (10YR 5/3) silt loam; weak, medium, subangular blocky structure; friable; many fine roots; common fine pores; strongly acid; clear, smooth boundary.

A2g—6 to 12 inches, gray (10YR 6/1) silt loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few fine roots; many fine pores; very strongly acid; gradual, irregular boundary.

B21tg—12 to 20 inches, gray (10YR 6/1) silt loam; many, medium, prominent, yellowish-red (5YR 5/8) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; few, thin, patchy clay films on faces of peds; very strongly acid; gradual, irregular boundary.

B22tg—20 to 40 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) mottles; thin, patchy clay films on faces of peds; few fine roots; common fine pores; few black accretions; very strongly acid; gradual, irregular boundary.

B23tg—40 to 54 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, brown (7.5YR 4/4) mottles; moderate medium, subangular blocky structure; friable; thin, patchy clay films on faces of peds; few fine roots; common fine pores; common black accretions; very strongly acid; gradual, irregular boundary.

C—54 to 72 inches, light-gray (N 7/0) silty clay loam; many, medium, prominent, strong-brown (7.5YR 5/6), reddish-yellow (7.5YR 6/8), and yellowish-red (5YR 5/8) mottles; massive; firm; few roots; common fine pores; very strongly acid.

The A1 horizon is dark grayish brown, brown, grayish brown, or gray. The A2g horizon is gray or light brownish gray. The B2tg horizon is gray or light-gray silt loam or silty clay loam. The C horizon is light-gray or gray silty clay loam or silt loam. Except where it has been limed, the profile is strongly acid or very strongly acid throughout.

Amy soils are near Leadvale, Rexor, Smithdale, and Wrightsville soils. They are grayer below the A1 horizon or the Ap horizon than Leadvale, Rexor, and Smithdale soils, and they are more poorly drained. Amy soils have less clay in the B horizon than Wrightsville soils.

Amy silt loam (Am).—This soil is on broad upland flats. Slopes are less than 1 percent. Areas of this soil range from about 20 to 600 acres in size. This soil has the profile described as representative for the series. Included in mapping are a few areas of Leadvale, Smithdale, and Wrightsville soils.

Runoff is slow, and wetness is a severe limitation. Farming operations are delayed several days after rains unless a surface drainage system is installed. Good management that includes adequate drainage permits clean-tilled crops that leave a large amount of residue to be safely grown year after year.

This soil is suited to crops. Most areas, however, are wooded. Cleared areas are mostly in pasture. This soil is

of erosion is very severe if the areas are not protected by vegetation. These soils contain a large amount of coarse fragments and are 12 to 20 inches deep over bedrock. Consequently, they are droughty. The shallow depth to bedrock limits the rooting depth for many kinds of plants. Frequent irrigation is needed for satisfactory growth of most kinds of ornamental plants.

These soils are poorly suited to most landscaping plants. They are limited for most urban uses because of the shallow depth to bedrock and slope. Not assigned to a capability unit or to a woodland group.

Norwood Series

The Norwood series consists of well-drained, level soils on young natural levees along the Arkansas River. These soils formed in loamy sediment carried from the west by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is dark-brown silty clay loam about 8 inches thick. The underlying material is brown to dark reddish-brown, thinly stratified silty clay loam, silt loam, and very fine sandy loam.

Norwood soils are high in natural fertility. Permeability is moderate, and available water capacity is high. Response to fertilizer is good, but these soils are somewhat difficult to till because of a high content of clay in the surface layer.

These soils are well suited to cultivated crops, and most of the acreage is cultivated.

Representative profile of Norwood silty clay loam, in a moist, cultivated area in the NE¼NW¼NE¼ sec. 24, T. 3 N., R. 14 W.:

Ap—0 to 6 inches, dark-brown (7.5YR 3/2) silty clay loam; weak, medium, granular structure; friable; common fine roots; mildly alkaline; calcareous; abrupt, smooth boundary.

A1—6 to 8 inches, dark-brown (10YR 3/3) silty clay loam; weak, medium, granular structure; friable; common fine roots; mildly alkaline; calcareous; abrupt, smooth boundary.

C1—8 to 10 inches, brown (7.5YR 5/4) silt loam; massive; friable; many bedding planes; few fine roots; mildly alkaline; calcareous; abrupt, smooth boundary.

C2—10 to 14 inches, dark reddish-brown (5YR 3/3) silty clay loam; massive; firm; mildly alkaline; calcareous; abrupt, smooth boundary.

C3—14 to 20 inches, dark-brown (7.5YR 3/2) silty clay loam; massive; firm; few small mussel shells; mildly alkaline; calcareous; abrupt, smooth boundary.

C4—20 to 22 inches, brown (7.5YR 4/2) silt loam; massive; friable; mildly alkaline; calcareous; abrupt, smooth boundary.

C5—22 to 27 inches, brown (7.5YR 4/2) and reddish-brown (5YR 4/3) silty clay loam; massive; firm; few bedding planes; mildly alkaline; calcareous; abrupt, smooth boundary.

C6—27 to 30 inches, reddish-brown (5YR 4/4) silt loam; massive; friable; many bedding planes; moderately alkaline; calcareous; abrupt, smooth boundary.

C7—30 to 35 inches, dark reddish-brown (5YR 3/2) silty clay loam; massive; firm; few worm casts; many bedding planes in upper part; mildly alkaline; calcareous; abrupt, smooth boundary.

C8—35 to 41 inches, reddish-brown (5YR 4/4) silt loam; massive; friable; many bedding planes; moderately alkaline; calcareous; clear, smooth boundary.

C9—41 to 52 inches, dark-brown (7.5YR 3/2) silt loam; massive; firm; common partly decayed wood fragments; moderately alkaline; calcareous; abrupt, smooth boundary.

C10—52 to 57 inches, brown (7.5YR 5/4) very fine sandy loam; massive; friable; common bedding planes; moderately alkaline; calcareous.

The A horizon is very dark gray, very dark grayish brown, or dark brown. The C horizon is thin layers of dark reddish-brown to brown fine sandy loam to silty clay loam. The A horizon is neutral or mildly alkaline in reaction, and the C horizon is mildly alkaline to moderately alkaline. The A and C horizons are calcareous. Bedrock is many feet beneath the surface.

Norwood soils are near Bruno, Crevasse, Keo, Latanier, and Moreland soils. They contain more silt and clay and less sand than Bruno and Crevasse soils and more clay than Keo soils. Norwood soils formed in loamy sediment rather than in beds of clayey sediment, as did Latanier and Moreland soils.

Norwood silty clay loam (No).—This soil is along the Arkansas River. Slopes are less than 1 percent. Areas range from about 20 to 200 acres in size.

Included with this soil in mapping are a few spots of Norwood soils that are gently undulating. Also included are spots of Bruno, Crevasse, Keo, Latanier, and Moreland soils.

This soil is somewhat difficult to till, because of a high content of clay in the surface layer. Clean-tilled crops that leave a large amount of residue can be safely grown year after year on this soil if it is well managed. In areas that are subject to occasional flooding, cool-season crops are likely to be damaged by floods in some years.

This soil is well suited to crops. Most of the acreage is in soybeans and alfalfa, but a few areas are in cotton, corn, truck crops, grain sorghum, and pasture. This soil is suited to winter small grain. Suitable pasture plants are bermudagrass, bahiagrass, dallisgrass, johnsongrass, tall fescue, and white clover. Capability units I-1 (protected areas) and IIw-1 (occasionally flooded areas); woodland group 2o4.

Perry Series

The Perry series consists of poorly drained, level soils on bottom lands. These soils formed in thick beds of clayey slack-water deposits laid down by the Arkansas River. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is dark yellowish-brown clay about 3 inches thick. The subsoil extends to a depth of 72 inches or more. Its upper 27 inches is mottled, dark-gray and gray clay, and the lower part is dark reddish-brown clay that is mottled below a depth of 61 inches.

Perry soils are moderate to high in natural fertility. Permeability is very slow, and available water capacity is high. When these soils dry, they shrink and crack, and when wet, they expand and the cracks seal.

Where these soils are adequately drained, they are suited to farming. Most areas are cleared, but some are wooded and others have developed for urban uses.

Representative profile of Perry clay, in a moist pasture i the NW¼SW¼SE¼ sec. 23, T. 2 N., R. 11 W.:

Ap—0 to 3 inches, dark yellowish-brown (10YR 3/4) clay; massiv parting to weak, medium, granular structure; fir plastic; few fine roots; medium acid; abrupt, smoc boundary.

B21g—3 to 8 inches, dark-gray (10YR 4/1) clay; few, fine, distir yellowish-brown (10YR 3/4) mottles; moderate, medi subangular blocky structure; firm; plastic; few fine ro few, small, black concretions; few fine pores; medium a clear, smooth boundary.

B22g—8 to 13 inches, dark-gray (10YR 4/1) clay; many, med distinct, light-gray (10YR 7/2) and pale-brown (1 6/3) mottles; weak, medium, subangular blocky struc very firm; plastic; common fine pores; medium acid; smooth boundary.

B23g—13 to 16 inches, dark-gray (10YR 4/1) clay; many, me and coarse, prominent mottles of dark reddish b (2.5YR 3/4) and many, medium, distinct mottles o gray (10YR 7/2) and pale brown (10YR 6/3); mod medium, angular blocky structure; firm; plastic; fe pores; medium acid; clear, smooth boundary.

B24g—16 to 30 inches, gray (10YR 5/1) clay; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, angular blocky structure; firm; plastic; medium acid; gradual, irregular boundary.

IIB25—30 to 61 inches, dark reddish-brown (5YR 3/4) clay; moderate, medium, angular blocky structure; firm; plastic; common slickensides; common black accretions; neutral; gradual, irregular boundary.

IIB26—61 to 72 inches, dark reddish-brown (5YR 3/4) clay; common, medium, prominent, dark-gray (10YR 4/1) mottles; moderate, medium, angular blocky structure; firm; plastic; few slickensides; thin bands of light reddish-brown (5YR 6/4) soft carbonate; moderately alkaline; calcareous.

The A horizon is dark gray, gray, very dark grayish brown, or dark yellowish brown. The B2g horizon is gray or dark gray. Depth to the IIB2 horizon ranges from 20 to 36 inches. The A and B2g horizons are slightly acid or medium acid, and the IIB2 horizon is neutral to moderately alkaline in reaction.

Perry soils are near Latanier and Moreland soils and clayey Umbraqualfs. They formed in thicker beds of clayey sediment than the Latanier soils. They are grayer in the upper part of the profile and more poorly drained than Latanier and Moreland soils. Where the surface layer of Perry soils has a color value of less than 3.5, it is thinner than the surface layer of the clayey Umbraqualfs. Perry soils have a thicker B horizon and are not so acid as the clayey Umbraqualfs.

Perry clay (Pe).—This soil is in low depressions on bottom lands. Slopes are less than 1 percent. This soil has the profile described as representative for the series. Areas range from about 30 to 500 acres in size.

Included with this soil in mapping are a few spots of Latanier and Moreland soils and clayey Umbraqualfs.

Runoff is very slow, and wetness is a severe limitation. Some tracts are subject to frequent flooding in winter and in spring. Because of its high clay content, this soil can be cultivated only within a narrow range of moisture content. Preparing a seedbed and maintaining good tilth are difficult. Farming operations are delayed several days after rains unless surface drains are provided. If this soil is adequately drained and otherwise well managed, clean-tilled crops that leave a large amount of residue can be safely grown year after year.

This soil is suited to crops, and most areas are cultivated. A few small areas are in pasture and woodland. Suitable crops are soybeans, rice, winter small grain, cotton, and grain sorghum. Suitable pasture plants are bermudagrass, dallisgrass, tall fescue, white clover, and vetch. Capability unit IIIw-3 and woodland group 2w6 (protected areas); capability unit IVw-2 and woodland group 3w6 (frequently flooded areas).

Perry-Urban land complex (Pu).—This poorly drained complex consists of Perry soils, and of areas of material, mainly from Perry soils, that has been modified by urban development. Slopes are less than 1 percent. Areas generally range from about 30 to 200 acres in size. Perry soil makes up about 25 to 75 percent of the acreage, and Urban land makes up the rest.

Included with this complex in mapping are spots of Latanier and Moreland soils, areas of clayey Umbraqualfs, and spots subject to frequent flooding.

Runoff is very slow on the Perry soil. Permeability is very slow, and available water capacity is high.

Because of wetness and poor aeration, the soils in this complex are suited to only a limited number of water-tolerant landscaping plants. Because of wetness, low bearing capacity, and high shrink-swell potential, these soils are severly limited for most urban uses. Not assigned to a capability unit or to a woodland group.

Rexor Series

The Rexor series consists of well-drained, level to gently undulating soils on flood plains of local drainageways. These soils formed in alluvium washed from uplands of weathered sandstone and shale. The native vegetation is mixed hardwoods and pines.

In a representative profile the surface layer is dark grayish-brown and dark yellowish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 66 inches or more. The upper 29 inches is strong-brown silt loam, the middle 13 inches is mottled, dark-brown silt loam, and the lower part is mottled, yellowish-red and very pale brown silt loam.

Rexor soils are moderate in natural fertility. Permeability is moderate, and available water capacity is high. Response to fertilizer is good. These soils are easy to till. They generally are not suited to cultivated crops, however, because they are subject to flooding several times each year, and at least once during the growing season.

Most areas of these soils are cleared and are used for pasture and meadow. A few small tracts have been developed for urban uses.

Representative profile of Rexor silt loam, frequently flooded, in a moist pasture in the NW¼NW¼NW¼ sec. 4, T. 1 S., R. 13 W.:

Ap1—0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many fine roots; medium acid; clear, smooth boundary.

Ap2—0 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable; common fine roots; medium acid; abrupt, smooth boundary.

B1—8 to 19 inches, strong-brown (7.5YR 5/8) silt loam; weak, fine and medium, subangular blocky structure; friable; common fine roots; many fine and medium pores; medium acid; gradual, smooth boundary.

B21t—19 to 25 inches, strong-brown (7.5YR 5/8) silt loam; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; thin, patchy clay films on faces of peds, in pores, and in cavities; medium acid; gradual, smooth boundary.

B22t—25 to 37 inches, strong-brown (7.5YR 5/6) silt loam; few, fine, faint, light yellowish-brown (10YR 3/4) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; common, thin, patchy clay films on faces of peds, in pores, and in cavities; medium acid; clear, smooth boundary.

B23t—37 to 50 inches, dark-brown (7.5YR 4/4) silt loam; many, medium, distinct, very pale brown (10YR 7/4) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; many fine and medium pores; few wormholes; few thick clay films and common, thin, patchy clay films on faces of peds, in pores, and in cavities; medium acid; clear, smooth boundary.

B24t—50 to 66 inches, mottled, yellowish-red (5YR 4/8) and very pale brown (10YR 7/3) silt loam; moderate, medium, subangular blocky structure; friable; few fine roots; many fine pores; few, thin, patchy clay films on faces of peds; common, large, black accretions; medium acid.

The Ap horizon is dark grayish brown, brown, dark brown, or dark yellowish brown. The B1 horizon is strong brown or dark yellowish brown. In some places the B1 horizon has dark-brown mottles. The upper layers of the Bt horizon are brown, dark-brown, strong-brown, yellowish-brown, or dark yellowish-brown silt loam or silty clay loam. In many places the B23t horizon and lower layers are mottled with yellowish red, very pale brown, light brownish gray, grayish brown, or gray. Reaction is medium acid to very strongly acid throughout.

Rexor soils are near Amy and Leadvale soils. They are better drained than these soils. They are browner below the A horizon than Amy soils, and they lack the mottled fragipan of Leadvale soils.

Rexor silt loam, frequently flooded (Re).—This well-

TABLE 3.—*Predicted average yields per acre of principal crops and pasture*

[Absence of a figure indicates that the crop is not suited to the specific soil or is not commonly grown on it. Predicted yields are not included for mapping units that consist of a high percentage of Urban land]

Soil	Cotton	Soybeans	Rice	Wheat	Bermudagrass	Bahiagrass	Tall fescue
	Lbs of lint	*Bu*	*Bu*	*Bu*	*AUM*[1]	*AUM*[1]	*AUM*[1]
Amy silt loam	450	25			6.0	7.5	6.0
Amy silt loam, frequently flooded					6.0	7.5	
Amy complex, undulating					6.5	7.5	6.5
Bruno fine sandy loam	400	20		35	5.5	6.0	
Carnasaw gravelly silt loam, 3 to 8 percent slopes					5.0	5.5	4.0
Carnasaw gravelly silt loam, 8 to 12 percent slopes					4.5	5.0	4.0
Carnasaw-Mountainburg association, undulating							
Carnasaw-Mountainburg association, steep							
Crevasse fine sand	350	15		25	4.0		
Guthrie-Leadvale complex, undulating					6.5	7.5	6.5
Keo silt loam	850	40		40	8.5	9.0	8.0
Latanier silty clay	650	35	120		7.5	8.0	7.5
Leadvale silt loam, 1 to 3 percent slopes		30		35	6.5	7.5	7.0
Leadvale silt loam, 3 to 8 percent slopes		25		30	6.5	7.0	6.5
Linker gravelly fine sandy loam, 3 to 8 percent slopes		20		25	6.0	6.5	5.0
Linker-Mountainburg association, moderately steep							
Moreland silty clay	650	35	130		7.0	7.5	6.5
Mountainburg stony fine sandy loam, 3 to 12 percent slopes					4.0	4.5	
Norwood silty clay loam	850	40		40	8.5	9.0	8.0
Perry clay	500	35	130		6.5		7.5
Rexor silt loam, frequently flooded					7.0	7.0	
Rilla silt loam, 0 to 1 percent slopes	850	40		40	8.5	9.0	8.5
Rilla silt loam, 3 to 5 percent slopes	800	35		40	8.5	9.0	8.5
Rilla-Perry complex, undulating	750	35			8.0	8.5	8.0
Sallisaw gravelly silt loam, 1 to 3 percent slopes		30		35	7.5	7.5	7.0
Sallisaw gravelly silt loam, 3 to 8 percent slopes		25		30	6.5	7.0	7.0
Sallisaw-Leadvale association, undulating							
Smithdale fine sandy loam, 3 to 8 percent slopes		25		30	6.5	7.0	6.5
Smithdale fine sandy loam, 8 to 12 percent slopes					5.5	6.0	
Tiak fine sandy loam, 1 to 3 percent slopes					5.0	5.5	4.0
Umbraqualfs, clayey		30			6.5		7.0
Wrightsville silt loam	450	25	120		7.0	7.5	7.0

[1] Animal-unit-months represent the number of months that 1 acre will provide grazing for one animal-unit (1,000 pounds live weight), or the number of months the pasture can be grazed multiplied by the number of animal units an acre will support. For example, 1 acre of Keo silt loam in an improved pasture of tall fescue will provide grazing for two animals for 4 months, so it has a rating of 8 animal-unit-months.

6. Fertilizers are applied according to soil tests and crop needs.
7. Adapted crop varieties are used at recommended seeding rates.

For rice, the following additional practices are applied:

8. Suitable quality of irrigation water is used.
9. Irrigation is timed to suit the needs of the soil and crop.
10. Irrigation systems are properly designed and efficiently used.

Wildlife[4]

Soils directly influence the kind and amount of vegetation and the amount of water available. In this way soils indirectly influence the kind of wildlife that can live in an area. Soil properties that affect the growth of wildlife habitat are (1) thickness of soil useful to crops, (2) surface texture, (3) available water capacity, (4) wetness, (5) flood hazard, (6) slope, and (7) permeability of the soil to air and water.

In table 4 the soils of Pulaski County are rated for their relative suitability for seven elements of wildlife habitat and three groups, or kinds, of wildlife. Ratings were not made for Urban land and for mapping units in which Urban land is a major component.

Each soil in table 4 is rated according to its suitability for producing various kinds of plants and other elements that make up wildlife habitat. The ratings mainly take into account the characteristics of the soils and closely related natural factors of the environment. They do not take into account climate, present use of soils, or present distribution of wildlife and people. For this reason, selection of an area

[4] ROY A. GRIZZELL, biologist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 4.—*Suitability of the soils for elements of wildlife habitat and kinds of wildlife*

Soils	Elements of wildlife habitat							Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood plants	Coniferous plants	Wetland plants	Shallow-water developments	Openland	Woodland	Wetland
Amy silt loam	Poor	Fair	Fair	Good	Fair	Good	Good	Fair	Good	Good.
Amy silt loam, frequently flooded	Poor	Fair	Fair	Good	Fair	Good	Poor	Fair	Good	Fair.
Amy complex, undulating	Poor	Fair	Fair	Good	Fair	Good	Fair	Fair	Good	Fair.
Bruno fine sandy loam	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Carnasaw gravelly silt loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Carnasaw gravelly silt loam, 8 to 12 percent slopes	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Carnasaw-Mountainburg association, undulating:										
Carnasaw part	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Mountainburg part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Carnasaw-Mountainburg association, steep:										
Carnasaw part	Poor to very poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Mountainburg part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Crevasse fine sand	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Guthrie-Leadvale complex, undulating	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Keo silt loam	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Latanier silty clay	Fair	Fair	Fair	Good	Poor	Good	Good	Fair	Good	Good.
Leadvale silt loam, 1 to 3 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Leadvale silt loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Linker gravelly fine sandy loam, 3 to 8 percent slopes	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
Linker-Mountainburg association, *moderately steep:*										
Linker part	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Mountainburg part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Moreland silty clay	Fair	Fair	Fair	Good	Poor	Good	Good	Fair	Good	Good.
Mountainburg stony fine loam, 3 to 12 percent slopes	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Norwood silty clay loam	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Perry clay	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Rexor silt loam, frequently flooded	Poor	Fair	Fair	Good	Good	Poor	Very poor	Fair	Good	Very poor.
Rilla silt loam, 0 to 1 percent slopes	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Rilla silt loam, 3 to 5 percent slopes	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Rilla-Perry complex, undulating	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Sallisaw gravelly silt loam, 1 to 3 percent slopes	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Sallisaw gravelly silt loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Salllsaw-Leadvale association, undulating:										
Sallisaw part	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Leadvale part	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Smithdale fine sandy loam, 3 to 8 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Smithdale fine sandy loam, 8 to 12 percent slopes	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Tiak fine sandy loam, 1 to 3 percent slopes	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Umbraqualfs, clayey	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Wrightsville silt loam	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

for development as a habitat for wildlife requires inspection at the site.

A rating of *good* means the element of wildlife habitat and kinds of wildlife generally are easily created, improved, and maintained. Few or no limitations affect management in this category, and satisfactory results are expected when the soil is used for the prescribed purpose.

A rating of *fair* means the element of wildlife habitat and kinds of wildlife can be established, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention may be required for satisfactory results.

A rating of *poor* means the element of wildlife habitat and limitations for the designated kinds of wildlife are severe. Habitats can be created, improved, or maintained in most places, but management is difficult and requires intensive effort.

A rating of *very poor* means use of the soil for the elements of wildlife habitat are very severe and that unsatisfactory results are to be expected. It is either impossible or impractical to create, improve, or maintain habitats on soils in this category.

In the following paragraphs the elements of wildlife habitat rated in table 4 are briefly described.

Grain and seed crops are annual grain-producing plants, such as corn, sorghum, millet, and soybeans.

Grasses and legumes are domestic grasses and legumes that are established by planting. They provide food and cover for wildlife. Grasses include bahiagrass, ryegrass, and panicgrass; legumes include annual lespedeza, shrub lespedeza, and other clovers.

Wild herbaceous plants are native or introduced perennial grasses, forbs, and weeds that provide food and cover for upland wildlife. Beggarweed, perennial lespedeza, wildbean, pokeweed, and cheatgrass are typical examples.

Hardwood plants are nonconiferous trees, shrubs, and woody vines that produce wildlife in the form of fruits, nuts, buds, catkins, or browse. Such plants commonly grow in their natural environment, but they can be planted and developed through wildlife management programs. Typical species in this category are oak, beech, cherry, dogwood, maple, viburnum, grape, honeysuckle, greenbrier, and silverberry.

Coniferous plants are cone-bearing trees and shrubs that provide cover and frequently furnish food in the form of browse, seeds, or fruitlike cones. They commonly grow in their natural environment, but they can be planted and managed. Typical plants in this category are pines, cedars, and ornamental trees and shrubs.

Wetland plants are annual and perennial herbaceous plants that grow wild on wet or moist sites. They furnish food and cover mostly for wetland wildlife. Typical examples of plants are smartweed, wild millet, spikerush and other rushes, sedges, burreed, tearthumb, and aneilema. Submerged and floating aquatics are not included in this category.

Shallow-water developments are impoundments or excavations for controlling water, generally not more than 5 feet deep, to create habitats that are suitable for waterfowl. Some are designed to be drained, planted, and then flooded; others are permanent impoundments that grow submerged aquatics.

Table 4 also rates soils according to their suitability as habitat for the three kinds of wildlife in the county—openland, woodland, and wetland. These ratings are related to ratings made for the elements of habitat. For example, soils rated very poor for shallow-water developments are rated very poor for wetland wildlife. The kinds of wildlife rated in table 4 are briefly described in the following paragraphs.

Openland wildlife are birds and mammals that normally live in meadows, pastures, and open areas where grasses, herbs, and shrubbery plants grow. Quail, doves, meadowlarks, field sparrows, cottontail rabbit, and fox are typical examples of openland wildlife.

Woodland wildlife are birds and mammals that normally live in wooded areas of hardwood trees, coniferous trees, and shrubs. Woodcock, thrushes, wild turkey, vireos, deer, squirrels, and raccoon are typical examples of woodland wildlife.

Wetland wildlife are birds and mammals that normally live in wet areas, marshes, and swamps. Duck, geese, rail, shore birds, heron, mink, and muskrat are typical examples of wetland wildlife.

Woodland[5]

Originally, the land area of Pulaski County, except for river sandbars, was wooded. Within the woodlands on the uplands were scattered tracts of savanna, where the open stand of forest trees had an understory of tall native grasses. In 1969 only about 49 percent of the county, including about 28,000 acres in public ownership, was woodland. Since that time urban expansion has engulfed another several thousand acres of woodland.

Good stands of commercial trees are produced in the woodlands of the southern and western parts of the county. Woodlands of fair quality are in the northern part. Needleleaf forest types occur most frequently on the uplands, and broadleaf types generally predominate on the bottom lands along the creeks and rivers.

The value of the wood products is substantial, though it is below its potential. Other values of these areas include grazing, wildlife, recreation, natural beauty, and conservation of soil and water. This section has been provided to explain how soils affect tree growth and management in the county. In table 5 potential productivity and management concerns of the soils of Pulaski County are listed.

Some of the column headings in table 5 are explained in the following paragraphs.

Soils are placed in woodland groups according to their suitability for trees, their response to management, and their potential productivity.

Each woodland group is identified by a three-part symbol. The first part of the symbol indicates the relative productivity of the soils: 1 = very high; 2 = high; 3 = moderately high; 4 = moderate; and 5 = low. The second part of the symbol, a letter, indicates the important soil property that imposes a moderate or severe hazard or limitation in managing the soils for wood production. The letter *x* shows that the main limitation is stoniness or rockiness; *w* shows that excessive water in or on the soil is the chief limitation; *t* shows that toxic substances in the soil are the chief limitation; *d* shows that the rooting depth is restricted; *c* shows that clay in the upper part of the soil is a limitation; *s* shows that the soils

[5] MAX D. BOLAR, woodland conservationist, and IVAN R. PORTER, range conservationist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 5.—*Use and management of the soils for wood crops and woodland forage*[1]—Continued

Soil series and map symbols	Woodland group	Potential productivity		Understory vegetation used as forage		Hazards and limitations			Species preferred for planting
		Important wood crops	Site index[2]	Important plants	Estimated yields for medium canopy	Erosion hazard	Equipment limitations	Seedling mortality	
					Lbs per acre				
Norwood: No	2o4	Eastern cottonwood. Sweetgum Sycamore Southern red oak Water oak Green ash	100 90 --- --- --- ---	Switchcane, switchgrass, bluestems, Virginia wildrye, uniolas, sedges, low panicums, vines, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Slight	Slight	Eastern cottonwood, sycamore, sweetgum, Shumard oak, cherrybark oak, black walnut.
Perry: Pe:									
Protected part	2w6	Sweetgum Green ash Eastern cottonwood. Water oak	90 70 90 ---	Switchgrass, eastern gamagrass, Virginia wildrye, broadleaf uniola, beaked panicum, redtop panicum, velvetgrass, sedges, rushes.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Moderate	Eastern cottonwood, sweetgum, willow oak, Nuttall oak, water oak, swamp chestnut oak, green ash.
Frequently flooded part	3w6	Sweetgum Green ash Eastern cottonwood. Water oak	80 70 85 ---	Switchgrass, eastern gamagrass, Virginia wildrye, broadleaf uniola, beaked panicum, redtop panicum, velvetgrass, sedges, rushes.	Unfavorable years, 1,000; favorable years, 2,000.	Slight	Severe	Severe	Eastern cottonwood, sweetgum, willow oak, Nuttall oak, water oak, swamp chestnut oak, green ash.
Rexor: Re	2w8	Loblolly pine Sweetgum Cherrybark oak	90 90 90	Switchgrass, indiangrass, Virginia wildrye, uniolas, sedges, forbs.	Unfavorable years, 2,500; favorable years, 3,000.	Moderate	Slight	Slight	Loblolly pine, sweetgum, cherrybark oak.
Rilla:									
RmA, RmC	2o4	Eastern cottonwood. Cherrybark oak Nuttall oak Water oak Sweetgum	100 100 85 85 100	Switchcane, Virginia wildrye, switchgrass, uniolas, sedges, low panicums, vines, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Slight	Slight	Eastern cottonwood, sweetgum, sycamore, cherrybark oak, Nuttall oak, willow oak, black walnut.
RpB	2w5	Eastern cottonwood. Cherrybark oak Nuttall oak Water oak Sweetgum	100 100 85 85 100	Switchcane, Virginia wildrye, switchgrass, uniolas, sedges, low panicums, vines, forbs.	Unfavorable years, 3,000; favorable years, 4,000.	Slight	Moderate	Slight	Eastern cottonwood, sweetgum, sycamore, cherrybark oak, Nuttall oak, willow oak, black walnut.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO	Coarse fraction greater than 3 inches
	Inches	*Feet*	*Inches*				
Norwood: No[2]	>72	>6	0–8	Silty clay loam	CL	A-6 or A-7	----------
			8–35	Silt loam and silty clay loam.	CL	A-4, A-6, or A-7	----------
			35–57	Silt loam and very fine sandy loam.	ML, CL-ML, or CL	A-4 or A-6	----------
*Perry: Pe[2], Pu. Urban land part of Pu is too variable to estimate.	>72	0–1	0–30	Clay	CH	A-7	----------
			30–72	Clay	CH	A-7	----------
*Rexor[2]: Re, Rf. Urban land part of Rf is too variable to estimate.	>72	3–4	0–66	Silt loam	ML, CL-ML, or CL	A-4 or A-6	----------
*Rilla: RmA, RmC, RpB, RuA. For Perry part of RpB, see Perry series. Urban land part of RuA is too variable to estimate.	>72	>6	0–7	Silt loam	ML, CL-ML, or CL	A-4	----------
			7–54	Silt loam and silty clay loam.	CL	A-4 or A-6	----------
			54–72	Very fine sandy loam and silt loam.	ML, CL-ML, or CL	A-4 or A-6	----------
*Saffell: SfC. Urban land part is too variable to estimate.	>72	>6	0–7	Gravelly fine sandy loam.	SM or ML	A-2 or A-4	----------
			7–44	Gravelly loam	GC or SC	A-2	----------
			44–72	Gravelly fine sandy loam.	GM-GP or GM	A-1 or A-2	----------
*Sallisaw: SgB, SgC, ShC, SKC. Urban land part of ShC is too variable to estimate. For Leadvale part of SKC, see Leadvale series.	>72	>6	0–7	Gravelly silt loam	SM, ML, or GM	A-4	0–10
			7–27	Silt loam	CL	A-4 or A-6	----------
			27–72	Gravelly silt loam	GC or SC	A-2, A-4, A-6	----------
*Smithdale: StC, StD, SuC. Urban land part of SuC is too variable to estimate.	>72	>6	0–5	Fine sandy loam	SM or ML	A-4	----------
			5–16	Clay loam	CL	A-4 or A-6	----------
			16–72	Sandy loam	SM or ML	A-4	----------
*Tiak: TaB, TuC. Urban land part of TuC is too variable to estimate.	>72	2–3	0–10	Fine sandy loam and loam.	SM or ML	A-4	----------
			10–72	Silty clay	CL or CH	A-7	----------
Umbraqualfs: Um[2]	>72	0–1	0–11	Silty clay	CH	A-7	----------
			11–60	Silty clay and clay	CH	A-7	----------
Urban land: Ut. Properties too variable to estimate; onsite investigation required.							
*Wrightsville: Wt, Wu. Urban land part of Wu is too variable to estimate.	>72	0–1	0–24	Silt loam	ML or CL-ML	A-4	----------
			24–69	Silty clay and clay	CH	A-7	----------
			69–72	Clay	CH	A-7	----------

[1] These values should not be confused with the coefficient "K" used by engineers.
[2] All or part of these soils is subject to flooding.
[3] NP means nonplastic.

significant to engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability[1]	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
					Percent	*Inches per hour*	*Inches per inch of soil*	*pH*			
-------	100	95–100	90–100	30–45	15–25	0.6–2.0	0.18–0.22	6.6–7.8	Moderate	Low to moderate.	Low.
-------	100	95–100	85–100	20–45	8–25	0.6–2.0	0.16–0.24	7.4–8.4	Low to moderate.	Low to moderate.	Low.
-------	100	95–100	70–95	20–40	4–20	0.6–2.0	0.13–0.24	7.4–8.4	Low	Low	Low.
-------	-------	100	95–100	51–80	30–50	<0.06	0.12–0.18	5.6–6.5	High	High	Low.
-------	-------	100	95–100	55–80	30–50	<0.06	0.12–0.18	6.6–8.4	High	High	Low.
-------	100	95–100	80–95	25–35	4–15	0.6–2.0	0.16–0.24	4.5–6.0	Low	Low	Moderate to high.
-------	100	95–100	90–100	<30	NP–10	0.6–2.0	0.16–0.24	5.1–7.3	Low	Low	Moderate to low.
-------	100	95–100	90–100	25–40	8–25	0.6–2.0	0.16–0.24	4.5–5.5	Moderate	Low	Moderate to high.
-------	100	95–100	70–95	20–40	4–20	0.6–2.0	0.13–0.24	5.1–7.3	Low	Low	Moderate to low.
70–85	60–75	50–70	30–60	-------	NP	2.0–6.0	0.07–0.10	4.5–5.5	Low	Low	Moderate to high.
40–70	30–50	25–45	20–35	20–30	8–15	0.6–2.0	0.07–0.10	4.5–5.5	Low	Low	Moderate to high.
35–50	10–35	10–25	5–20	<35	NP–10	2.0–6.0	0.03–0.07	4.5–5.5	Low	Low	Moderate to high.
70–90	60–80	55–75	45–70	<35	NP–10	0.6–2.0	0.12–0.22	5.1–6.0	Low	Low	Moderate.
80–95	70–90	65–85	55–80	25–40	8–20	0.6–2.0	0.14–0.22	5.1–6.0	Low	Low	Moderate.
30–70	20–50	20–45	15–40	25–40	8–20	0.6–6.0	0.05–0.12	5.1–6.0	Low	Low	Moderate.
95–100	90–100	75–90	40–60	-------	NP	2.0–6.0	0.11–0.15	4.5–7.3	Low	Low	Low to high.
95–100	90–100	80–95	70–80	20–40	8–15	0.6–2.0	0.15–0.20	4.5–5.5	Low	Low	Moderate to high.
95–100	90–100	70–85	40–55	-------	NP	2.0–6.0	0.10–0.14	4.5–5.5	Low	Low	Moderate to high.
95–100	95–100	75–95	45–80	<35	NP–10	0.6–2.0	0.11–0.20	4.5–6.0	Low	Moderate	Moderate to high.
-------	-------	100	90–100	45–65	20–35	0.06–0.2	0.14–0.18	4.5–5.5	High	High	Moderate to high.
-------	-------	100	95–100	51–70	25–45	<0.06	0.14–0.18	4.5–5.5	High	High	High.
-------	-------	100	95–100	55–80	30–50	<0.06	0.12–0.18	<4.5–5.5	High	High	High.
-------	100	95–100	90–100	<30	NP–7	0.2–0.6	0.16–0.24	4.5–5.5	Low	High	Moderate.
-------	100	95–100	90–100	51–65	30–40	<0.06	0.12–0.18	4.5–5.5	High	High	Moderate to high.
-------	100	95–100	90–100	55–70	30–45	<0.06	0.12–0.18	4.5–7.3	High	High	Low to high.

TABLE 10.—*Degree and kind of limitations of the soils for recreational use*—Continued

Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails
Tiak: TaB, TuC. Urban land part of TuC is too variable to estimate.	Moderate: slow permeability	Generally moderate: slow permeability; slope. Severe where slope is greater than 6 percent.	Slight	Slight.
Umbraqualfs: Um	Severe: poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: poorly drained; very slow permeability; clayey surface layer; poor trafficability.	Severe: poorly drained; clayey surface layer; poor trafficability.	Severe: poorly drained; clayey surface layer; poor trafficability.
Urban land: Ut. Limitations too variable to estimate; onsite investigation needed.				
Wrightsville: Wt, Wu. Urban land part of Wu is too variable to estimate.	Severe: poorly drained; very slow permeability.	Severe: poorly drained; very slow permeability.	Severe: poorly drained	Severe: poorly drained.

The interaction of the five factors of soil formation is more complex for some soils than for others. The five factors, and how they interact to form some of the soils in the county, are discussed in the following paragraphs.

Parent material

In Pulaski County, the soils formed in two general kinds of parent material. In the southeastern third of the county, the parent materials are unconsolidated sediment ranging in age from the Tertiary Period through the Recent Epoch. In most of the rest of the county, the soils formed in material that weathered from consolidated bedrock of the Ordovician Period through the Pennsylvanian Period.

Alluvium deposited by the Arkansas River is the chief parent material on the flood plain from the northwest to the vicinity of Little Rock, and on the bottom lands in the eastern part of the county. This alluvium is a mixture of minerals derived from many kinds of soil, rock, and unconsolidated material. It washed downstream from the Arkansas River basin, which extends from the Rocky Mountains and includes parts of Colorado, New Mexico, Texas, Kansas, Oklahoma, and Arkansas. This sediment had a high content of bases and weatherable minerals, and some was calcareous.

The sandier sediment was deposited on parts of natural levees adjacent to the stream channel. Crevasse and Bruno soils formed in this sediment. Young loamy sediment deposited near the stream channel makes up the natural levees on which the Keo and Norwood soils formed. Similar, but older, loamy deposits are the parent materials of the Rilla soils. The clayey sediment deposited some distance away from the channel in the slack-water bays is the material in which the clayey Umbraqualfs and the Moreland and Perry soils formed. Latanier soils formed in areas where the meander pattern of the river had changed and thin clayey deposits were laid down in younger backswamps over loamy sediment of former natural levees. All of these soils have high base saturation and medium to high content of weatherable minerals, and some, like the Norwood soils, are calcareous.

The parent materials of soils on the coastal plain were deposited in the Gulf of Mexico when it covered southern and eastern Arkansas. These materials extend diagonally across the county from Jacksonville through Little Rock. They consist mainly of clayey and loamy sediment. Some strata have a high content of quartz and chert pebbles. This sediment is low in bases and weatherable minerals. In places where clayey sediment was the dominant parent material, Tiak and Wrightsville soils formed. Where the loamy sediment was dominant, Smithdale and Amy soils formed. Saffell soils formed in areas that had loamy sediment with a high content of pebbles. All of these soils but the Wrightsville soils are low in bases and weatherable minerals.

The Ouachita Mountains area covers the western part of the county. In this area, the soils formed mainly in residuum from moderately hard to hard bedrock of nine geological formations (*6*). These rock layers have been folded and faulted and in many places are tilted toward the vertical. The soils formed in material weathered mainly from the upturned, broken edges of the rocks. The rock layers include shale, slate, sandstone, chert, and novaculite. Carnasaw soils formed in areas where the shale and slate were the dominant parent materials. These are moderately deep soils that have a clayey B horizon. The shallow, loamy Mountainburg soils formed in areas where the sandstone, chert, and novaculite were the dominant parent materials. Carnasaw soils have an irregular boundary at the soil-rock contact, probably because the shale and slate are tilted and the degree of weathering has varied along the upturned edges.

Parent materials of soils along the drainageways in the Ouachita Mountains area are mainly loamy sediment that washed from the surrounding hills and mountains. Soils that formed in this sediment are mainly of the Leadvale, Rexor, and Sallisaw series.

Igneous rock is the parent material for soils in a small area at the eastern end of the Ouachita Mountains. This area is along the southeastern edge of Little Rock. The rock is nephelite syenite. Linker and Mountainburg soils formed in the regolith weathered from this rock.

The parent materials in the northern part of the county range from slightly tilted and faulted to level-bedded acid sandstone and shale of the Atoka Formation (*4, 6*). These sedimentary rocks include coarse-grained sandstone, shaly sandstone, sandy shale, and clayey shale, all of which are interbedded. Leadvale and Guthrie soils formed in the valleys where the shale or sediment that washed from adjacent uplands are the dominant materials. On the ridges and low mountains, sandstone is the dominant rock. Linker and Mountainburg soils formed in residuum in these areas.

Climate

The climate of Pulaski County is characterized by mild winters, warm or hot summers, and generally abundant rainfall. The generally warm temperatures and high precipitation probably are similar to the climate under which the soils in the county formed.

The warm, moist climate promotes rapid soil formation and rapid chemical reaction. The large amount of water that moves through the soil is instrumental in removing dissolved or suspended materials. Plant remains decompose rapidly, and the organic acid thus formed hastens the removal of carbonates and the formation of clay minerals. Because the soil is frozen only to a shallow depth, and for short periods, soil formation continues almost the year round. The climate throughout the county is relatively uniform, though its effect is modified locally by runoff. Climate alone does not account for differences in the soils of the county.

Living organisms

Higher plants and animals, as well as insects, bacteria, and fungi, are important in the formation of soils. Living organisms help to increase the content of organic matter and nitrogen in the soil, to increase or decrease the supply of plant nutrients, and to change structure and porosity.

Before Pulaski County was settled, the native vegetation had more influence on soil formation than did animal activity. The northern part of the county was covered by forests and small areas of savanna.

The native vegetation in the swamp areas was mainly baldcypress and water tupelo. Some Perry soils and the clayey Umbraqualfs formed in these areas. On the poorly drained to well-drained flood plains and natural levees, the trees were chiefly cottonwood, black willow, hackberry, elm, sycamore, ash, oak, hickory, and pecan. Bruno, Crevasse, Keo, Latanier, Norwood, Moreland, and Rilla soils and some Perry soils formed in these areas. The differences in these soils are mainly caused by parent material, age, and relief.

In the coastal plain area, the native vegetation was mixed stands of shortleaf and loblolly pines, oak, and hickory. Amy and Cahaba soils and some Leadvale, Saffell, Smithdale, Tiak, and Wrightsville soils formed in these areas. They differ chiefly in parent material and relief. Rexor soils and some Amy soils formed along drainageways where the native vegetation was mainly mixed hardwoods.

In the Ouachita Mountains in the western part of the county, the native vegetation was upland oaks, hickory, and shortleaf pine. Carnasaw and Mountainburg soils formed in material that remained in place, and Leadvale and Sallisaw soils formed on stream terraces in this area.

In the Arkansas Valley and Ridges area, which stretches across most of the northern part of the county, the native vegetation was mainly shortleaf pine, upland oaks, and hickory. Guthrie, Leadvale, Linker, and Mountainburg soils formed in this area. Within this area were scattered tracts of savanna. In these savannas the vegetation was scattered trees, mainly oak, and an understory of tall native grasses. Some Linker and Mountainburg soils formed in these areas.

Man is influencing the formation of the soils by clearing forests and tilling the soil; introducing new plants; fertilizing; applying chemicals for insect, disease, and weed control; improving drainage; and controlling floods. Man has had his strongest and most destructive effect on formation of soils in urban areas by cutting and filling, compacting, and covering with roof and pavement. Even in many of the areas that have remained in woodland, man is influencing soil formation through woodland management practices such as selective harvesting, timber stand improvement, and planting pure stands of preferred species. Only a few results of man's activities can be seen now in rural areas, such as changes in structure, color, organic-matter content, nutrient content, and thickness of the surface horizon, or plow layer. Many of the results of man's activities will probably not be evident for several centuries.

Relief

Relief is inequalities in elevation, brought about in Pulaski County chiefly by faulting and folding, and the subsequent entrenchment of drainage channels into the land surface. The highest elevation in the county, about 1,068 feet above sea level, is in the western part of the county. The lowest elevation, about 213 feet above sea level, is in the southeastern part of the county at the Arkansas River.

Some of the greatest differences in the soils of Pulaski County are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil. Relief ranges from near-vertical bluffs to broad flats.

Generally, the steeper slopes and narrow ridges have lost so much soil material through geologic erosion that the soils on them—Mountainburg soils, for example—are shallow. In contrast, the broad, level or gently sloping areas have lost little soil material, and the soils in these areas—Linker, Leadvale, and Guthrie, for example—are moderately deep or deep.

The flood plain of the Arkansas River is level to nearly level and was subject to frequent overflow before flood-control dams were built on the river and its tributaries. The floodwaters, loaded with soil particles, move at different speeds, depending partly on the topography. The rapidly moving waters deposit sandy sediment similar to that in which the Crevasse soils formed. The waters moving less rapidly deposit mixed sediment high in silt, and the Keo, Norwood, and Rilla soils formed in this material. The slack or still waters caught in flood bays and broad flats deposit clayey sediment, and Perry soils formed in this material.

The coastal plain in the eastern and south-central parts of the county is level to rolling. Most of the sloping areas and the ridgetops are well drained or moderately well drained. The Saffell, Smithdale, and Tiak soils formed in these areas. On the level and nearly level flats and depressions, the poorly drained Amy and Wrightsville soils formed.

Time

The length of time required for soil formation depends largely on other factors of soil formation. Generally, less time is required if the climate is warm and humid and the vege-

tation luxuriant. If other factors are equal, less time is also required where the parent material is loamy than where it is clayey.

In terms of geological time, most of the soils of Pulaski County are old, regardless of whether they are on mountaintops, mountainsides, or stream terraces. The young soils formed either in alluvium along streams or in residual material where geologic erosion has nearly kept pace with weathering of the bedrock.

Some of the soils on the uplands are examples of old soils. They formed in material weathered from sandstone, quartzite, and shale ranging in age from Pennsylvanian to Ordovician. Most are old enough that nearly all of the cations have been leached out, the reaction is strongly acid or very strongly acid, there has been considerable weathering and translocation of clay, and the horizons are clearly expressed. Iron, as well as clay, has been translocated from the A horizon to the B horizon and then oxidized, causing the B horizon to have stronger red, brown, and yellow colors than the A horizon. Carnasaw and Linker soils clearly show the impact of time, acting with other soil-forming factors, on the parent material.

The Norwood and Bruno soils are examples of very young soils. They formed in recent alluvium on the flood plain of the Arkansas River. No definite horizons have formed below the A horizon. Instead, these soils still have the depositional rock structure, or bedding planes, and little or no soil structure. Base saturation is high, and the reaction is neutral to moderately alkaline, which indicates that leaching has been slight. The organic-matter content decreases irregularly with increasing depth. Except for the slight mechanical changes caused by worms and roots, there is little evidence of soil-forming activity.

Processes of Horizon Differentiation

In this section a brief definition of the horizon nomenclature and processes responsible for soil formation are given. The marks that the soil-forming factors leave on the soil are recorded in the soil profile, which is a succession of layers, or horizons, from the surface to the parent rock. The horizons differ in one or more properties, such as color, texture, structure, consistence, and porosity. Most soil profiles contain three major horizons, called A, B, and C. Very young soils do not have a B horizon.

The A horizon can be the horizon of maximum accumulation of organic matter, which is called the A1 horizon or the surface layer, or it can be the horizon of maximum leaching of dissolved or suspended materials, which is called the A2 horizon, or the subsurface layer.

The B horizon lies immediately beneath the A horizon and is sometimes called the subsoil. It is a horizon of maximum accumulation of suspended materials, such as clay and iron. Commonly, the B horizon has blocky structure and is firmer than the horizons immediately above and below it.

Beneath the B horizon is the C horizon, which has been little affected by the soil-forming processes, though the C horizon can be materially modified by weathering. In some young soils, the C horizon immediately underlies the A horizon and has been slightly modified by living organisms as well as by weathering.

Several processes have been active in the formation of soil horizons in Pulaski County. Among these processes are (1) the accumulation of organic matter, (2) the leaching of bases, (3) the oxidation or reduction and transfer of iron, and (4) the formation and translocation of silicate clay minerals. In most of the soils of the county, more than one of these processes has been active in soil formation.

Physical weathering of rocks through heating and cooling and through wetting and drying slowly breaks the rocks into small pieces that form the parent material for the residual soils in the county. This is most evident in the Linker and Mountainburg soils.

Accumulation of organic matter in the upper part of the profile to form an A1 horizon has been an important process of soil formation. The A1 horizon is evident in profiles that have a light-colored subsurface layer from which organic

TABLE 11.—*Classification of soil series*

Series	Family	Subgroup	Order
Amy	Fine-silty, siliceous, thermic	Typic Ochraquults	Ultisols.
Bruno	Sandy, mixed, thermic	Typic Udifluvents	Entisols.
Carnasaw	Clayey, mixed, thermic	Typic Hapludults	Ultisols.
Crevasse	Mixed, thermic	Typic Udipsamments	Entisols.
Guthrie[1]	Fine-silty, siliceous, thermic	Typic Fragiaquults	Ultisols.
Keo	Coarse-silty, mixed, thermic	Dystric Fluventic Eutrochrepts	Inceptisols.
Latanier	Clayey over loamy, mixed, thermic	Vertic Hapludolls	Mollisols.
Leadvale	Fine-silty, siliceous, thermic	Typic Fragiudults	Ultisols.
Linker	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols.
Moreland	Fine, mixed, thermic	Vertic Hapludolls	Mollisols.
Mountainburg	Loamy-skeletal, siliceous, thermic	Lithic Hapludults	Ultisols.
Norwood	Fine-silty, mixed (calcareous), thermic	Typic Udifluvents	Entisols.
Perry	Very fine, montmorillonitic, nonacid, thermic	Vertic Haplaquepts	Inceptisols.
Rexor	Fine-silty, siliceous, thermic	Ultic Hapludalfs	Alfisols.
Rilla	Fine-silty, mixed, thermic	Typic Hapludalfs	Alfisols.
Saffell	Loamy-skeletal, siliceous, thermic	Typic Hapludults	Ultisols.
Sallisaw	Fine-loamy, siliceous, thermic	Typic Paleudults	Alfisols.
Smithdale	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols.
Tiak	Clayey, mixed, thermic	Aquic Paleudults	Ultisols.
Wrightsville	Fine, mixed, thermic	Typic Glossaqualfs	Alfisols.

[1] The Guthrie soils in this survey area are taxadjuncts to the series. They are outside the range of the Guthrie series in that they have patchy clay films and are less leached in the horizon above the fragipan, but have slightly less clay in the textural control section.

REFERENCE 2

U.S. Census
Arkansas 1990

Population Totals by County and City

ARKANSAS
1990 Population Totals

Bureau of the Census
Department of Commerce

This table provides 1990 census population counts for states and governmental units. Since these counts provide only totals for the states and local governmental units, they are not suitable for redistricting. As required by Public Law 94-171, the Bureau of the Census will provide redistricting counts at the block level for all states and the District of Columbia. The counts will be released on a state-by-state basis beginning in early 1991 and ending by April 1, 1991.

The population counts set forth herein are subject to possible correction for undercount or overcount. The United States Department of Commerce is considering whether to correct these counts and will publish corrected counts, if any, not later than July 15, 1991.

(010491)

GOVERNMENTAL UNIT CODE	NAME	Number of Persons
CO 05 111	Poinsett County	24,664
CO 05 113	Polk County	17,347
CO 05 115	Pope County	45,883
CO 05 117	Prairie County	9,518
CO 05 119	Pulaski County	349,660
CO 05 121	Randolph County	16,558
CO 05 123	St. Francis County	28,497
CO 05 125	Saline County	64,183
CO 05 127	Scott County	10,205
CO 05 129	Searcy County	7,841
CO 05 131	Sebastian County	99,590
CO 05 133	Sevier County	13,637
CO 05 135	Sharp County	14,109
CO 05 137	Stone County	9,775
CO 05 139	Union County	46,719
CO 05 141	Van Buren County	14,008
CO 05 143	Washington County	113,409
CO 05 145	White County	54,676
CO 05 147	Woodruff County	9,520
CO 05 149	Yell County	17,759
PL 05 0005	Adona town	146
PL 05 0010	Alexander town	201
PL 05 0020	Alicia town	157
PL 05 0023	Allport town	188
PL 05 0025	Alma city	2,959
PL 05 0030	Almyra town	31
PL 05 0035	Alpena town	319
PL 05 0040	Altheimer city	97
PL 05 0045	Altus city	43
PL 05 0050	Amagon town	10

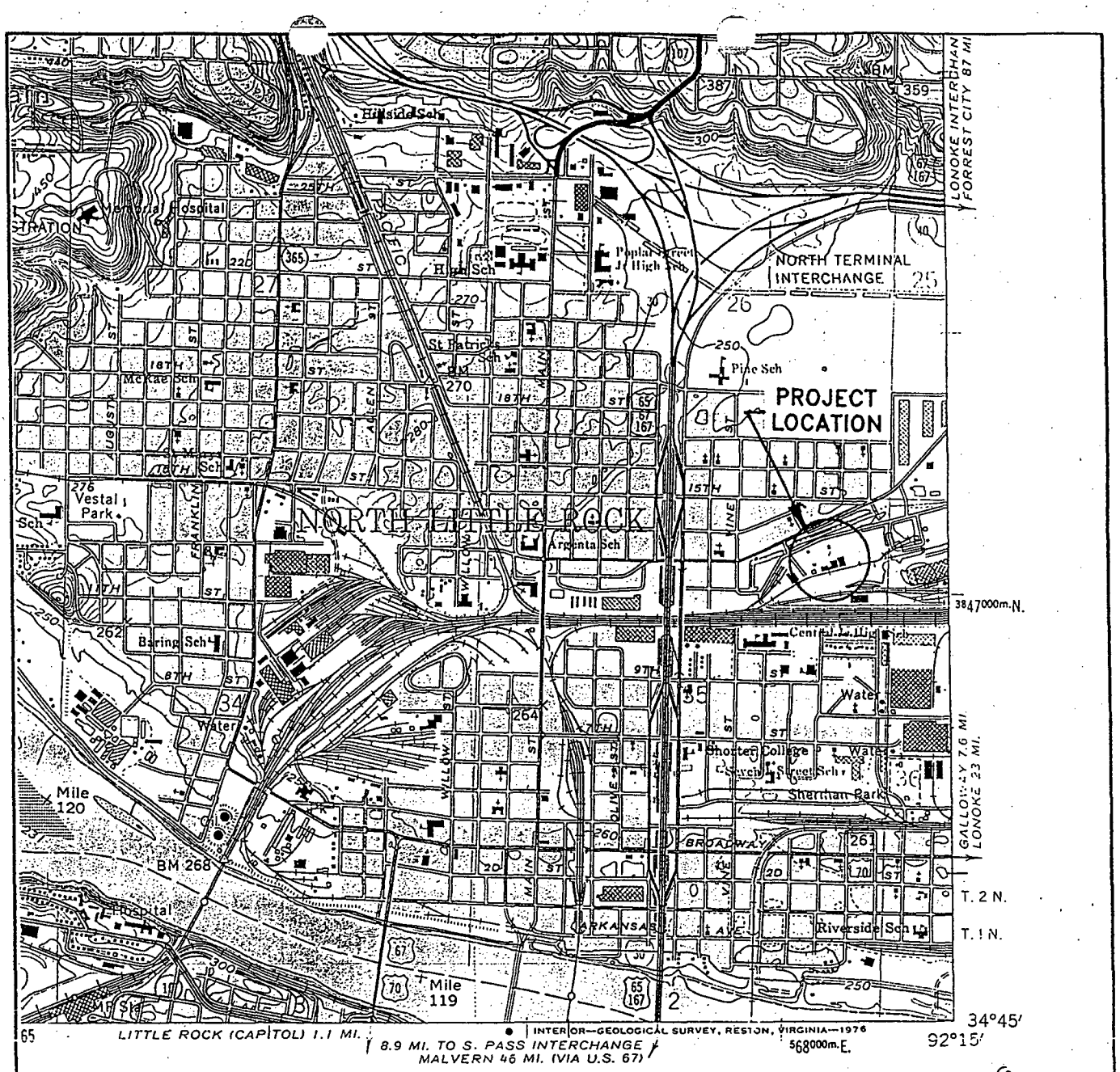
This table provides 1990 census population counts for states and governmental units. Since these counts provide only totals for the states and local governmental units, they are not suitable for redistricting. As required by Public Law 94-171, the Bureau of the Census will provide redistricting counts at the block level for all states and the District of Columbia. The counts will be released on a state-by-state basis beginning in early 1991 and ending by April 1, 1991.

The population counts set forth herein are subject to possible correction for undercount or overcount. The United States Department of Commerce is considering whether to correct these counts and will publish corrected counts, if any, not later than July 15, 1991.

(010491)

GOVERNMENTAL UNIT CODE	NAME	Number of Persons
PL 05 1387	Moorefield town	160
PL 05 1390	Moro town	287
PL 05 1395	Morrilton city	6,551
PL 05 1397	Morrison Bluff town	84
PL 05 1400	Mountainburg city	488
PL 05 1405	Mountain Home city	9,027
PL 05 1410	Mountain Pine city	866
PL 05 1415	Mountain View city	2,439
PL 05 1420	Mount Ida city	775
PL 05 1423	Mount Pleasant town	422
PL 05 1424	Mount Vernon town	192
PL 05 1425	Mulberry city	1,448
PL 05 1430	Murfreesboro city	1,542
PL 05 1435	Nashville city	4,639
PL 05 1440	Newark city	1,159
PL 05 1445	Newport city	7,459
PL 05 1455	Nimmons town	96
PL 05 1460	Norfork city	394
PL 05 1465	Norman town	382
PL 05 1470	Norphlet city	706
PL 05 1475	North Little Rock city	61,741
PL 05 1485	Oak Grove town	231
PL 05 1487	Oak Grove Heights town	513
PL 05 1490	Oakhaven city	35
PL 05 1495	Oden town	126
PL 05 1500	Ogden town	264
PL 05 1505	Oil Trough city	208
PL 05 1510	O'Kean town	250
PL 05 1515	Okolona town	113
PL 05 1520	Ola city	1,090

REFERENCE 3

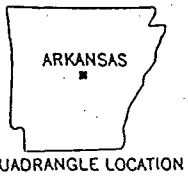


ROAD CLASSIFICATION

Heavy-duty — Light-duty

Medium-duty — Unimproved dirt

Interstate Route — U. S. Route — State Route



QUADRANGLE LOCATION

NORTH LITTLE ROCK, ARK.

N3445—W9215/7.5

1961

PHOTOREVISED 1970 AND 1975

Site Latitude 34°45'58"
Site Longitude 92°15'17"

N

0 2000

Scale in Feet

ICI Americas Inc.

PROJECT LOCATION

Drawn By: JCH File: LOCAMAP.DWG

Project No. 6285-021 13MAR92

REFERENCE 4

LATITUDE AND LONGITUDE CALCULATION WORKSHEET #2
LI USING ENGINEER'S SCALE (1/60)

SITE NAME: ICI BURIAL PIT CERCLIS #: ARD983285255

AKA: ICI Agricultural SSID: N/A

ADDRESS: 824 East 12th Street

CITY: North Little Rock STATE: Arkansas ZIP CODE: 72114

SITE REFERENCE POINT: Center of Site

USGS QUAD MAP NAME: North Little Rock, AR TOWNSHIP: 2 N RANGE: 12 W

SCALE: 1:24,000 MAP DATE: 1986 SECTION: 35

MAP DATUM: 1927 MERIDIAN: North American Datum

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 7.5' MAP (Attach copy):

LONGITUDE: 92° 15' LATITUDE: 34° 45'

COORDINATES FROM LOWER RIGHT (SOUTHEAST) CORNER OF 2.5' GRID CELL:

LONGITUDE: 92° 17' 30" LATITUDE: 34° 47' 30"

CALCULATIONS: LATITUDE (7.5' QUADRANGLE MAP)

A) NUMBER OF RULER GRADUATIONS FROM LATITUDE GRID LINE TO SITE REF POINT: 105

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:
A X 0.3304 = 34.69

C) EXPRESS IN MINUTES AND SECONDS (1'=60"): 58"

D) ADD TO STARTING LATITUDE: 34° 45' + 58"

→ **SITE LATITUDE: 34° 45' 58"**

CALCULATIONS: LONGITUDE (7.5' QUADRANGLE MAP)

A) NUMBER OF RULER GRADUATIONS FROM RIGHT LONGITUDE LINE TO SITE REF POINT: 30

B) MULTIPLY (A) BY 0.3304 TO CONVERT TO SECONDS:
A X 0.3304 = 9.91

C) EXPRESS IN MINUTES AND SECONDS (1'=60"): 17"

D) ADD TO STARTING LONGITUDE: 92° 15' + 17"

→ **SITE LONGITUDE: 92° 15' 17"**

INVESTIGATOR: TAMMIE J. HYNUM Tammie J. Hynum DATE: November 18, 1992

1. STATEMENT OF PROBLEM

Location information is critical to the site investigation process. This Standard Operating Procedure (SOP) describes the minimum standard to which latitudinal and longitudinal measurements should be recorded and how to obtain measurements from topographic maps. The investigator should complete a worksheet and attach supporting documentation, which record measurements and provide computations for review.

The purpose of this SOP is to provide a method to measure latitude and longitude which is accurate and practical. The procedure uses linear measurement and interpolation, referred to as Linear Interpolation (LI) to measure latitude and longitude. Compared to other techniques, LI:

- Requires only a single ruler or scale
- Requires no extrapolation of tangents or perpendiculars
- Requires no conversions or calculations, when using a scale graduated in seconds
- Is easy to learn
- Can be easily reviewed
- Is accurate to 1 second (± 0.5)

2. SITE REFERENCE POINT

The investigator should determine the site's geographic coordinates of a specified reference point. EPA's June 1989 draft policy simply requires describing the reference point for a site (e.g., northeast corner of site, entrance to facility, point of discharge). The January 1990 revision states: "...latitude and longitude coordinates may be made in reference to **any convenient aspect of a site**..." The language was intentionally vague due to the potentially infinite range of site spatial characteristics.

Latitude and longitude determination relies on 7.5-minute topographic maps published by the U.S. Geological Survey (USGS). At the scale of these maps (1:24,000), the small black square used to identify a single family dwelling is a little less in width than 1 second of latitude; the latitude and longitude of a house can be accurately determined to 1 second. When the building, facility, site, etc., is larger in width than 1 second, the question becomes, "From where should I take the measurement?" In some cases, the site could encompass hundreds of square miles, and several degrees or minutes of latitude. To specify a pair of geographic coordinates for the site location, a reference point must be determined for each site on a map for the official record.

To specify a single point location, remember that both natural and man-made features can change with time, and contamination can be documented outside a facility boundary. Property lines, water bodies, and buildings are particularly vulnerable to change. Give priority to the following situations when determining site reference points:

- Point representing the approximate center of the area of greatest concern or a major source as chosen by the project officer in the Region most familiar with the site; or
- Location of largest permanent structure, identified to the corner being measured.

2

On a 7.5-minute topographic map, mark the boundaries of the site, the area encompassing waste sources, with a very sharp pencil. If the site is a single point or building, use that point. If the building is large, select a corner and describe it for later worksheets. If the site is larger than a single building, draw a center line along the long axis (longest part) of the site (curving or segmenting the line so the line is always centered within the site), and designate the midpoint of the line as the center of the site. Mark this spot in pencil keeping the dot or cross-hair as fine as possible.

Choose a permanent site reference point that is accessible to field verification. During the site reconnaissance, verify the point location relative to topographic and physical structures on the map. Coordinates of known point locations (e.g., landfills, impoundments, wells) can also be calculated and recorded.

3. EQUIPMENT

The only equipment required for LI is an original version of the scale template, the Coordinator™ (see attached page), a fine mechanical pencil (0.3 or 0.5 mm), a large flat work surface, and the topographic map(s) containing the site. Mylar films of maps are preferable. Do not use folded or wrinkled field maps.

The accuracy of LI depends on several factors, specifically the accuracy of the map and measuring device, the width of the pencil, and the cartographic ability of the person making the measurements.

The accuracy of maps printed on paper is approximately 50 feet (1 millimeter map distance) due to paper shrinking or swelling in varying humidity, or by creases in the map. This error can be considerable at the 1:24,000 scale, but these problems can be overcome by using Mylar film versions of the USGS maps. Similarly, measuring tools can have different levels of precision. Do not use the Topo-Aid™, a map aid used in the past, which does not provide the 1-second precision now required by EPA.

A second area where precision can be lost is the pencil used to mark reference lines. The smaller the width of the scribe (or line drawn by the pencil), the greater the ability to align measurements to the ruler. If the width of the scribe is broader than the graduation marks on the ruler, precision cannot be greater than the width of the scribe or ruler calibration.

A third critical factor of accuracy is the cartographic ability of the measurer. There are basically two ways to measure latitude and longitude on maps. The first requires extrapolating data from the site reference point out to the map boundaries. This method requires moderate cartographic skill and accurate drafting supplies, and can magnify resulting errors in proportion to the map edge distance from the reference point. The second requires measuring data interpolated within known map reference points, thereby reducing drafting errors.

Methodologies that required drawing tangents from an unknown point on a map to the map boundary using straight-edges or right-triangles are no longer supported by EPA. The ability to align edges parallel to the map boundaries while extrapolating the tangent line is critical to the accuracy of the calculation. A difference of only a few millimeters will create coordinate errors of 1 or more seconds. Error will result from aligning the straight edge directly over the unknown point and not allowing for the width of the scribe while drawing the tangent line. Another way that locational error is introduced is by relying on other features inside the map -- such as straight roads, apparently straight survey lines, and section lines -- to extrapolate tangents.

4. PROCEDURE

4.1 DEFINING THE GRID

Nine 2.5-minute map grid cells make up a USGS 7.5-minute topographic map (scale 1:24,000). These nine grid cells are defined by 2.5-minute tic marks at the edges of the map and 2.5-minute cross-hairs within the map. Determine which of the nine 2.5-minute grid cells contains the site center or reference point. Depending on the location of the grid, you will be required to draw two, three, or four framing lines. All measurements will be made within this grid. To draw the lines, align a straight edge so the point of the pencil will intersect two of the 2.5-minute cross-hairs. Be sure that the edge is not directly over the cross-hairs or the width of the pencil will be offset and the framing line will not exactly intersect the two cross-hairs (see Figure 4-1).

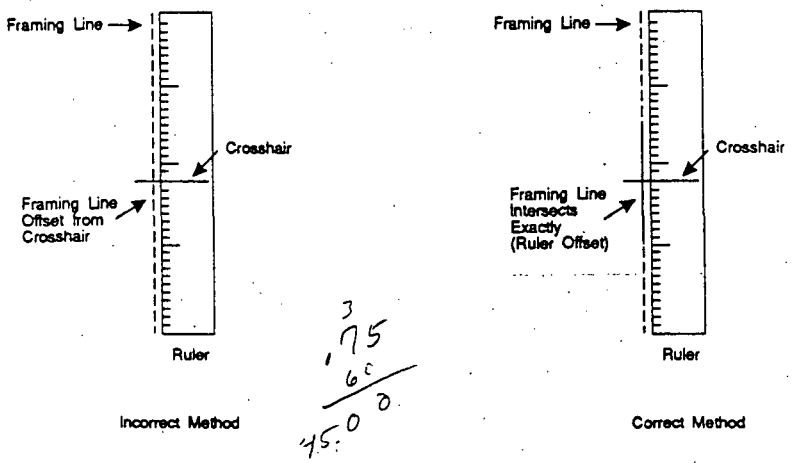


Figure 4-1. Aligning Framing Lines

Lightly draw the framing line, being careful to keep the pencil at an angle less than vertical, between 60 and 80 degrees. Strive to keep the pencil point against the straight edge at all times (see Figure 4-2).

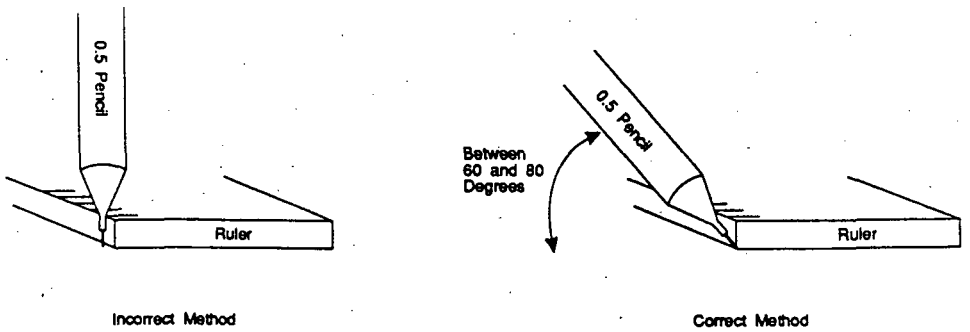


Figure 4-2. Scribing Framing Lines

4

After completing one of the lines, remove the straight edge and examine the line. If it does not intersect the center of the cross-hairs exactly on each end, erase the line completely and repeat the process.

NOTE: The corners of more recent 7.5 minute topographic maps may have dashed cross-hairs that differ slightly from the corners of the map. Measure from the corners of the map and not the dashed corner cross-hairs, a USGS correction for the 1983 datum. Most maps still rely on the 1927 datum. Consult the lower left legend of the map for more information on geodetic datum.

4.2 LI USING RULER GRADUATED IN SECONDS

The Coordinator™ is a clear template that is essentially eight custom rulers corresponding to the most common map scales. (The Coordinator™ can be obtained from drafting supply stores or 145 Cedar Hill Road, Bedford, NY 10506.) Other custom rulers can be used if the 1-second (or better) level of precision is maintained and documented.

Custom rulers are directly graduated in seconds of latitude. This is possible because map representations of latitude are essentially constant. One scale on the Coordinator™ fits precisely within a 2.5 minute arc of latitude on a 7.5 minute quadrangle map. By laying the scale over the site location precisely between the scribed latitude lines, latitude is read directly off the scale and added to the latitude of the lower line. With scale graduations in seconds, the accuracy of latitude to 1.0 second is ensured through direct measurement and interpolation. Directly measuring seconds prevents errors caused by conversion and ratio calculations.

Measuring Latitude Using a Custom Ruler (Coordinator™)

1. Set out Coordinator™ 1:24,000 scale and map with the site center or reference point identified.

2. Draw 2.5-minute framing lines around the grid with the site center or reference point (see Section 4.1).

3. Fill out background information on latitude/longitude worksheet.

4. Lay the scale on the map so that the bottom of the scale coincides with the bottom framing line and the top of the scale coincides with the top framing line (see Figure 4-3).

5. Move the scale laterally until it intersects the point to be measured. Be very careful to keep the top and bottom edges of the scale on the framing lines.

6. The scale has two sets of incremental designations; the left set begins at 30 seconds and the right set begins at 0 seconds. Use the scale that corresponds to the latitude number of the lower framing line. If it ends in 30 seconds, read along the left side. If it ends in 0 seconds, read along the right side.

7. Read up the scale from the lower framing line to the point to be measured. Note at each 00 second reading on the Coordinator Scale, add 1 minute to the beginning latitude number of the lower framing line. Record that number on the worksheet.

Measuring Longitude Using a Custom Ruler (Coordinator™)

Longitude is calculated using the same principle and scale as for latitude. The difference is that the ground distances of 2.5 minutes of latitude and longitude are not the same. If, however, you use the same scale and align your

5

divisions to those of the known longitude lines, the ratios and conversions become a linear measurement. Since the scale is exactly 2.5 minutes long, place each end of the scale on one of the longitude lines. Next, slide the scale up or down until it intersects the reference point. When the edges of the scale are precisely touching the longitude lines and the scale intersects the unknown point, read up the scale from right to left to measure the longitude.

1. Set up longitude framing lines as described in Section 4.1.

2. Lay the 1:24,000 scale on the map so that the bottom of the scale coincides with the right framing line and the top of the scale coincides with the left framing line (see Figure 4-3).

3. Move the scale up or down until it intersects the point to be measured. Be very careful to keep the top and bottom edges of the scale on the framing lines.

4. The scale has two sets of increments: the left set begins at 30 seconds and the right set begins at 0 seconds. Use the scale that corresponds to the longitude number of the right framing line. If it ends in 30 seconds, read along the left side. If it ends in 0 seconds, read along the right side.

5. Read the scale up from the right framing line to the point to be measured. Note at each 00" on the Coordinator™ scale, add 1 minute to the beginning longitude number of the lower framing line. Record that number on the worksheet.

Note: Be sure to identify starting latitude and longitude from the lower right-hand corner of the 2.5 minute grid. If it ends in 30 seconds (30"), read off the 30-second side on the scale; if it ends in 00 seconds (00"), read off the 00 side.

4.3 LI USING AN ENGINEER'S SCALE

Alternative equipment to determine latitude and longitude coordinates is an "engineer's scale." An engineer's scale is a multi-sided ruler containing series of graduations per inch corresponding to map scales. For the 1:24,000 topographic maps, use the 60 divisions per inch scale; on this scale 454 divisions equal to 2.5 minutes. Use the 0 as 00" and 454 as 2'30" and follow the alignment process of Section 4.2. Record the number of divisions on the ruler, divide by 454 and multiply the resultant by 150. The number is now in seconds and can be added to the starting latitude or longitude to get the coordinates of the site.

<u>Measuring Latitude and Longitude Using an Engineer's Scale</u>

1. Display the 1/60 engineer's scale and map with the site center or reference point site identified.

2. Draw 2.5-minute framing lines on the grid with the site center or reference point (see Section 4.1).

3. Fill out background information on the latitude/longitude worksheet.

4. For latitude: place the 1/60 scale on the map so that the bottom of the ruler coincides with the bottom framing line and 454 coincides with the top framing line (see Figure 4-3).

   For longitude: place the scale on the map so that the bottom of the ruler coincides with the right framing line and 454 coincides with the left framing line (see Figure 4-3).

6

5. Move the scale laterally (for latitude) or vertically (for longitude) until the scale intersects the point to be measured. Be very careful to keep the 0 and 454 edges of the scale on the framing lines.

6. Record the number on the ruler where it intersects the point to be measured on the appropriate worksheet. Divide that number by 454 and multiply the resultant by 150. **OR** multiply the number by 0.3304. The number is now in seconds and can be added to the starting latitude or longitude of the grid to get the latitude or longitude coordinates of the site. Complete the worksheet.

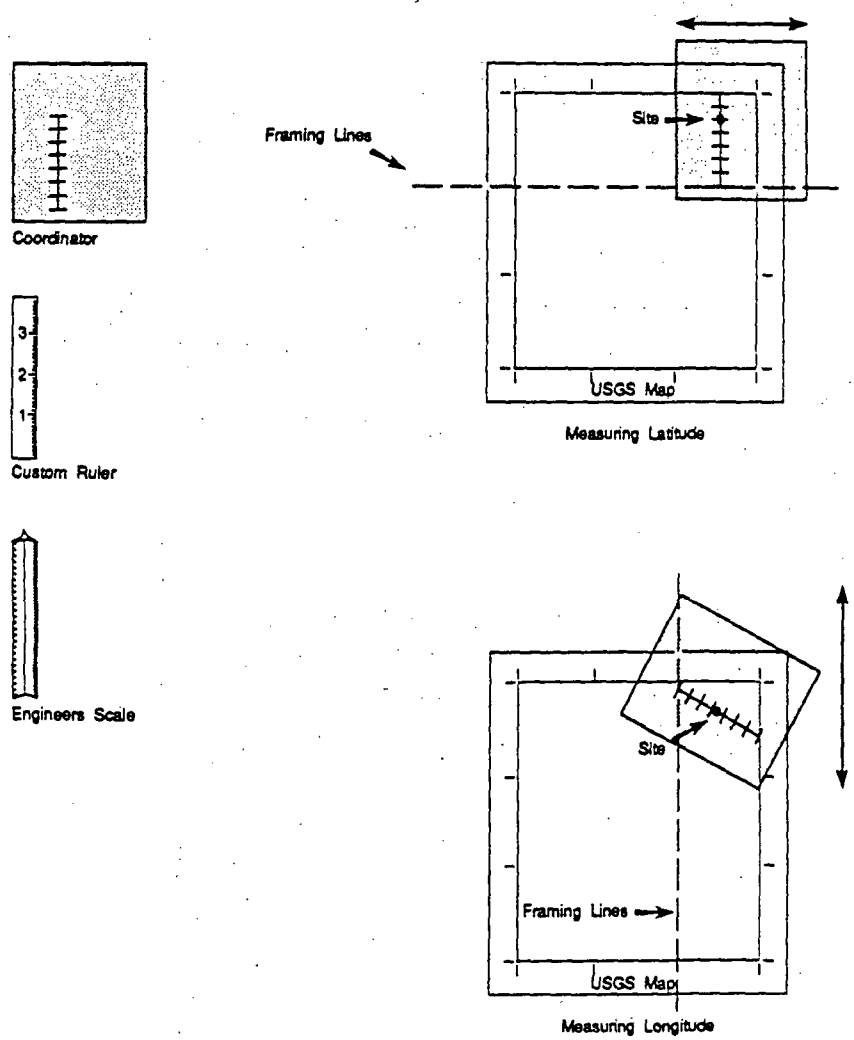


Figure 4-3. Determining Latitude and Longitude Using Linear Interpolation

7

5. QUALITY ASSURANCE

For QA purposes, a method must be developed to track how latitude and longitude coordinates have been verified and calculated. A datasheet (worksheet) is part of the required documentation for each PA. A completed worksheet allows a reviewer to follow the original steps and check the calculations. Completing each form is estimated to take approximately 10 minutes. Attach a complete 2.5-minute grid on a separate page with the site center or reference point clearly marked. All four corners of the grid must be clearly visible.

8

REFERENCE 5

TOTAL PRECIPITATION AND DEPARTURES FROM NORMAL (INCHES)

ARKANSAS
1990

STATION	JAN		FEB		MAR		APR		MAY		JUN	
	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE
WEST CENTRAL 04												
ABBOTT	6.40	4.40	6.34	3.85	8.11	4.00	9.22	4.82	14.38	9.46	.81	-2.55
BIG FORK 2 ENE	8.59	4.95	6.84	2.97	8.67	2.56	5.98	.10	14.95	8.58	2.09	-2.60
BLUE MOUNTAIN DAM	7.05		5.04		7.93		9.60		15.97		.85	
BOONEVILLE 3 SSE	6.69		5.90		8.52		8.55		15.16		1.67	
CLARKSVILLE	7.12		5.88		9.86		7.49		12.15		1.81	
CLARKSVILLE 6 NE	7.31		6.32		10.22		7.79		13.66		2.82	
COVE	6.37	3.23	5.51	1.95	7.74	2.48	6.10	.09	18.19	12.64	1.70	-2.45
DANVILLE	6.69	4.10	5.45	2.47	8.19	3.12	8.40	3.79	12.38	6.94	.76	-2.83
DARDANELLE	7.78	4.94	5.54	2.46	8.50	3.30	7.56	3.16	13.15	8.05	.84	-3.33
FORT SMITH WSO AIRPORT//R	5.13	3.27	5.95	3.42	4.61	.73	8.48	4.28	13.45	8.66	.63	-3.04
GRAVELLY 1 ESE	7.03	4.32	4.37	1.18	7.35	2.40	5.98	1.00	15.52	10.11	1.05	-3.00
GREENWOOD	7.67	5.65	7.20	4.40	8.05	3.73	7.30	2.67	15.62	10.59	1.09	-2.35
HENA	6.64	3.57	5.08	1.63	6.95	1.66	6.33	.53	18.08	12.41	2.08	-2.16
MOUNTAINBURG 2 NE	6.29	3.99	7.25	4.39	8.28	3.83	8.60	3.47	16.19	10.04	1.88	-2.14
NATURAL DAM	6.60		6.78		7.87		4.80		14.00		1.00	
OZARK	7.38	5.13	6.09	3.16	8.16	3.80	7.03	2.68	13.28	8.38	2.31	-1.22
OZONE	5.30		4.67		9.50		8.43		M 12.90		2.88	
PARKS 2 W	6.59	4.18	4.88	2.13	6.02	1.29	7.12	2.10	18.82	13.44	.77	-2.91
RATCLIFF	6.45	4.37	6.02	3.35	7.53	3.67	8.63	4.60	12.36	7.47	2.00	-1.15
SUBIACO	6.23	3.95	5.11	2.23	7.31	3.09	8.92	4.28	12.00	6.63	3.05	-1.13
WALDRON	6.07	3.69	5.39	2.57	7.09	2.72	6.60	1.84	15.56	10.32	1.28	-2.64
--DIVISIONAL DATA------->	6.64	4.16	5.72	2.67	7.72	3.14	7.92	3.10	14.50	9.15	1.64	-2.42
CENTRAL 05												
ALUM FORK	6.31	2.25	5.72	2.07	M 8.69		8.70	3.45	M 10.85		1.67	-2.91
BENTON	6.98	3.17	4.42	.57	7.77	2.67	7.86	2.28	9.95	4.42	.85	-3.08
BISMARCK 2 SE	6.76		3.05		12.26		6.17		13.19		.45	
BLAKELY MOUNTAIN DAM	6.08	2.20	5.77	1.99	M 6.12		9.57	3.41	13.94	7.78	2.10	-1.81
BONNERDALE	M 6.70		4.83		M 8.45		5.10		17.70		1.41	
CABOT 4 SW	5.81	2.20	4.72	1.19	10.57	5.73	6.60	1.40	8.99	3.63	2.11	-1.70
CONWAY	6.67	3.03	6.11	2.59	6.84	1.73	4.74	-.08	8.14	2.72	3.29	-.77
CRYSTAL VALLEY	6.37	2.32	4.25	.20	12.73	7.85	6.59	.99	7.26	1.37	2.70	-1.29
GREENBRIER	6.56		6.04		7.46		5.68		7.21		3.30	
HOT SPRINGS 1 NNE	6.09	2.28	4.81	.73	8.40	3.15	9.79	3.90	20.22	13.79	1.92	-2.48
JESSIEVILLE	5.02	.90	6.92	2.78	9.60	3.81	9.53	3.82	12.07	6.08	1.41	-3.14
LAKE MAUMELLE	4.83		4.52		10.68		4.26		8.32		2.17	
LEOLA	6.13	1.99	6.25	2.20	11.14	6.18	6.46	1.09	8.83	3.46	1.42	-2.52
LITTLE ROCK FAA ARPT	6.50	2.59	4.82	.99	10.40	5.71	7.73	2.32	7.71	2.42	.80	-2.87
MALVERN	6.76	2.57	4.43	.47	10.52	5.28	5.88	.39	11.20	5.48	1.41	-2.86
MORRILTON												
NIMROD DAM	6.66	3.57	8.51	5.47	8.52	3.51	5.93	1.08	13.10	7.79	1.35	-2.31
NORTH LITTLE ROCK WSFO	5.57	1.87	4.02	.30	10.09	5.20	5.93	.64	9.65	4.65	.61	-2.62
OWENSVILLE	4.83	1.09	5.28	1.35	10.82	5.50	7.88	2.17	11.85	6.08	2.90	-1.33
PERRY	5.67	2.38	7.68	4.46	8.92	3.80	5.89	1.15	9.73	4.14	1.93	-2.36
SHERIDAN	6.55		8.25		11.81		6.33		8.92		2.14	
--DIVISIONAL DATA------->	6.36	2.56	5.68	2.00	9.41	4.30	7.02	1.74	10.66	5.01	1.77	-2.26
EAST CENTRAL 06												
ARKANSAS POST	6.00		9.92		11.49		4.34		7.10		3.01	
AUGUSTA 2 NW	6.13	2.61	5.65	1.82	9.75	4.63	4.99	-.15	7.62	2.45	3.18	-.65
BRINKLEY	5.37	1.22	6.06	1.77	M 4.33		6.69	1.17	8.36	2.85	2.32	-1.33
CLARENDON	5.85		8.87		8.63		3.85		6.71		2.01	
DES ARC	6.05	1.97	7.38	2.97	8.12	2.97	7.15	1.40	6.58	.91	1.85	-1.71
HELENA	5.13	.67	9.36	5.00	8.54	3.23	5.47	.00	7.63	2.40	3.99	-.04
KEO	6.32	2.23	5.10	1.15	10.68	5.70	9.63	4.68	6.61	1.57	.58	-2.90
MADISON 1 NW	3.96	-.24	8.50	4.16	9.04	4.17	6.96	1.79	7.22	2.07	1.77	-1.43

SEE REFERENCE NOTES FOLLOWING STATION INDEX

TOTAL PRECIPITATION AND DEPARTURES FROM NORMAL (INCHES)

ARKANSAS
1990

STATION	JUL		AUG		SEP		OCT		NOV		DEC		ANNUAL	
	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE	PRECIP.	DEPARTURE
WEST CENTRAL 04														
ABBOTT	2.97	-.30	3.98	.64	8.69	5.01	M 2.64		3.15	-.15	M 3.05		M 69.74	
BIG FORK 2 ENE	5.01	.21	1.83	-1.51	7.33	2.50	10.07	5.77	4.40	-.12	8.31	3.93	84.07	27.34
BLUE MOUNTAIN DAM	2.53		3.38		4.13		2.73		2.68		4.40		66.29	
BOONEVILLE 3 SSE	1.27		2.10		6.18		4.20		2.42		4.73		67.39	
CLARKSVILLE	5.79		1.90		3.01		2.64		2.66		6.03		66.34	
CLARKSVILLE 6 NE	5.33		3.04		3.57		2.98		3.03		M 5.14		M 71.21	
COVE	7.46	2.95	1.35	-2.20	5.54	1.08	7.12	2.87	3.34	-.58	5.40	1.25	75.82	23.31
DANVILLE	1.67	-1.96	2.32	-1.04	6.43	2.46	4.30	.92	3.61	-.55	M 6.07		M 66.27	
DARDANELLE	2.06	-1.18	.73	-2.52	3.32	-.35	2.63	-.71	3.06	-1.36	5.84	2.08	61.01	14.54
FORT SMITH WSO AIRPORT//H	2.37	-.78	3.60	.58	4.87	1.65	3.52	.28	3.77	.27	4.84	1.99	61.22	21.31
GRAVELLY 1 ESE	2.57	-1.49	2.27	-.66	4.76	.83	4.66	1.22	3.99	.15	6.33	2.46	65.88	18.52
GREENWOOD	3.74	.14	2.46	-.63	4.89	1.09	2.75	-.83	3.70	-.14	5.95	2.68	70.42	27.00
MENA	6.62	1.97	1.38	-1.47	9.37	4.63	13.63	9.37	3.52	-.71	4.97	1.05	84.65	32.48
MOUNTAINBURG 2 NE	3.26	-.96	1.12	-2.40	3.05	-1.44	4.09	.17	4.84	.86	5.69	2.37	70.54	22.18
NATURAL DAM	1.65		1.40		2.47		M 4.12		M 4.75		M 4.59		M 60.03	
OZARK	M 1.63		2.22	-.65	1.79	-2.33	2.43	-.89	M 2.37		4.74	1.60	M 59.43	
OZONE	2.75		1.76		2.41		4.26		3.82		5.05		M 63.73	
PARKS 2 W	4.38	.38	1.19	-1.39	5.15	1.37	4.07	.65	3.87	.32	4.83	1.42	67.69	22.98
RATCLIFF	2.29	-1.21	4.13	1.46	2.63	-1.08	M 1.18		2.77	-.63	M 3.19		M 59.18	
SUBIACO	4.03	.39	3.28	-.05	2.93	-.75	1.93	-1.51	M 1.78		4.42	.90	M 60.99	
WALDRON	3.09	-.85	3.39	.52	6.27	2.51	4.61	1.20	2.97	-.70	M 3.96		M 66.28	
--DIVISIONAL DATA-------->	3.45	-.44	2.31	-.85	4.49	.44	4.24	.70	3.24	-.70	5.07	1.52	66.94	20.47
CENTRAL 05														
ALUM FORK	4.42	.51	2.44	-.80	3.77	-.63	M 8.50		2.64	-1.77	8.48	4.25	M 72.19	
BENTON	2.85	-1.21	2.63	-.57	7.46	2.73	9.59	6.30	3.25	-1.51	M 6.28		M 69.89	
BISMARCK 2 SE	4.86		.70		2.50		8.67		3.01		5.05		66.67	
BLAKELY MOUNTAIN DAM	2.86	-1.95	.71	-2.65	5.18	.80	7.28	3.69	2.86	-2.25	10.62	6.43	M 73.09	
BONNERDALE	3.25		1.14		M 3.63		7.90		3.55		M 8.15		M	
CABOT 4 SW	2.07	-1.28	1.80	-1.39	3.47	-.44	8.54	5.79	3.58	-.83	10.04	5.94	68.30	20.24
CONWAY	2.48	-.81	1.82	-.88	7.51	2.77	6.22	3.20	M 2.36		7.71	3.59	M 63.89	
CRYSTAL VALLEY	1.84	-1.74	3.41	.38	3.33	-1.46	8.23	5.04	3.13	-1.66	8.14	3.83	67.98	15.83
GREENBRIER	3.66		2.59		4.95		5.50		2.84		6.68		62.47	
HOT SPRINGS 1 NNE	M 1.70		2.64	-.71	5.28	.91	6.02	2.66	2.53	-2.27	8.81	4.34	M 78.21	
JESSIEVILLE	1.92	-2.63	3.34	-.02	4.09	-.85	8.34	4.34	2.72	-2.50	9.90	5.41	74.86	18.00
LAKE MAUMELLE	.82		.86		2.80		6.39		3.27		9.29		58.21	
LEOLA	2.15	-2.01	2.03	-.96	1.40	-2.81	13.84	10.74	3.07	-1.35	6.99	2.47	69.71	18.48
LITTLE ROCK FAA AMPT	4.63	1.00	1.57	-1.50	4.08	-.18	8.75	5.91	3.29	-1.08	6.87	2.64	67.15	17.95
MALVERN	2.44	-2.16	2.66	-.28	2.83	-1.83	10.14	6.79	3.42	-1.53	6.56	1.78	68.25	14.10
MORRILTON											6.41	2.50		
NIMROD DAM	1.77	-1.57	1.00	-1.96	6.75	2.92	5.24	2.24	M 2.26		M 6.22		M 67.31	
NORTH LITTLE ROCK WSFO	2.09	-1.03	3.22	.54	3.56	-.26	7.58	4.86	3.26	-.82	8.68	4.66	64.26	17.99
OWENSVILLE	2.85	-1.75	2.31	-1.28	5.93	1.31	8.57	5.04	2.50	-2.14	8.89	4.46	74.61	20.50
PERRY	1.19	-2.12	1.48	-1.63	4.62	.63	4.89	2.02	2.99	-1.16	6.77	3.03	61.76	14.34
SHERIDAN	3.57		2.11		3.20		12.43		3.37		7.03		75.71	
--DIVISIONAL DATA-------->	2.92	-.97	2.09	-.96	4.57	.20	8.43	5.28	3.10	-1.43	7.91	3.65	69.92	19.12
EAST CENTRAL 06														
ARKANSAS POST	.62		1.07		1.89		6.39		4.21		M 7.35		M 63.39	
AUGUSTA 2 NW	1.01	-1.92	3.62	-.30	4.07	-.14	10.02	7.62	4.00	-.61	9.56	5.12	69.60	20.48
BRINKLEY	2.02	-1.63	3.30	.07	3.63	-.27	7.08	4.57	M 3.43		8.69	4.10	M 61.28	
CLARENDON	1.83		2.83		5.24		8.00		3.69		M 7.70		M 65.21	
DES ARC	2.15	-1.82	2.12	-1.26	2.28	-1.34	8.22	5.66	3.93	-.42	6.35	1.88	62.18	11.21
HELENA	2.05	-1.76	1.77	-.93	2.69	-1.37	3.25	.50	4.52	.05	10.94	6.07	65.34	13.82
KEO	3.15	-.68	1.15	-1.30	3.02	-.62	10.12	7.13	3.96	-.01	6.29	1.81	66.61	18.76
MADISON 1 NW	.94	-2.61	2.15	-1.64	2.61	-1.15	4.61	1.88	3.45	-.96	8.10	3.26	59.31	9.30

SEE REFERENCE NOTES FOLLOWING STATION INDEX

AVERAGE TEMPERATURES AND DEPARTURES FROM NORMAL (°F)

ARKANSAS
1990

STATION	JAN TEMPERATURE	JAN DEPARTURE	FEB TEMPERATURE	FEB DEPARTURE	MAR TEMPERATURE	MAR DEPARTURE	APR TEMPERATURE	APR DEPARTURE	MAY TEMPERATURE	MAY DEPARTURE	JUN TEMPERATURE	JUN DEPARTURE	JUL TEMPERATURE	JUL DEPARTURE	AUG TEMPERATURE	AUG DEPARTURE	SEP TEMPERATURE	SEP DEPARTURE	OCT TEMPERATURE	OCT DEPARTURE	NOV TEMPERATURE	NOV DEPARTURE	DEC TEMPERATURE	DEC DEPARTURE	ANNUAL TEMPERATURE	ANNUAL DEPARTURE
HOT SPRINGS 1 NNE	44.5	3.1	48.6	3.1	52.7	-.5	58.5	-5.0	64.8	-6.0	77.7	-.4	80.7	-1.5	81.4	.0	76.4	1.4	59.5	-5.3	54.9	2.3	40.4	-4.2	61.7	-1.1
LEOLA	47.9		51.9		55.7		61.5		67.9		79.3		80.1		80.3		76.7		55.6		49.4		44.2		62.5	
LITTLE ROCK FAA ARPT	48.1	8.2	51.3	7.2	55.4	3.2	62.0	-.4	68.1	-2.4	80.6	2.1	83.2	1.1	82.2	1.2	77.5	3.2	61.5	-1.6	56.3	5.1	43.1	-.1	64.1	2.2
MALVERN	47.2	6.3	52.0	6.6	56.2	3.2	62.6	-.4	68.4	-1.6	79.8	2.8	81.2	.6	81.3	1.8	77.5	4.1	61.2	-1.2	55.4	4.0	43.6	-.4	63.9	2.2
MORRILTON																							40.0	-3.5	M	
NIMROD DAM	44.4	7.0	48.1	6.5	53.3	3.7	58.7	-1.9	65.8	-2.5	77.7	1.8	80.8	.4	80.5	1.4	75.7	3.2	58.9	-2.5	54.6	5.4	39.7	-1.0	61.5	1.8
NORTH LITTLE ROCK HSFO	47.4	7.9	50.2	6.4	54.7	2.7	61.1	-1.7	66.8	-3.6	80.4	2.6	82.2	.5	81.6	1.1	77.1	3.0	61.8	-1.6	57.2	5.7	42.8	-.3	63.6	1.9
SHERIDAN	45.8		49.7		54.2		60.2		67.6		78.3		80.3		80.1		76.5		60.1		54.9		43.0		62.6	
--DIVISIONAL DATA-------->	46.3	6.2	50.4	6.1	54.9	2.9	61.2	-1.1	67.1	-2.7	79.0	1.9	80.9	-.3	80.7	.7	76.6	3.0	60.2	-2.6	55.0	3.9	42.3	-1.0	62.9	1.4
EAST CENTRAL 06																										
ARKANSAS POST	48.9		53.9		56.6		62.9		69.9		80.7		82.2		81.9		78.1		61.7		58.2		46.4		65.1	
BRINKLEY	45.3	6.1	49.2	6.0	52.9	1.6	59.7	-1.9	67.1	-3.0	78.8	1.1	81.2	.0	79.4	-.2	75.8	2.9	59.5	-2.1	54.9	4.8	M		M	
CLARENDON	46.9		51.9		54.3		61.2		67.4		80.1		82.0		79.4		75.8		59.7		56.0		45.3		63.3	
DES ARC	45.6	5.8	50.1	6.1	53.8	1.7	61.2	-1.8	68.1	-2.5	79.9	1.5	82.1	.3	80.7	.7	76.4	2.9	60.7	-2.5	56.8	5.1	43.7	.5	63.3	1.5
HELENA	46.2	6.5	51.0	7.5	54.0	2.3	61.2	-1.2	68.2	-2.3	80.0	2.1	81.7	.6	81.1	1.4	77.2	3.6	61.2	-1.4	56.2	5.0	45.2	2.1	63.6	2.2
KEO	47.7	7.3	51.5	6.8	55.1	2.6	62.2	-.6	68.4	-2.1	80.1	2.6	80.8	.1	80.3	1.2	76.4	3.7	61.3	-1.2	56.8	5.5	44.4	.7	63.8	2.2
MARIANNA 2 S	44.6	4.8	48.9	4.8	52.3	.3	59.0	-3.6	66.6	-4.3	77.8	-.5	80.4	-.6	78.9	-.3	75.2	1.9	58.6	-4.1	53.7	2.2	42.1	-1.3	61.5	-.1
ST CHARLES	46.4	6.9	51.4	7.8	54.6	2.6	61.1	-1.5	67.5	-3.0	78.4	.3	80.8	-.7	80.1	-.2	77.3	3.3	60.6	-2.3	55.5	4.2	45.1	1.9	63.2	1.6
STUTTGART 9 ESE	46.1	7.1	50.9	7.9	54.0	2.9	61.0	-.9	66.6	-3.9	79.6	1.5	81.7	.5	80.4	.8	76.4	3.2	60.5	-1.6	56.4	5.4	44.7	2.1	63.2	2.1
WEST MEMPHIS	45.6		50.1		M52.2		M		M66.6		79.8		81.7		79.4		76.0		60.0		56.6		47.3		M	
WYNNE	46.1	7.3	51.1	7.9	54.1	2.8	60.7	-1.5	67.0	-3.2	80.3	2.6	81.7	.6	79.3	.0	75.5	2.5	60.2	-2.5	56.9	6.0	44.1	1.6	63.1	2.0
--DIVISIONAL DATA-------->	46.3	6.4	50.9	6.9	54.0	1.9	61.0	-1.7	67.6	-3.1	79.6	1.5	81.5	.2	80.1	.4	76.4	2.9	60.4	-2.4	56.2	4.8	44.8	1.5	63.2	1.6
SOUTHWEST 07																										
DE QUEEN	47.2	5.4	50.8	4.6	55.5	1.6	61.7	-1.6	67.6	-3.2	80.0	2.2	80.6	-.9	82.2	1.4	78.2	3.8	61.7	-1.9	56.4	4.5	42.4	-2.2	63.7	1.1
HOPE 3 NE	M		51.0	6.0	54.5	2.1	60.6	-1.6	67.0	-3.1	78.2	.8	78.9	-2.4	79.9	-.5	75.9	1.7	60.5	-2.8	55.8	4.0	42.5	-1.7	M	
MOUNT IDA 3 SE	43.5	4.8	47.5	4.9	52.4	2.4	58.1	-2.1	64.2	-3.7	76.7	1.2	78.5	-1.4	78.6	-.1	74.0	1.9	56.6	-4.2	53.3	3.9	38.6	-3.3	60.2	.4
MURFREESBORO 2 NNW	44.9		49.5		53.3		59.1		65.6		76.5		77.6		78.6		74.9		58.7		53.9		40.9		61.1	
NASHVILLE	46.4	6.1	50.9	6.9	54.7	3.4	60.9	-.3	67.3	-1.9	78.3	1.8	79.2	-1.5	79.7	-.4	76.5	2.3	60.9	-2.5	56.7	5.3	42.8	-.7	62.9	1.5
OKAY	49.2	5.2	53.0	4.7	57.2	1.4	63.9	-1.1	69.9	-2.3	80.9	1.8	80.7	-2.2	81.7	-.2	77.5	1.7	62.8	-2.7	57.2	3.0	44.0	-2.8	64.8	.5
TEXARKANA FAA AIRPORT	51.9	7.8	54.5	6.2	58.5	3.1	64.9	.3	M70.7	-1.5	81.7	2.5	80.9	-2.0	82.9	.8	78.8	2.7	64.4	-1.5	58.9	4.3	M46.0	-1.3	M66.2	1.8
--DIVISIONAL DATA-------->	47.2	5.6	51.0	5.4	55.2	2.2	61.3	-1.4	67.5	-2.8	78.9	1.5	79.5	-1.9	80.5	.0	76.5	2.1	60.8	-2.8	56.0	3.9	42.5	-2.1	63.1	.8
SOUTH CENTRAL 08																										
ARKADELPHIA 2 N	47.7	5.8	52.5	6.0	56.0	2.0	62.4	-1.1	68.6	-2.0	79.3	1.6	79.9	-1.6	80.1	-.8	76.8	2.2	61.1	-2.5	55.3	3.4	43.3	-1.3	63.6	1.0
CALION LOCK & DAM	47.9		M		56.4		63.4		69.9		M		M		M		M81.0		61.9		57.2		46.8		M	
CAMDEN 1	47.4	5.0	52.8	6.3	55.9	1.7	62.2	-1.7	69.2	-2.0	79.0	.7	80.8	-1.1	81.0	.2	77.3	2.7	60.9	-2.7	56.4	3.8	45.7	.5	64.1	1.1
EL DORADO FAA AIRPORT	50.7	7.6	54.8	8.0	58.8	4.3	64.5	.8	70.9	-.3	81.5	3.2	82.5	.7	82.1	1.4	79.0	3.9	62.6	-1.3	58.3	5.6	48.0	2.1	66.1	3.0
FORDYCE	50.8		M		59.2		65.4		70.6		77.5		80.0		80.7		76.6		60.3		M		44.1		M	
MAGNOLIA 3 N	49.9	5.9	53.9	5.8	57.6	2.4	63.5	-.4	69.5	-1.4	79.8	2.2	80.6	-.4	80.6	.4	77.0	2.6	62.4	-1.7	56.9	3.7	46.4	-.1	64.8	1.6
PRESCOTT	48.8	6.6	52.6	5.9	56.8	2.4	63.1	-.9	69.0	-2.5	79.7	1.1	80.2	-2.2	81.1	-.6	77.4	2.1	62.8	-1.8	56.4	3.7	43.9	-1.1	64.3	1.1
SPARKMAN	51.7		53.4		56.6		59.3		67.7		78.7		83.4		81.4		79.2		60.3		56.5		47.4		64.6	
WARREN 2 WSW	47.8	5.1	M52.4	5.7	55.2	1.1	62.4	-1.1	68.4	-2.6	79.0	.9	80.2	-1.5	80.1	-.6	76.1	1.5	60.0	-3.9	56.3	3.4	46.2	.5	M63.7	.7
--DIVISIONAL DATA-------->	49.2	6.6	53.2	6.4	56.9	2.6	62.9	-.8	69.3	-1.7	79.3	1.2	81.0	-.7	80.9	.1	77.8	3.1	61.4	-2.4	56.7	4.1	45.8	.4	64.5	1.6
SOUTHEAST 09																										
CROSSETT 2 SSE	48.2	4.4	53.0	5.3	55.5	.5	61.9	-2.1	70.0	-1.0	79.7	1.9	80.2	-.9	79.6	-.7	75.8	1.0	59.9	-4.2	55.1	1.6	46.0	-.4	63.7	.5
DERMOTT 3 NE	48.5		53.1		55.9		62.6		70.4		81.7		82.9		82.0		78.8		61.9		57.3		46.9		65.2	
DUMAS	49.4	6.8	54.6	7.9	57.3	3.0	64.0	-.1	70.6	-1.4	82.2	2.8	82.9	.6	82.1	1.2	77.8	2.8	61.9	-2.2	58.1	5.0	46.6	.9	65.6	2.3
EUDORA	49.0		53.9		56.3		62.5		70.8		81.7		82.2		81.5		78.3		63.1		58.1		48.3		65.5	
MONTICELLO 3 SW	47.5	5.1	51.3	5.3	54.2	.4	60.1	-3.0	68.7	-1.9	79.9	2.4	80.1	-.5	78.9	-.7	75.0	1.1	59.5	-4.0	57.1	4.5	46.2	.5	63.2	.8
PINE BLUFF	47.9	5.0	51.9	4.9	54.3	-.2	61.5	-3.3	68.5	-3.6	79.8	.7	81.4	-1.3	80.9	-.7	77.3	2.0	61.3	-3.3	57.0	3.6	44.5	-1.4	63.9	.2
PORTLAND	49.5		54.7		56.9		63.4		70.6		81.2		81.0		80.4		77.1		61.7		56.9		48.6		65.2	
ROHWER 2 NNE	47.5		52.2		55.3		62.2		69.8		80.3		81.9		80.8		76.9		61.3		56.8		46.1		64.3	
STAR CITY	47.7																									
--DIVISIONAL DATA-------->	48.4	6.1	53.1	6.7	55.7	1.7	62.3	-1.4	69.9	-1.5	80.8	2.3	81.6	.0	80.8	.4	77.1	2.6	61.3	-2.4	57.1	4.2	46.7	1.2	64.6	1.7

SEE REFERENCE NOTES FOLLOWING STATION INDEX

REFERENCE 6

TELECON NOTE
AR DEPT. OF POLLUTION CONTROL & ECOLOGY

SITE ID. NUMBER:	DATE:	TIME:
ARD983285255	November 18, 1992	0900 Hours

DISTRIBUTION: ICI Burial Pit
12th and Cedar Street
North Little Rock, AR 72114

BETWEEN:	OF:	PHONE:
Fred Days	ICI Agricultural	1-(501)-374-7445

AND: Tammie J. Hynum
Tammie J. Hynum, Inspector, ADPC&E

DISCUSSION:

Requested legal description of the property on which ICI Agricultural is currently operating on at 12th and Cedar Streets.

ICI's physical address is 824 East 12th Street, North Little Rock, AR 72114. Their mailing address is P.O. Box 188, North Little Rock, AR 72115. The following is the legal description:

A Part of the NE 1/4 Section 35, Township 2 North, Range 12 West, North Little Rock, Pulaski County, Arkansas. Described as commencing at the NE corner of said NE 1/4, Section 35; Thence South 704.1 feet along the East line of said NE 1/4; Thence South 74^0 57' West, 269.8 feet for the P.O.B. of lands herein described. From said point of beginning continue South 74^0 57' West, 347.0 feet to the South line of 12th Street; Thence North 64^0 26' East, 260.0 feet along the South line of 12th Street; Thence North 73^0 34' East, 614 feet along the South line of 12th Street; Thence South 16^0 26' East, 387.7 feet to the P.O.B., containing 6.99 acres, more or less.

ACTION ITEMS:

REFERENCE 7

December 11, 1992 ICI Burial Pit

AKA: ICI of America, ICI Agricultural, and Old Stauffer Chemical Company

Address: 824 East 12th Street
North Little Rock, AR 72114

EPA I.D. No.: ARD923285255

Site is located within Pulaski County

To reach the site → Travel Interstate 30 East toward North Little Rock, take the Broadway street Exit (access road will be Locust Street), remain on locust street, cross over the bridge, and turn right onto 13th Street. Off of 13th Street take a Right onto Cedar Street, proceed 1 block, and you will be at 12th street. ICI is located at 824 E. 12th Street.

The ICI site and general vicinity appears to be relatively flat with about ½ % slope to the northeast. The site is bordered on the south by commercial, industrial, and transportation (RR), on the West by commercial and residential, on the north by residential, commercial, and industrial and on the east by industrial and open urban area.

The nearest resident → ¼ block N of site on 13th street.

Jammie J. Hyn

12-11-92 ICI Burial Pit
Arrival Time Onsite → 0915 Hours
Facility Contacts → Frederick Days, Safety and Training Specialist, and Irvin Williams, Plant Manager (374-7445)

ICI employs about 31 people. The facility mixes and formulates liquid and granular herbicides/pesticides for agricultural use. Manufacturing agri-Chemicals generates hazardous waste. Discussion of hazardous waste generated and chemicals utilized at the site —
ICI generates ignitable D001 characteristic hazardous waste (filter cake containing ethyl benzene) and laboratory solvents (F003 & F005). Acetone and Toluene is the extraction solvents.
Zenca → new name for the facility - effective January 1, 1993. The owner will still be ICI America. The corporation is based out of Delaware.
ICI has two major production areas → (1) granular herbicides (2) liquid herbicides. None of the herbicides manufactured & packaged here are classified as poisonous.
Frederick Days handles RCRA Compliance
12/11/92 ~~Harold~~ Hayes Baber handles Air & Water Compliance

Jammie J. Hyman

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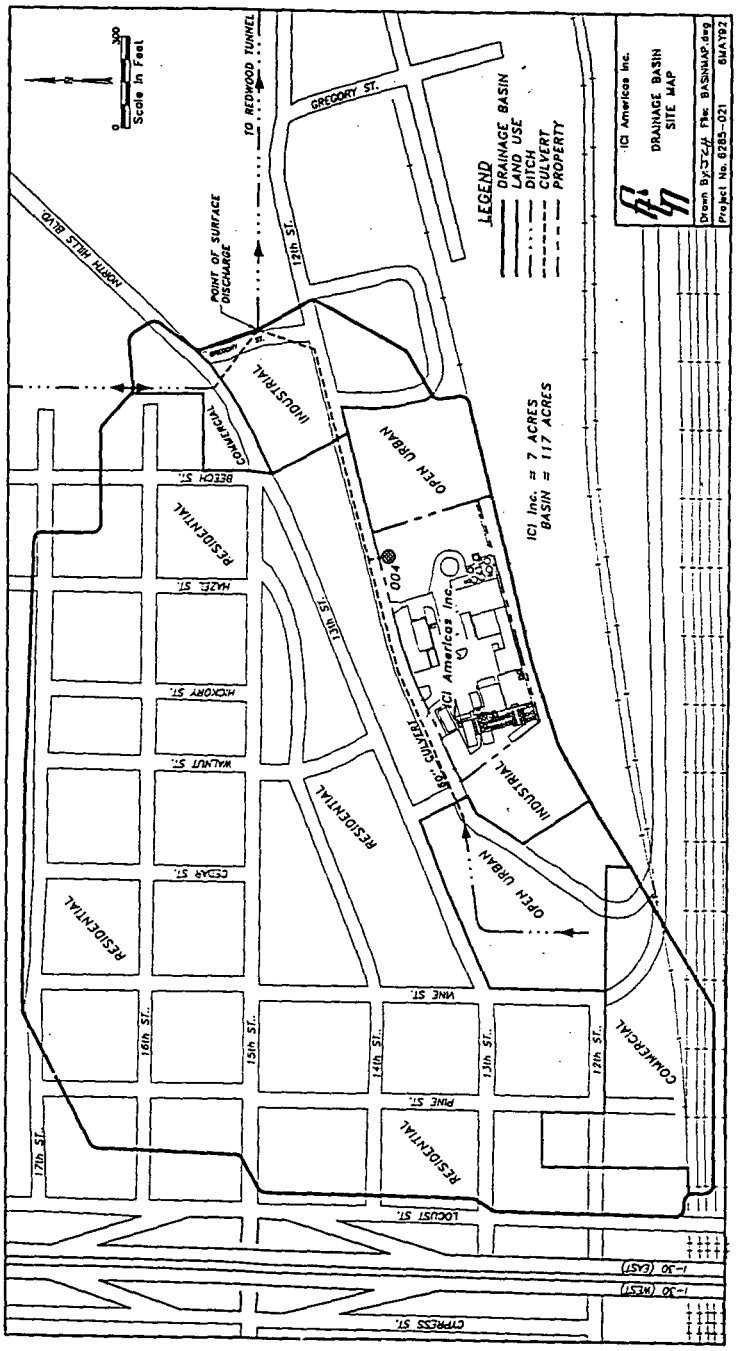
ICI Site Map



Jamie J. Hyman

12-11-92 ICI Burial Pit

ICI had an incinerator onsite that had not been utilized for years. The incinerator was disassembled 2 months ago and sold to a metal scrap facility. In 1975 or so, the incinerator was used to burn empty bags that once contained chemicals. (Mostly paper & wood pallets).

Currently onsite → 4 silo tanks ( ) ← used to store granular material, 2 charcoal filters tanks and two dust collectors, and one surge tank (50,000 lbs) (used for feeding). The granular material is brought to the site by truck. 3 buildings used for storage of raw materials, products, and empty containers. Maintenance supplies are also stored in a corner of one of the buildings. Office complex that contains management offices and the laboratory. Worker showers & lunch room building. Maintenance shop for routine plant repairs. Covered loading dock → process equipment pump and empty jugs (chemicals). Packaging building → for liquid materials. New Package building with some storage. The new package building contains 6 tanks w/in containment area. Boiler building. A large tank farm divided into 5 sections → ① sections → ⑤ utilized to store liquid technical grade herbicides, emulsifiers, and finished product prior to shipment.

plus a 300,000 lb holding tank w/in silo area 12/11/92

Tammie J Hyn

12-11-92 ICI Burial Pit

NOTE: The buried "sevin dust" is underneath the concrete foundation of one of the storage buildings (located directly behind the 4 silo tanks). RCRA hazardous waste is stored in the NE corner.

ICI has two underground tanks (W side of tank farm) used to store solvents (Kerosene and T5000/100) which aid in the production of liquid herbicides.

Liquid herbicide (technical grade) is received by Railcar and on some occassions by truck.

The plant is on one shift operator, 8 hours per day - Monday through Friday.

Sizes of tanks:

4 silo tanks → 900,000 lbs each

Tank Farm → Range 10,000 to 25,000 gallons (some 5,000 gallon tanks also)

Underground Tanks → 12,000 [T5000/100] 15,000 [Kerosene]

6 tanks w/in New Packaging Bldg. → (2) 12,000 gallons each (3) 6,000 gallons & (1) 4500 gallons

Approximate size of burial site → 80' x 160'

Jammie J. Hyre

12-11-92 ICI Burial Pit

Irvin Wheeler request a copy of the PA rpt. after it has been through EPA review.

ICI has 3 outfalls of their NPDES permit. Piping has been routed throughout the plant connecting all 3 outfall points, making a 4th outfall. ICI has intentions of trying to negotiate a new permit to include only 1 outfall. The complete site is fenced with the outfalls being w/in site property. Total acreage → 7 acres

PHOTO DOCUMENTATION

Time	WITNESS	LOCATION
9:40 AM	F. Days	NE Corner of Warehouse Storage Bldg. Burial site underneath Concrete foundation.
9.43 AM	F. Days	Outfall #4 + Closest Resident to site

Tammie J. Hom

12-11-92 ICI Burial Pit

The facility grounds have a heavy vegetative growth. The tanks are contained within a concrete bermed area. Rainfall is collected and shipped offsite to Oklahoma for deep well injection.

ICI has had no problems with the burial site. The soil covering the burial area was covered with compacted "Donofil" prior to constructing the building. The grass area adjacent to the burial site shows no signs of stress. NO ODOR

Jamnue J. Hyman
12/11/92

REFERENCE 8

OFFICIAL PHOTOGRAPH

AR DEPT. OF POLLUTION CONTROL & ECOLOGY

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SUBJECT: Burial site underneath corner of building
LOCATION: ICI Burial Site (ICI America)

CITY: North Little Rock COUNTY: Pulaski STATE: AR
DATE: December 11, 1992 TIME: 0940 Hours
WEATHER: [SUN] [HAZE] [CLOUDY] [RAIN] [SNOW]
PHOTOGRAPHER (Sig.) Tammie J. Hyne
WITNESS: Fred Days, ICI
CAMERA: Pentax K1000
FILM TYPE: 35 mm ASA: 200 T:1/ f:
NEGATIVE LOCATIONS: ADPC&E FILE #: 1589
PROCESSED BY: Harvest Foods
PHOTO #: 1 OF 2

OFFICIAL PHOTOGRAPH

AR DEPT. OF POLLUTION CONTROL & ECOLOGY

****

SUBJECT: Nearest Residence and NPDES Outfall 004
LOCATION: ICI Burial Site (ICI America)

CITY: North Little Rock COUNTY: Pulaski STATE: AR
DATE: December 11, 1992 TIME: 0943 Hours
WEATHER: [SUN] [HAZE] [CLOUDY] [RAIN] [SNOW]
PHOTOGRAPHER (Sig.) Tammie J. Hyne
WITNESS: Fred Days, ICI
CAMERA: Pentax K1000
FILM TYPE: 35 mm ASA: 200 T:1/ f:
NEGATIVE LOCATIONS: ADPC&E FILE #: 1589
PROCESSED BY: Harvest Foods
PHOTO #: 2 OF 2

A44840023

REFERENCE 9

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501) 562-7444
FAX: (501) 562-4632

May 26, 1992

R. Hayes Baber, Manager
ICI Agricultural Products
824 E. 12th Street
P. O. Box 188
North Little Rock, Arkansas 72115

Dear Mr. Baber:

The enclosed Permit No. 1030-AR-1 is your authority to construct, operate, and maintain the equipment and/or control apparatus as set forth in your application dated or last amended October 7, 1992.

After considering the facts and requirements of Act 472 of 1949, as amended (Ark. Code. Ann. Sec. 8-4-101 et seq.) and implementing regulations, I have determined that Permit No. 1030-AR-1 for the construction, operation and maintenance of an air pollution control system for ICI Agricultural Products be issued and effective on the date specified in the permit, unless a Commission review has been properly requested under Section 4, Part III, of Regulation No. 8, Arkansas Department of Pollution Control and Ecology Administrative Procedures, within 30 days after service of this decision.

All persons submitting written comments during this 30 day period, and all other persons entitled to do so, may request an adjudicatory hearing and Commission review on whether the decision of the Director should be reversed or modified. Such a request shall be in the form and manner required by Section 4, Part III, of Regulation No. 8.

The permit is subject to the conditions specified therein and the conditions, if any, which are specified in the enclosed summary report.

Sincerely,

James B. Jones, Jr.

James B. Jones, Jr.
Chief, Air Division

Enclosure

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501) 562-7444
FAX: (501) 562-4632

PERMIT

FOR THE INSTALLATION, ALTERATION, OR REPLACEMENT OF EQUIPMENT AND/OR AIR POLLUTION CONTROL APPARATUS UNDER TERMS OF THE ARKANSAS AIR POLLUTION CONTROL CODE

Permit Number: 1030-AR-1 CSN: 60-0378

To: ICI Agricultural Products
824 E. 12th Street
North Little Rock, Arkansas 72115

This permit is your authority to construct, operate and/or maintain the equipment and/or facility in the manner as set forth in the Department's summary report and your application dated October 7, 1991. This permit is issued pursuant to the provisions of the Arkansas Water and Air Pollution Control Act (Ark. Code Ann. Sec. 8-4-101 et seq.) hereinafter referred to as the "Act," and the Arkansas Air Pollution Control Code hereinafter referred to as the "Code."

1. This permit shall not relieve the owner or operator of the equipment and/or the facility from compliance with all applicable provisions of the Act and Code.

2. The equipment and/or facility shall be constructed, installed, and operated in accordance with the plans, specifications, written descriptions, and other representations contained in the permit application and the Department's summary report. There shall be no deviation therefrom without the written approval of the Director of the Department of Pollution Control and Ecology.

3. The Director shall be notified in writing within thirty (30) days after construction has commenced, construction is complete, the equipment and/or facility is first placed in operation, and the equipment and/or facility first reaches the target production rate.

4. Records must be kept for two years which will enable the Department to determine compliance with the terms of this

permit--such as hours of operation, throughput, upset condition, and continuous monitoring data. The records may be used, at the discretion of the Department, to determine compliance with the conditions of the permit.

5. Each emission point for which an emission test method is specified in this permit shall be tested in order to determine compliance with the emission limitations contained herein within sixty (60) days of achieving the maximum production rate, but in no event later than 180 days after initial start-up of the permitted source. The permittee shall notify the Department of the scheduled date of compliance testing at least fifteen (15) days in advance of such test. Compliance test results shall be submitted to the Department within thirty (30) days after the completed testing. The permittee shall provide:

   (a) Sampling ports adequate for applicable test methods
   (b) Safe sampling platforms
   (c) Safe access to sampling platforms
   (d) Utilities for sampling and testing equipment

6. The equipment, control apparatus and emission monitoring equipment shall be operated within their design limitations and maintained in good condition at all times.

7. If, for any reason, the permittee does not comply with or will not be able to comply with the emission limitations specified in this permit, the permittee shall report such occurrences to the Department within twenty-four (24) hours and provide the following information in writing within five (5) days of such conditions:

   (a) Description of noncomplying emission(s)
   (b) Cause of noncompliance
   (c) Anticipated time the noncompliance is expected to continue, or if corrected, the duration of the period of noncompliance
   (d) Steps taken by the permittee to reduce and eliminate the noncomplying emission
   (e) Steps taken by the permittee to prevent recurrence of the noncomplying emission

   Failure to provide the above information shall constitute a violation of the terms and conditions of this permit. Submittal of this report does not constitute a waiver of the emission limitations contained within this permit.

8. This permit shall be available for inspection on the premises where the control apparatus is located.

ICI Agricultural Products
Permit No. 1030-AR-1

9. The permittee shall allow representatives of the Department upon the presentation of credentials:

   (a) To enter upon the permittee's premises, or other premises under the control of the permittee, where an air pollutant source is located or in which any records are required to be kept under the terms and conditions of this permit

   (b) To have access to and copy any records required to be kept under the terms and conditions of this permit, or the Act
   (c) To inspect any monitoring equipment or monitoring method required in this permit
   (d) To sample any emission of pollutants
   (e) To perform an operation and maintenance inspection of the permitted source

9. This permit is issued in reliance upon the statements and presentations made in the application. The Department has no responsibility for the adequacy or proper functioning of the equipment or control apparatus.

10. This permit shall be subject to revocation or modification when, in the judgment of the Director, such revocation or modification shall become necessary to comply with the provisions of the Act, Code, or Plan, or if the permittee fails to pay the permit fee in accordance with Regulation No. 9.

11. This permit is issued to the applicant alone. It may not be transferred to another party. In the event of the sale of the permitted facility, this permit shall expire and the purchaser must apply for a new permit.

Approved:

Department of Pollution Control
and Ecology

James B. Jones Jr.
Chief, Air Division

Date 26 MAY 1992

4

Arkansas Department of Pollution Control and Ecology.
Division of Air Pollution Control

Summary Report Relative to Permit Application

Submitted By: ICI Agricultural Products, NLR Plant
North Little (Pulaski County)

CSN: 600378 Permit No.: 1030-AR-1 Date Issued: 5/26/92

Submittals: 10/07/91, 11/19/91, 12/17/91, 12/18/91, 04/01/92

Summary

Permit 198-I was issued to Stauffer Chemical Company on 03/24/74. This permit allowed installation and operation of an incinerator to burn 2000 lb/day of type 0 waste. Currently this incinerator is not in service and is scheduled to be dismantled.

Permit 577-A was issued to Stauffer Chemical Company on 09/28/79 after several years of operation without an air permit. In the past, this facility has been the subject of several complaints for noxious odors.

Imperial Chemical Industries (PLC) is the parent company of ICI Agricultural Products which operates a chemical formulation facility (SIC 2870) located at 824 East 12th Street, North Little Rock, Pulaski County, Arkansas. ICI Agricultural Products will be regulated under the Arkansas Air Pollution Control Code (Air Code) standards. ICI is proposing to install four additional tanks at this site to contain the finished products.

The following is a description of processes in this facility:

Granular production unit

This process (SN-01) involves blending granular clay with herbicide in two converted cylindrical cement mixers. Each blended batch is about 5,000 pounds. The blended material is transported to hoppers above the bagfilling unit. The material is bagged into fifty pound bags, heat sealed, check weighed, and palletized. Each pallet is shrink wrapped in polyethylene film and stored in a warehouse on site.

The packaging unit is vented to a double 3 foot activated carbon bed (C1) operating at 10,000 cfm through a baghouse (F1). The carbon bed (C1) is vented to the atmosphere.

Reviewed By: Alan Shar Approved By: J.B. Jones
Applicable Regulation: Air Code

5

The carbon bed is vented to the atmosphere. The carbon bed is monitored periodically for break through. Sampling ports are located at 9 inch increments of the bed. There are three sampling ports for carbon bed filter C1. There is a fabric filter, and a carbon bed adsorber associated with this operation.

The following chemicals are handled at SN-01: Koalin clay, Ordram (molinate), and Eptam (EPTC).

Liquid herbicide unit

Mixing of herbicide technicals with emulsifiers and solvents (kerosene or Tenneco 500-100), and packaging of finished product into various size containers are performed here (SN-02). Some technicals and all finished products are filtered to remove impurities and debris. All materials are transported in a closed pipe system. Containers of finished products are capped, sealed, and placed in boxes. These boxes are palletized and stretch wrapped with a polyethylene film. Pallets are warehoused and shipped.

Some of the chemicals handled at SN-02 are as follows: Ordram (molinate), Eptam (EPTC), Propanil, Betasan (bensulide), R-33865 (0,0-Diethyl-0-phenyl phosphorothioate), Sutan (butlyate), Tillam (pebulate), Kerosene (solvent), Tenneco 500-100 (solvent), Sponto 221ER (emulsifier), Sponto C-5643 (emulsifier), Sponto 221ST (emulsifier), Sponto 217 (emulsifier), Touchdown (sulfosate), and Al-2406 (emulsifier).

Vapam unit

This process (SN-03) involves packaging of Vapam (Sodium methyl dithiocarbamate CAS 137-42-8). Vapam is transported from the Vapam storage tanks to a filler where it is packaged into five or fifty-five gallon containers. All finished product packages are palletized, stretch wrapped, and set aside for shipment. See specific condition number thirteen (13). The following chemical is handled at SN-03: Vapam (soil fumigant).

Loading/ unloading / storage

Finished products are loaded into tank trucks for distribution (SN-04). Bulk loading is accomplished by pumping final product from storage tanks through filters into tank trucks positioned on scales. Raw materials are unloaded from tank trucks into storage tanks within a closed pipe system.

The air emissions at SN-04 are normally associated with the following materials: Dipropylene Glycol, Betasan (bensulide), AL-2406, Touchdown (sulfosate), and wastewater.

CSN 600378 ICI Agricultural Products, North Little Rock
Permit No. 1030-AR-1

The following chemicals are handled at the herbicide technical storage(SN-05) area: Ordram (molinate), Eptam (EPTC), Propanil, Betasan (bensulide), Sutan (butlyate), and Tillam (pebulate).

Only Kerosene is handled at SN-06.
Only Tenneco 500-100, a solvent containing mixed isomers of Xylene, Naptha, Ethyl benzene, and toluene is handled in SN-07.

The following chemicals are handled in SN-08: Sponto 221ER (emulsifier and surfactant mixture), Sponto 221ST (emulsifier and surfactant mixture).

Tanks

All tanks are vented directly to the atmosphere. The permittee is considering installation of one granular carbon bed adsorber as the control device for all tanks in the near future. Currently, there are 7 tanks associated with SN-04, 21 tanks associated with SN-05, and 8 tanks associated with SN-05. In addition, there are also 2 underground tanks (Kerosene and Tenneco) at this facility.

SPECIFIC CONDITIONS

1. Delivery, storage, shipment, sales, process,distribution, and production of unregistered pesticides in any form (active or inert ingredients) shall be considered a violation of this permit.

2. Visible emissions from each source shall not exceed 0% opacity as measured by USEPA Method 9.

3. The permittee shall operate all equipment and associated control devices within design specifications as described in the permit application at all times. In addition, the permittee shall routinely maintain all equipment and associated control devices in proper operating condition.

4. Any construction, modification, or reconstruction shall be reported to the Department in advance.

5. There shall be no obnoxious odors emitted to the atmosphere from this facility. Noncompliance with this condition shall be considered a violation of this air permit.

6. The permittee shall comply with all provisions of 40 CFR part 169 - Books and Records of Pesticide Production and Distribution- at all times (Attachment 2).

7. The permittee shall comply with all provisions of 40 CFR part 152.220 Subpart L- Intrastate Pesticide Products- at all times (Attachment 1).

8. The permittee shall comply with all provisions of 40 CFR part 710 - Inventory Reporting Regulations- on which information must be reported.

9. The permittee shall maintain production logs on site and such data shall be made available for inspection upon request.

10. The permittee shall report any accidental release, spill, mishap, or fire to the Department. Such a report shall describe the incident, surrounding circumstances, and corrective actions taken to rectify the problem. All persons exposed to Ordram in case of fire and explosion shall be monitored for Choline Esterase levels.

11. The permittee shall maintain a complete list of all storage tanks (above ground and underground) on site at all times. This list shall contain all pertinent information regarding storage tanks (ID, capacity, material stored, control device, etc.). This list shall be made available for inspection upon request.

12. The permittee shall comply with all applicable provisions of SARA Title III air emission reporting requirements. Currently Xylene (ortho, meta, and para), Ethyl benzene, Butanol, Trimethyl benzene, and Acetone are on this report.

13. The permittee shall store Vapam in a well maintained and ventilated area to prevent its gradual decomposition to Methyl Isothiocyanate (MITC).

14. The permittee shall collect periodically (at least twice a year) air or carbon samples from each and every level of the carbon bed adsorber C1. Samples shall be analyzed and the complete test results along with the operating or production parameters shall be submitted to the Department within 30 days of sampling.

CSN 600378 ICI Agricultural Products, North Little Rock
Permit No. 1030-AR-1

SN	Source	Control	lb/hr	hr/day/wk/yr	ton/yr	Pollutant
01	Granular herb. prod.	bag filter F1	0.285	8/5/50	0.297	PM(Koalin dust)
		adsorber C1	0.0037		0.0037	VOC(Thiocarbamate)
02	Liq. herb. prod.	None	0.07	8/5/50	0.07	VOC
03	Vapam prod.	None	0.31	8/5/12	0.185	VOC
04	Bulk load/unload/storage	None	0.0002	8/5/52	0.0002	VOC
05	Herb. tech. storage	None	0.001	24/7/52	0.004	VOC
06	Kerosene storage	None	0.008	24/7/52	0.033	VOC
07	Tenneco storage	None	0.005	24/7/52	0.022	VOC
08	Emulsifier	None	0.002	24/7/52	0.01	VOC

Total VOC: 0.40 lb/hr, 0.33 ton/yr.
Total PM: 0.285 lb/hr, 0.297 ton/yr.

Subparts J—K [Reserved]

Subpart L—Intrastate Pesticide Products

SOURCE: 53 FR 15988, May 4, 1988, unless otherwise noted.

§ 152.220 Scope.

This subpart applies to any intrastate pesticide product defined as a product:

(a) Which is distributed and sold solely within a single State, in accordance with a registration issued to the producer by that State; and

(b) For which a proper Notice of Application for Federal Registration (EPA Form 8570-8) was filed (in accordance with regulations codified in 40 CFR 162.17(d) on July 3, 1975) by October 4, 1975 (or by a later date as allowed by the Agency).

§ 152.225 Application for Federal registration.

(a) Each current intrastate producer who has submitted a "Notice of Application for Federal Registration" must, no later than July 31, 1988, submit a full application for Federal registration complying with the requirements of this Part 152.

(b) The Agency may, at any time before that date, require the producer of an intrastate product to submit an application for Federal registration of the product. If the Agency requires the submission of an application for registration of an intrastate product prior to July 31, 1988, the Agency will notify the producer of the intrastate product in writing, and will specify a date by which the application must be submitted.

(c) The Agency will require the producer of an intrastate product to submit an application for Federal registration if the intrastate product contains the same active ingredient as, and is intended for the same or a substantially similar end use as, a federally registered product that is subject to:

(1) A notice of special review in accordance with § 154.25 of this chapter;

(2) A notice under FIFRA sec. 3(c)(2)(B) requiring the submission of data in support of Federal registration;

(3) A regulation or notice classifying the product for restricted use under FIFRA sec. 3(d)(1)(C); or

(4) A notice requiring the Federal registrant to submit an application for reregistration of his product.

§ 152.230 Sale and distribution of unregistered intrastate pesticide products.

(a) An intrastate product which is not federally registered may continue to be sold or distributed solely within a single State, provided that:

(1) Such product complies with FIFRA sec. 12(a)(1)(D) and (E), in accordance with definitions contained in:

(i) FIFRA sec. 2(q)(1)(A) through (G); and

(ii) FIFRA sec. 2(q)(2)(A), (C)(i) through (iii), and (D).

(2) The producer of such product has submitted a timely application for Federal registration of the pesticide (by July 31, 1988, or earlier if notified by the Agency to do so);

(3) The Agency has not issued in the FEDERAL REGISTER a notice of denial of an application for registration of such product under FIFRA sec. 3(c)(6);

(4) The Agency has not issued a notice of intent to cancel or suspend any federally registered pesticide products containing the same active ingredient as, and intended for the same (or substantially similar) end uses as, such intrastate product; and

(5) The pesticide product is registered under the applicable State pesticide registration law.

(b) No person may distribute or sell an intrastate product after the date specified in a notice furnished in accordance with § 152.225(b) that requires submission of a full application for Federal registration by such date.

(c) No person may distribute or sell an intrastate product after July 31, 1988, unless he has submitted an application for full Federal registration in accordance with § 152.225. Distribution or sale of any such product will be considered a violation of FIFRA sec. 12(a)(1)(A).

ATTACHMENT 1

mend or suggest the purchase or use of:

(1) Any pesticide for a use authorized under a FIFRA section 5 experimental use permit (EUP).

(2) Any pesticide for a use authorized under a FIFRA section 18 emergency exemption, except for advertisements that:

(i) Are placed in media which address primarily persons in the geographical area to which the exemption applies.

(ii) State the name and address of one or more retail dealers who stock the pesticide.

(iii) Contain a prominent notice of the limitations on use under the section 18 emergency exemption.

(3) Any pesticide for any use authorized only by a FIFRA section 24(c) special local need registration, unless the advertisement contains a prominent notice of the limitations on use under the section 24(c) registrations.

(4) Any unregistered pesticide for any use unless the advertisement is one permitted by paragraph (b) (2) or (3) of this section.

(5) A registered pesticide product for an unregistered use, unless the advertisement is one permitted by paragraph (b) (2) or (3) of this section. However, as a matter of policy, the Agency will not regard as unlawful the advertisement of uses permitted by FIFRA section 2(ee) provided the product is not an antimicrobial pesticide targeted against human pathogens (see 51 FR 19174; May 28, 1986).

(c) For purposes of paragraph (b) of this section, a "prominent notice of the limitations on use" is one which sets forth the limitations on use in a manner reasonably likely to be understood by persons to whom the advertisement is addressed. For printed advertising, this criterion will be met by a legend in 6-point or larger type.

PART 169—BOOKS AND RECORDS OF PESTICIDE PRODUCTION AND DISTRIBUTION

Sec.

169.1 Definitions.
169.2 Maintenance of records.
169.3 Inspection.

AUTHORITY: 7 U.S.C. 136f and 136w.

SOURCE: 45 FR 54338, Aug. 15, 1980, unless otherwise noted.

§ 169.1 Definitions.

Terms used in this part shall have the meanings set forth for such terms in the Federal Insecticide, Fungicide, and Rodenticide Act, as amended. In addition, as used in this part, the following terms shall have the meanings set forth below:

(a) *Amount of pesticide or active ingredient.* The term "amount of pesticide or active ingredient" means the weight or volume of the pesticide or active ingredient used in producing a pesticide expressed as weight for solid or semi-solid products and as weight or volume of liquid products.

(b) *Batch.* The term "batch" means a quantity of a pesticide product or active ingredient used in producing a pesticide made in one operation or lot or if made in a continuous or semi-continuous process or cycle, the quantity produced during an interval of time to be specified by the producer.

(c) *Device.* The term "device" means any device or class of device as defined by the Act and determined by the Administrator to be subject to the provisions of the Act.

(d) *Inability.* The term "inability" means the incapacity of any person to maintain, furnish or permit access to any records under this Act and regulations, where such incapacity arises out of causes beyond the control and without the fault or negligence of such person. Such causes may include, but are not restricted to acts of God or of the public enemy, fires, floods, epidemics, quarantine restrictions, strikes, and unusually severe weather, but in every case, the failure must be beyond the control and without the fault or negligence of said person.

(e) *Producer.* The term "producer" means the person, as defined by the Act, who produces or imports any pesticide or device or active ingredient used in producing a pesticide.

§ 169.2 Maintenance of records.

All producers of pesticides, devices, or active ingredients used in producing pesticides subject to this Act, including pesticides produced pursuant to an experimental use permit and pesti-

ATTACHMENT 2

11

cides, devices, and pesticide active ingredients produced for export, shall maintain the following records:

(a) Records showing the product name, EPA Registration Number, Experimental Permit Number if the pesticide is produced under an Experimental Use Permit, amounts per batch and batch identification (numbers, letters, etc.) of all pesticides produced. In cases where the product is an active ingredient used in producing a pesticide or where the product is a pesticide which is not registered, is not the subject of an application for registration, or is not produced under an Experimental Use Permit, the records shall also show the complete formula. The batch identification shall appear on all production control records. These records shall be retained for a period of two (2) years.

(b) Records showing the brand names and quantities of devices produced. These records shall be retained for a period of two (2) years.

(c) Records showing the following information regarding the receipt, by the producer, of all pesticides, devices, and active ingredients used in producing pesticides:

(1) Brand name of the pesticide or device, or common or chemical name of the pesticide active ingredient;

(2) Name and address of shipper;

(3) Name of delivering carrier;

(4) Date received; and

(5) Quantities received.

These records are not intended to cover receipt of pesticides used for in-plant maintenance, extermination, or sanitation programs, etc. Shipping and receiving documents such as invoices, freight bills, receiving tickets, etc., which provide the required information will be considered satisfactory for the purposes of this section. These records shall be retained for a period of two (2) years.

(d) Records showing the following information regarding the shipment of all pesticides, devices, and active ingredients used in producing pesticides:

(1) Brand name of pesticide or device, or the common or chemical name of the pesticide active ingredient;

(2) Name and address of consignee;

(3) Where the pesticide is produced pursuant to an experimental use permit (FIFRA section 5), a special exemption (section 18), or a special local need (section 24), the information required under these sections and any regulations promulgated thereto regarding the distribution of such pesticides;

(4) Name of originating carrier;

(5) Date shipped or delivered for shipment; and

(6) Quantities shipped or delivered for shipment.

Such records are required regardless of whether any shipment or receipt of shipment is between plants owned or otherwise controlled by the same person. Shipping and receiving documents such as invoices, freight bills, receiving tickets, etc., which provide the required information will be considered satisfactory for purposes of this section. These records shall be retained for a period of two (2) years.

(e) Inventory records with respect to the types and amounts of pesticides or pesticide active ingredients, or quantities of devices in stock which he has produced. These records may be disposed of when a more current inventory record is prepared.

(f) Copies of all domestic advertising of the restricted uses of any pesticide registered for restricted use which the producer caused to have prepared, including any radio or television scripts for all such pesticides. These records shall be retained for a period of two (2) years.

(g) Copies of all guarantees given pursuant to section 12(a)(2)(C) of the Act. These records shall be retained for a period of one (1) year after expiration of the guarantee.

(h) In the case of all pesticides, devices, and active ingredients used in producing pesticides intended solely for export to any foreign country:

(1) Copies of the specification or directions of the foreign purchaser for the production of such pesticides, devices, or pesticide active ingredients;

(2) Copies of labels or labeling required to comply with section 17(a)(1) of the Act; and

(3) For any pesticide other than a pesticide registered under section 3 or

12

sold under section 6(a)(1) of the Act, copies of a statement signed by the foreign purchaser of the pesticide acknowledging that the purchaser understands that such pesticide is not registered for use in the United States and cannot be sold for use in the United States under this Act. These foreign purchaser acknowledgement statements must be obtained for the first shipment of a particular product to a particular purchaser for each importing country, once annually.

These records shall be retained for a period of two (2) years after expiration of the contract.

(i) Records on the method of disposal (burial, incineration, etc.) date or dates of disposal, location of the disposal sites, and the types and amounts of pesticides or pesticide active ingredients disposed of by the producer or his contractor. With regard to the disposal of containers accumulated during production, the Agency will consider satisfactory a statement, attested to by a responsible firm official, describing in general terms the method and location of disposal, e.g., all containers are taken periodically to a certain site. Records of deviations from normal practice must be maintained. In addition, any records on the disposal of pesticides or pesticide active ingredients and/or containers specified pursuant to section 19 of the Act and any regulations promulgated thereto shall also be maintained. The above requirements apply to those products bearing label instructions for disposal and to any other products specified under any regulations promulgated pursuant to section 19. These records shall be retained for twenty (20) years or may be forwarded after three (3) years to the Environmental Protection Agency Regional Administrator for maintenance. Notwithstanding these record keeping requirements, whenever any producer of pesticides or pesticide active ingredients is complying with a rule promulgated under the authority of the Resource Conservation and Recovery Act of 1976 (RCRA) (Pub. L. 94-580, 90 Stat. 2795, October 21, 1976), for the handling or disposal of hazardous wastes, as defined by RCRA or any regulations promulgated thereunder, such producer will no longer be required to maintain records in accordance with this subsection.

(j) Records of any tests conducted on human beings whether performed by the producer himself or authorized and/or paid for by the producer. Such records shall include: The names and addresses of subjects tested, dates of tests, types of tests, written consent of subjects to test, and all information and instructions given to the subjects regarding the nature and purpose of the tests and of any physical and mental health consequences which were reasonably foreseen therefrom, and any adverse effects of the test on the subjects, including any such effects coming to the attention of the producer after completion of the tests. These records shall be retained for twenty (20) years or may be forwarded after three (3) years to the Environmental Protection Agency Regional Administrator for maintenance.

(k) Records containing research data relating to registered pesticides including all test reports submitted to the Agency in support of registration or in support of a tolerance petition, *all* underlying raw data, and interpretations and evaluations thereof, whether in the possession of the producer or in the possession of the independent testing facility or laboratory (if any) which performed such tests on behalf of the producer. These records shall be retained as long as the registration is valid and the producer is in business.

§ 169.3 Inspection.

(a) *Producers.* Any producer of any pesticide, device, or active ingredient used in producing a pesticide which is subject to this Act shall, upon request of any officer or employee of the Agency or of any State or political subdivision, duly designated by the Administrator, furnish or permit such person at all reasonable times to have access to and to copy all records required to be maintained by this part, including records in the possession of an independent testing facility or laboratory which performed tests on behalf of the producer. Such inspection will be conducted in accordance

13

with procedures detailed in section 8(b) of the Act.

(b) Distributors, carriers, dealers, etc. Any distributor, carrier, dealer, or any other person who sells or offers for sale, delivers or offers for delivery any pesticide, device, or active ingredient used in producing a pesticide which is subject to this Act, shall, upon request of any officer or employee of the Agency or of any State or political subdivision, duly designated by the Administrator, furnish or permit such person at all reasonable times to have access to and copy all records showing the delivery or holding of such pesticide, device, or active ingredient used in producing a pesticide, including the quantity, the date of shipment and receipt, and the name and address of the consignor and consignee, and any guarantee received pursuant to section 12(b)(1) of the Act.

(c) *Confidentiality.* Any record which is subject to the regulations under this part, and which may be confidential, shall be treated in accordance with the provisions of section 10 of the Act. The availability to the public of information provided to, or otherwise obtained by, the Administrator under this Part shall be governed by Part 2 of this chapter.

(d) *Inability.* (1) In the event of the inability of any person to produce records containing the information required to be maintained, furnished for inspection, or given access to, all other records and information regarding the same shall be provided.

(2) Where no such inability exists and any such person fails to give access to and permit copying of such records as required, such failure shall be deemed a refusal to keep records required or a refusal to allow the inspection of any such records or both.

PART 170—WORKER PROTECTION STANDARDS FOR AGRICULTURAL PESTICIDES

Sec.

170.1 General.
170.2 Definitions.
170.3 General standard.
170.4 State standards, labels and exemptions.
170.5 Warnings.

AUTHORITY: 7 U.S.C. 136w.

SOURCE: 39 FR 16890, May 10, 1974, unless otherwise noted.

§ 170.1 General.

This part contains occupational safety and health standards for farm workers performing hand labor operations in fields after ground (other than those incorporated into the soil), aerial or other type of application of pesticides.

§ 170.2 Definitions.

Terms used in this subpart shall have the meanings set forth for such terms in the Act. In addition, as used in this subpart, the following terms shall have the meanings stated below:

(a) The term "reentry time" means the period of time immediately following the application of a pesticide to a field when unprotected workers should not enter as provided for in § 170.3(b).

(b) The term "farm worker" or "worker" means any person or persons engaged in agricultural hand labor in the field.

(c) The term "field" means any treated land area, or part thereof, upon which one or more pesticides are used for agricultural purposes, all as specified by this part.

(d) The term "protective clothing" means at least a hat or other suitable head covering, a long sleeved shirt and long legged trousers or a coverall type garment (all of closely woven fabric covering the body, including arms and legs), shoes and socks.

§ 170.3 General standard.

(a) *Application.* No owner or lessee shall permit the application of a pesticide in such a manner as to directly or through drift expose workers or other persons except those knowingly involved in the application. The area being treated must be vacated by unprotected persons.

(b) *Reentry times.* (1) No owner or lessee shall permit any worker not wearing protective clothing (under § 170.2(d)) to enter a field treated with pesticides until sprays have dried or dusts have settled, unless exempted from such requirements, or a longer

14

REFERENCE 10

→ Permit number: AR0042901

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND THE ARKANSAS WATER AND AIR POLLUTION CONTROL ACT

In accordance with the provisions of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, Ark. Code Ann. 8-4-101 et seq.), and the Clean Water Act (33 U.S.C. 1251 et seq.),

I.C.I. Americas, Inc.
Nyala Farm Road
Wilmington, DE 19897

is authorized to discharge from a facility located at

824 East 12th Street in City of North Little Rock. In NE 1/4, Section 35, Township 2 North, Range 12 West, Pulaski County, Arkansas.

Outfall 001:	34 deg. 45' 57" N
	92 deg. 15' 18" W
Outfall 002:	34 deg. 45' 58" N
	92 deg. 15' 14" W
Outfall 003:	34 deg. 45' 58" N
	92 deg. 15' 09" W

to receiving waters named:

unnamed tributary of West Branch of Dark Hollow Canal, thence to West Branch of Dark Hollow Canal, thence to Dark Hollow Canal, thence to Arkansas River in Segment 3C of the Arkansas River Basin.

in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II (Version 1), III, and IV (Version 1) hereof.

This permit shall become effective on November 1, 1988

This permit and the authorization to discharge shall expire at midnight, October 31, 1993

Signed this 30th day of September, 1988

Vince Blubaugh
Chief, Water Division
Arkansas Department of Pollution Control and Ecology

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL Outfall 001 - Stormwater Runoff from Diked Storage Areas

During the period beginning on effective date and lasting through date of expiration, the permittee is authorized to discharge from outfall serial number Outfall 001 - Stormwater Runoff from Diked Storage Areas. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day)		Other Units (specify)		Measurement	Sample
	Monthly Avg	Daily Max	Monthly Avg	Daily Max	Frequency	Type
Flow* (mgd)	N/A	N/A	*	*	One/day/dish. **	Instantaneous
Chemical Oxygen Demand	N/A	N/A	N/A	75 mg/l	One/day/dish. **	Grab
Total Suspended Solids	N/A	N/A	N/A	50 mg/l	One/day/dish. **	Grab
Oil & Grease	N/A	N/A	N/A	15 mg/l	One/day/dish. **	Grab
Phenol, Total	N/A	N/A	N/A	0.5 mg/l	One/day/dish. **	Grab
Arsenic, Total Recoverable	N/A	N/A	N/A	0.3 mg/l	One/day/dish. **	Grab
Zinc, Total Recoverable	N/A	N/A	N/A	0.3 mg/l	One/day/dish. **	Grab
Acute Biomonitoring	N/A	N/A	***	***	Once/quarter	Grab

* Flow must be monitored and reported. See Part II, C., 2.
** Once per day, each day discharge occurs.
*** See Part III, 1.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored once/day/discharge by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Outfall 001, where discharge enters drain on west side of plant site.

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL Outfall 002 - Stormwater Runoff from Central Portion of Plant Site.

During the period beginning on effective date and lasting through date of expiration, the permittee is authorized to discharge from outfall serial number Outfall 002 - Stormwater Runoff from Central Portion of Plant Site. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day)		Other Units (specify)		Measurement	Sample
	Monthly Avg	Daily Max	Monthly Avg	Daily Max	Frequency	Type
Flow* (mgd)	N/A	N/A	*	*	One/quarter **	Instantaneous
Chemical Oxygen Demand	N/A	N/A	N/A	75 mg/l	One/quarter **	Grab
Total Suspended Solids	N/A	N/A	N/A	50 mg/l	One/quarter **	Grab
Oil & Grease	N/A	N/A	N/A	15 mg/l	One/quarter **	Grab
Phenol, Total	N/A	N/A	N/A	0.5 mg/l	One/quarter **	Grab
Arsenic, Total Recoverable	N/A	N/A	N/A	0.3 mg/l	One/quarter **	Grab
Zinc, Total Recoverable	N/A	N/A	N/A	0.3 mg/l	One/quarter **	Grab
Acute Biomonitoring	N/A	N/A	***	***	One/quarter	Grab

* Flow must be monitored and reported. See Part II, C., 2.
** During or immediately following rainfall event.
*** See Part III, 1.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored one/quarter by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Outfall 002, where runoff enters 30" drain pipe on north side of plant site (between main office and parking area).

3

SECTION A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS: OUTFALL Outfall 003 - Stormwater Runoff from South & East Portion of Plant Site

During the period beginning on effective date and lasting through date of expiration, the permittee is authorized to discharge from outfall serial number Outfall 003 - Stormwater Runoff from South & East Portion of Plant Site. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Mass (lbs/day)		Other Units (specify)		Measurement	Sample
	Monthly Avg	Daily Max	Monthly Avg	Daily Max	Frequency	Type
Flow* (mgd)	N/A	N/A	*	*	One/quarter **	Instantaneous
Chemical Oxygen Demand	N/A	N/A	N/A	75 mg/l	One/quarter **	Grab
Total Suspended Solids	N/A	N/A	N/A	50 mg/l	One/quarter **	Grab
Oil & Grease	N/A	N/A	N/A	15 mg/l	One/quarter **	Grab
Phenol, Total	N/A	N/A	N/A	0.5 mg/l	One/quarter **	Grab
Arsenic, Total Recoverable	N/A	N/A	N/A	0.3 mg/l	One/quarter **	Grab
Zinc, Total Recoverable	N/A	N/A	N/A	0.3 mg/l	One/quarter **	Grab
Acute Biomonitoring	N/A	N/A	***	***	One/quarter	Grab

* Flow must be monitored and reported. See Part II, C., 2.
** During or immediately following rainfall event.
*** See Part III, 1.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored one/quarter by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Outfall 003, where runoff enters east/west road ditch @ northeast corner of plant site.

SECTION B. SCHEDULE OF COMPLIANCE

The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

Compliance with effluent limitations is required on the effective date of the permit.

PART II — STANDARD CONDITIONS
SECTION A — GENERAL CONDITIONS

1. **Duty to Comply**
The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the federal Clean Water Act and the Arkansas Water and Air Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. Any values reported in the required Discharge Monitoring Report which are in excess of the effluent limitation specified in Part I.A. shall constitute evidence of violation of such effluent limitation and of this permit.

2. **Penalties for Violations of Permit Conditions**
The Arkansas Water and Air Pollution Control Act provides that any person who violates any provisions of a permit issued under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year, or a fine of not more than ten thousand dollars ($10,000) or by both such fine and imprisonment for each day of such violation. Any person who violates any provision of a permit issued under the Act may also be subject to civil penalty in such amount as the court shall find appropriate, not to exceed five thousand dollars ($5,000) for each day of such violation. The fact that any such violation may constitute a misdemeanor shall not be a bar to the maintenance of such civil action.

3. **Permit Actions**
This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:
   a. Violation of any terms or conditions of this permit;
   b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
   c. A change in any conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
   d. A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination.
   e. Failure of the permittee to comply with the provisions of ADPC&E Regulation No. 9 (Permit fees) as required by condition II A. 10 herein.

   The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

4. **Toxic Pollutants**
Notwithstanding Part II.A.3., if any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Regulation No. 2, as amended, (regulation establishing water quality standards for surface waters of the State of Arkansas) or Section 307(a) of the Clean Water Act for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the permittee so notified.

   The permittee shall comply with effluent standards or prohibitions established under Regulation No. 2 (Arkansas Water Quality Standards), as amended, or Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

5. **Civil and Criminal Liability**
Except as provided in permit conditions on "Bypassing" (Part II.B.4.a.), and "Upsets" (Part II.B.5.b.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

6. **Oil and Hazardous Substance Liability**
Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

7. **State Laws**
Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act.

8. **Property Rights**
The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

9. **Severability**
The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, if held invalid, the application of such provisions to other circumstances, and the remainder of this permit, shall not be affected thereby.

10. **Permit Fees**
The permittee shall comply with all applicable permit fee requirements for wastewater discharge permits as described in ADPC&E Regulation No. 9 (Regulation for the Fee System for Environmental Permits). Failure to promptly remit all required fees shall be grounds for the Director to initiate action to terminate this permit under the provisions of 40 CFR 122.64 and 124.5(d), as adopted in ADPC&E Regulation No. 6, and the provisions of ADPC&E Regulation No. 8.

SECTION B — OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. **Proper Operation and Maintenance**
The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. **Need to Halt or Reduce Not a Defense**
It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example when the primary source of power for the treatment facility is reduced, is lost, or alternate power supply fails.

3. **Duty to Mitigate**
The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. **Bypass of Treatment Facilities**
   a. Bypass not exceeding limitation. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Part II.B.4.b. and 4.c.
   b. **Notice**
      (1) **Anticipated bypass.** If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
      (2) **Unanticipated bypass.** The permittee shall submit notice of an unanticipated bypass as required in Part II.D.6 (24-hour notice).
   c. **Prohibition of bypass.**
      (1) Bypass is prohibited and the Director may take enforcement action against a permittee for bypass, unless:
         (a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
         (b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
         (c) The permittee submitted notices as required by Part II.B.4.b.
      (2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in Part II.B.4.c.(1).

5. **Upset Conditions**
   a. **Effect of an upset.** An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based

permit effluent limitations if the requirements of Part II.B.5.b. of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

b. **Conditions necessary for a demonstration of upset.** A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the specific cause(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required by Part II.D.6.; and

(4) The permittee complied with any remedial measures required by Part II.B.3.

c. **Burden of proof.** In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

6. **Removed Substances**
Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering the waters of the state. Written approval for such disposal must be obtained from the ADPC&E.

7. **Power Failure**
The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failure either by means of alternate power sources, standby generators, or retention of inadequately treated effluent.

SECTION C — MONITORING AND RECORDS

1. ***Representative Sampling***
Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. **Flow Measurements**
Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to insure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10% from true discharge rates throughout the range of expected discharge volumes. Guidance in selection, installation, calibration and operation of acceptable flow measurement devices can be obtained from the following references:

a. "A Guide to Methods and Standards for the Measurement of Water Flow", U.S. Department of Commerce, National Bureau of Standards, NBS Special Publication 421, May 1975, 97 pp. (Available from the U. S. Government Printing Office, Washington, D.C. 20402. Order by SD catalog No. C13.10:421).

b. "Water Measurement Manual", U.S. Department of Interior, Bureau of Reclamation, Second Edition, Revised Reprint, 1974, 327 pp. (Available from the U.S. Government Printing Office, Washington, D.C. 20402. Order by Catalog No. 127.19/2:W29/2, Stock No. S/N 24003-0027).

c. "Flow Measurement in Open Channels and Closed Conduits", U.S. Department of Commerce, National Bureau of Standards, NBS Special Publication 484, October 1977, 982 pp. (Available in paper copy or microfiche from National Technical Information Service (NTIS), Springfield, VA 22151. Order by NTIS No. PB-273 535/5ST).

d. "NPDES Compliance Sampling Manual", U.S. Environmental Protection Agency, Office of Water Enforcement, Publication MCD-51, 1977, 140 pp. (Available from the General Services Administration (8FFS), Centralized Mailing Lists Services, Building 41, Denver Federal Center, Denver, CO 80225).

3. **Monitoring Procedures**
Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals frequent enough to insure accuracy of measurements and shall insure that both calibration and maintenance activities will be conducted. An adequate analytical quality control program, including the analysis of sufficient standards, spikes, and duplicate samples to insure the accuracy of all required analytical results shall be maintained by the permittee or designated commercial laboratory.

4. **Penalties for Tampering**
The Arkansas Water and Air Pollution Control Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year or a fine of not more than ten thousand dollars ($10,000) or by both such fine and imprisonment.

5. **Reporting of Monitoring Results**
Monitoring results must be reported on a Discharge Monitoring Report (DMR) form (EPA No. 3320-1). Monitoring results obtained during the previous calendar month shall be summarized and reported on a DMR form postmarked no later than the 25th day of the month following the completed reporting period to begin on the effective date of the permit. Duplicate copies of DMR's signed and certified as required by Part II.d.11 and all other reports required by Part II.D. (Reporting Requirements), shall be submitted to the Director at the following address:

Director
Arkansas Department of Pollution
Control and Ecology
8001 National Drive
Post Office Box 9583
Little Rock, Arkansas 72219

6. **Additional Monitoring by the Permittee**
If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such *increased frequency shall also be indicated on the DMR.*

7. **Retention of Records**
The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

8. **Record Contents**
Records and monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. the analytical techniques or methods used; and

f. The measurements and results of such analyses.

9. **Inspection and Entry**
The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's permises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample, inspect or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

SECTION D — REPORTING REQUIREMENTS

1. **Planned Changes**
The permittee shall give notice and provide plans and specifications to the Director for review and approval prior to any planned physical alterations or additions to the permitted facility. Notice to the Environmental Protection Agency is required only when:

For Industrial Dischargers

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR

Part 122.29(b) [48 FR 14153, April 1, 1983, as amended at 49 FR 38046, September 26, 1984]; or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR Part 122.42(a)(1) [48 FR 14153, April 1, 1983, as amended at 49 FR 30846, September 26, 1984].

For POTW Dischargers:

c. Any change in the facility discharge (including the introduction of any new source or significant discharge or significant changes in the quantity or quality of existing discharges of pollutants) must be reported to the permitting authority. In no case are any new connections, increased flows, or significant changes in influent quality permitted that will cause violation of the effluent limitations specified herein.

2. **Anticipated Noncompliance**
The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. **Transfers**
The permit is nontransferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Act.

4. **Monitoring Reports**
Monitoring results shall be reported at the intervals and in the form specified at Part II.C.5. (Reporting).

5. **Compliance Schedules**
Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

6. **Twenty-four Hour Reporting**
The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

The following shall be included as information which must be reported within 24 hours:

a. Any unanticipated bypass which exceeds any effluent limitation in the permit;
b. Any upset which exceeds any effluent limitation in the permit; and
c. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in Part III of the permit to be reported within 24 hours.

7. **Other Noncompliance**
The permittee shall report all instances of noncompliance not reported under Part II.D.4., 5, and 6, at the time monitoring reports are submitted. The reports shall contain the information listed at Part II.D.6.

8. **Changes in discharge of Toxic Substances for Industrial Dischargers**
The permittee shall notify the Director as soon as he/she knows or has reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, in a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" described in 40 CFR 122.42(a)(1) [48 FR 14153, April 1, 1983, as amended at 49 FR 38046, September 26, 1984].
b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" described in 40 CFR Part 122.42(a)(2) [48 FR 14153, April 1, 1983, as amended at 49 FR 38046, September 26, 1984].

9. **Duty to Provide Information**
The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

10. **Duty to Reapply**
If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit. The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

11. **Signatory Requirements**
All applications, reports or information submitted to the Director shall be signed and certified.

a. All permit applications shall be signed as follows:
   (1) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
      (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or
      (ii) The manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
   (2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
   (3) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:
      (i) The chief executive officer of the agency, or
      (ii) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

b. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   (1) The authorization is made in writing by a person described above.
   (2) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
   (3) The written authorization is submitted to the Director.

c. **Certification.** Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

12. **Availability of Reports**
Except for data determined to be confidential under 40 CFR Part 2 and Regulation 6, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department of Pollution Control and Ecology. As required by the Regulations, the name and address of any permit applicant or permittee, permit applications, permits and effluent data shall not be considered confidential.

13. **Penalties for Falsification of Reports**
The Arkansas Air and Water Pollution Control Act provides that any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained under this permit shall be subject to civil and/or criminal penalties specified in Part II.A.2.

PART III
OTHER CONDITIONS

1. Biomonitoring Requirements

The Provisions of this section are applicable to Outfall(s) 001, 002, and 003.

(a) The permittee shall determine if eighty (80) percent or greater of the culture of test organisms will survive by use of the "Range-Finding Screening Test," set out in "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, " EPA-600/4-85/013 (Third Edition, March 1985). Organisms for this test shall be Daphnia sp.. The specific organism selected by the applicant shall remain the same throughout the test, unless the permittee is authorized in writing by the Department to change organisms once the test has commenced. This screening test will be conducted within sixty (60) days of the effective date of the permit. Tests will be conducted once each quarter for a period of two years utilizing a static method of 24 hours and following this dilution scheme only:

Effluent sample *	-	100 percent by volume
Dilution water	-	0 percent by volume

* Grab sample: refrigerated after collection

(b) If at any time during the above testing period a test shows a survival of less than eighty (80) percent of the test organisms, the permittee shall within twenty-four (24) hours conduct a replacement static 48-hour median lethal concentration (LC-50) test on the originally collected sample. Replacement of effluent samples shall be once per 24 hours. Organisms for this test shall be Daphnia sp. and reconstituted fresh water (EPA-600/4-85/-13, Section 6) shall be used for dilution. The remaining LC-50 methodology is available in EPA-600/4-85/013, Section 8.

(c) The permittee has the option to forego the 24-hour screening test and proceed directly with the complete 48-hour test as described above.

(d) All screening and LC-50 test results shall be reported with the Discharge Monitoring Reports. The test results should include the chemical and physical data as specified in Section 10 of EPA-600/4-85/013. The permittee shall incorporate all testing information into a report which conforms with Section 13 of EPA-600/4-85/013. A report summarizing all of the toxicity tests shall be submitted within sixty (60) days after the end of the testing period.

(e) Each time the permittee performs a bioassay as required by subsection (a) above, he/she shall also sample and analyze for all parameters specified in Part 1, Section A of this permit.

(f) If test results show that toxicity is present, the permittee shall conduct a Toxicity Reduction Evaluation (TRE) and submit results to the Department within one (1) year from the date of the report in paragraph (d) above.

(g) Whenever toxicity is present in the discharge, and at the discretion of the Department, the permit may be reopened for inclusion of toxicity based effluent limits.

PART IV —
SECTION A — DEFINITIONS

All definitions contained in Section 502 of the Clean Water Act shall apply to this permit and are incorporated herein by reference. Additional definitions of words or phrases used in this permit are as follows:

1. "Act" means the Clean Water Act, Public Law 95-217 (33. U.S.C. 1251 et seq.) as amended.
2. "Administrator" means the Administrator of the U.S. Environmental Protection Agency.
3. "Applicable effluent standards and limitations" means all State and Federal effluent standards and limitations to which a discharge is subject under the Act, including, but not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, and pretreatment standards.
4. "Applicable water quality standards" means all water quality standards to which a discharge is subject under the federal Clean Water Act and which have been (a) approved or permitted to remain in effect by the Administrator following submission to the Administrator pursuant to Section 303(a) of the Act, or (b) promulgated by the Director pursuant to Section 303(b) or 303(c) of the Act, and standards promulgated under Regulation No. 2, as amended, (regulation establishing water quality standards for surface waters of the State of Arkansas).
5. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility
6. "Daily Discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in terms of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the sampling day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the sampling day. "Daily discharge" determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the "daily discharge" determination of concentration shall be the arithmetic average (weighted by flow value) of all the samples collected during that sampling day.
7. "Monthly Average" discharge limitations means the highest allowable average of "daily discharge" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.
8. "Daily Maximum" discharge limitation means the highest allowable "daily discharge" during the calendar month.
9. "Department" means the Arkansas Department of Pollution Control and Ecology (ADPC&E)
10. "Director" means the Administrator of the U.S. Environmental Protection Agency and/or the Director of the Arkansas Department of Pollution Control and Ecology.
11. "Grab sample" means an individual sample collected in less than 15 minutes in conjunction with an instantaneous flow measurement.
12. "Industrial User" means a nondomestic discharger, as identified in 40 CFR 403, introducing pollutants to a publicly-owned treatment works.
13. "National Pollutant Discharge Elimination System" means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Clean Water Act.
14. "POTW" means a Publicly Owned Treatment Works.
15. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in productions.
16. "ADPC&E" means the Arkansas Department of Pollution Control and Ecology.
17. "Sewage sludge" means the solids, residues, and precipitate separated from or created in sewage by the unit processes of a publicly-owned treatment works. Sewage as used in this definition means any wastes, including wastes from humans, households, commercial establishments, industries, and storm water runoff, that are discharged to or otherwise enter a publicly-owned treatment works.
18. "7-day Average", other than for fecal coliform bacteria, is the arithmetic mean of the values for all effluent samples collected during the calendar week. The 7-day average for fecal coliform bacteria is the geometric mean of the values for all effluent samples collected during the calendar week. The DMR should report the highest 7-day average obtained during the calendar month.
19. "30-day Average", other than for fecal coliform bacteria, is the arithmetic mean of the values for all effluent samples collected during the calendar month. The 30-day average for fecal coliform bacteria is the geometric mean of the values for all effluent samples collected during a calendar month.
20. "12-hour composite sample" consists of 12 effluent portions collected no closer together than one hour and composited according to flow.
21. "6-hour composite sample" consists of six effluent portions collected no closer together than one hour (with the first portion collected no earlier than 10:00 a.m.) and composited according to flow.
22. "3-hour composite sample" consists of three effluent portions collected no closer together than one hour (with the first portion collected no earlier than 10:00 a.m.) and composited according to flow.
23. "Treatment works" means any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage and industrial wastes of a liquid nature to implement section 201 of the Act, or necessary to recycle or reuse water at the most economic cost over the estimated life of the works, including intercepting sewers, sewage collection systems, pumping, power and other equipment, and their appurtenances, extensions, improvement, remodeling, additions, and alterations thereof, elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities, and any works, including site acquisition of the land that will be an integral part of the treatment process or is used for ultimate disposal of residues resulting from such treatment.
24. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventive maintenance, or careless or improper operations.
25. For "fecal coliform bacteria", a sample consists of one effluent grab portion collected during a 24-hour period at peak loads.

Arkansas Department of Pollution Control and Ecology NPDES authorization to discharge to waters of the United States, permit number AR0042901.

The applicant's mailing address is:

I.C.I. Americas, Inc.
Nyala Farm Road
Wilmington, DE 19897

The discharge from this existing facility is made into unnamed tributary of West Branch of Dark Hollow Canal, thence to West Branch of Dark Hollow Canal, thence to Dark Hollow Canal, thence to Arkansas River in Segment 3C of the Arkansas River Basin. The receiving stream is a water of the United States classified for secondary contact recreation, raw water source for public industrial and agricultural water supplies, propagation of desirable species of fish and other aquatic life, and other compatible uses. The discharge is located on that water as follows: 824 East 12th Street in city of North Little Rock. In NE 1/4, Section 35, Township 2 North, Range 12 West, in Pulaski County, State of Arkansas. A statement of basis is available upon request. Under the standard industrial classification (SIC) code 2879 the applicant's activities are Mixing/formulation of agricultural chemicals.

The changes from the draft permit include:

1. Requirements for monitoring Betasan, Ordram, and Thiocarbamates were replaced with requirements for acute biomonitoring.

2. Effluent limitations for total phenol were increased from 0.3 to 0.5 mg/l.

CONSTRUCTION PERMIT

TO:
ICI Americas Inc.
P.O. Box 188
North Little Rock, AR 72115

Consulting Engineer:
FTN Associates, Ltd.
Little Rock, AR

Permit Number 42901C1

This permit is your authority to construct and/or modify the waste disposal system as set forth in Part I of the wastewater discharge permit application dated March 13, 1992; the plans and specifications dated March 13, 1992.

This permit is issued subject to the provisions of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, Ark. Code Ann. 8-4-101 et seq.), and the following terms and conditions:

1. This permit shall become effective on May 2, 1992.

2. This facility is located as follows:

   Outfall 004: Latitude: 34° 45′ 58"; Longitude: 92° 15′ 09" in Section 35 Township 2 North, Range 12 West in Pulaski County, Arkansas.

3. The disposal system shall be constructed or modified in accordance with the final plans and specifications as approved by the Arkansas Department of Pollution Control and Ecology.

4. Within ten (10) days of completion of construction, the Permittee shall submit written certification to the Department that the facility has been constructed or modified in accordance with the approved plans and specifications.

5. This permit is issued in reliance upon the statements and representations made in the application and the plans and specifications and the Department has no responsibility for adequacy or proper functioning of the disposal system. Approval of the plans and specifications by the Department does not constitute assurance that the disposal system will achieve the effluent limitations required by the final NPDES permit, or that the discharge permit will be issued.

6. This permit is for the construction of a stormwater drainage system within the property of ICI Americas Inc. to combine outfalls 001, 002, and 003 into a single outfall (004).

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

By: Chuck Bennett 4/2/92
Chuck Bennett — Date
Chief, Water Division

REFERENCE 11

Product Safety Information

EPTAM® TECHNICAL

Selective Herbicide

This Product Safety Information Sheet is principally directed to managers, safety, hygiene and medical personnel. The description of physical, chemical and toxicological properties and handling advice is based on experimental results and past experience. It is intended as a starting point for the development of safety and health procedures.

Eptam Technical is a selective herbicide for further manufacturing use only.

I. PHYSICAL AND CHEMICAL PROPERTIES

1. Active Ingredient
S-ethyl dipropylthiocarbamate

2. Application
Herbicide

3. Physical State
Amber Liquid

4. Flash Point
Greater than 200° F (Pensky-Martens Closed Tester)

5. Specific Gravity of Liquid
0.960 at 25° C/25° C

6. Water Solubility
370 ppm at 20° C

7. Vapor Pressure
0.10 millimeters at 25° C

8. Boiling Point
137-138° C at 30 mm Hg

II. CHEMICAL REACTIVITY

Relatively inert. No significant reactivity problems have been identified.

III. STABILITY

Stable under normal storage conditions. Drums should be stored in a cool location out of the sun to prevent pressure build-up.

IV. FIRE HAZARD

A closed cup flash point of greater than 200° F.

V. FIREFIGHTING TECHNIQUE

Wear full face self-contained breathing apparatus and impervious clothing (gloves, hats, safety goggles, suits and boots) of rubber. Personnel exposure must be prevented and nonessential personnel evacuated from the immediate area. Eptam may decompose under fire conditions to give off toxic irritants.

If containers are not leaking, keep cooled with a water spray.

VI. TOXICOLOGY

1. Ingestion
LD50 in rats, 1642 mg/kg. Single oral exposures of 215 to 4640 mg/kg resulted in depression, squinting, salivation, labored respiration, and ataxia. Mortality was observed at doses of 1000 mg/kg and above. LD50 in mice, 3160 mg/kg. Single oral exposures of 2150 to 10,000 mg/kg produced lacrimation, labored respiration, ataxia, ptosis, incoordination, peripheral vasodilation, depression and convulsions. Mortality was observed at doses of 4640 mg/kg. Depression, lacrimation, labored respiration, ataxia are also observed at 4640 and 1000 mg/kg.

Daily ingestion of 450, 900 and 1800 ppm Eptam Technical in the diet by dogs for 16 weeks resulted in a slight reduction of brain cholinesterase activity and alteration in the gastric mucosa at 1800 ppm and small areas of alopecia at 900 and 1800 ppm. No treatment related effects were observed at 450 ppm.

Daily ingestion of 5-160 mg/kg/day Eptam Technical in the diet by rats for up to 19 weeks resulted in reduced food consumption and body weight gains at 32-160 mg/kg, and dose dependent anticoagulation effects at 80 mg/kg and higher. At 80 mg/kg coagulation prothrombin, Russel's viper venom, and activated partial thromboplastin times were prolonged. At 160 mg/kg, death due to hemorrhage was observed as early as 18 days after initiation of treatment. Female rats were less sensitive than male rats. Resistance to the anticoagulation effect developed with time.

A no-effect level was demonstrated at 20 mg/kg/day.

Daily ingestion of 8-24 mg/kg/day Eptam Technical by mice on days 6-18 of gestation was non-teratogenic.

2. Dermal
LD50 in rabbits, approximately 10,000 mg/kg. Single dermal exposures of 10,000 mg/kg produced depression, labored respiration, unsteadiness, depressed reflexes, clonic convulsions, hind limb incoordination and mortality.

Mild irritant to the skin of rabbits.

Negative findings for skin sensitization in guinea pigs.

In case of suspected Eptam Technical poisoning, refer to procedure and emergency contacts in Section VII—FIRST AID.

In case of spillage, refer to procedure and emergency contacts in Section IX—SPILL HANDLING.

In case of animal poisoning, call a veterinarian or call collect day and night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

In case of contamination of other materials with Eptam Technical, call (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

All information is offered in good faith, without guarantee or obligation for the accuracy or sufficiency thereof, or the results obtained, and is accepted at user's risk. The uses referred to are for the purpose of illustration only, user should investigate and establish the suitability of such use(s) in every case. Nothing herein shall be construed as a recommendation for uses which infringe valid patents or as extending license under valid patents.

Stauffer CHEMICALS

STAUFFER CHEMICAL COMPANY
AGRICULTURAL CHEMICAL DIVISION
Westport, Connecticut 06880

* Registered Trademark of Stauffer Chemical Company

Printed in U.S.A. A-10811 (11/80I)

3. Ocular
Moderate irritant to the rabbit eye.

4. Mutagenicity
Negative in the Ames Test.

5. Threshold Limit Value (TLV)
The American Conference of Government Industrial Hygienists has not established a TLV for Eptam.

H-68, H-91, T-1050, T-1705, T-2060, T-2061, T-2062, T-4500, T-4935, T-6157, T-6314, RR-77-18

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs, or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the recommended procedures below. Simultaneously contact a physician, the nearest hospital, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow his advice. For additional information, call collect, day or night, Chemtrec (800) 424-9300 or Stauffer Chemical Company (203) 226-6602.

1. Ingestion
If swallowed—immediately dilute the swallowed material by rapidly giving large quantities of water or milk, if available, and induce vomiting by gagging the victim with a finger or blunt object placed on the back of the victim's tongue. Continue fluid administration until vomitus is clear. Never give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

2. Eye Contact
Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the irrigation to ensure flushing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the irrigation for an additional 15 minutes if the physician is not immediately available.

3. Skin Contact
Immediately remove contaminated clothing under a safety shower. Flush all affected areas with large amounts of water for at least 15 minutes. Do not attempt to neutralize with chemical agents. Obtain medical advice immediately.

4. Inhalation
Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually triggered oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous flow inhalator, and preferably with a physician's advice. Contact a physician immediately.

VIII. INDUSTRIAL HYGIENE

1. Ingestion
Eating, drinking, smoking and carrying of tobacco products should be prohibited in areas where there is a potential for exposure. Before eating, drinking, or smoking, in places where it is permitted, persons who have been working with this product should thoroughly wash their hands and face.

2. Inhalation
This material should only be handled in well-ventilated work areas. Control of inhalation exposures can be achieved through the use of NIOSH-MESA approved pesticide respirators with an organic vapor filter. If there is potential for exposure from aerosols or mists a particulate pre-filter is indicated.

3. Skin Contact and Absorption
Dermal contact and exposure must be prevented through the use of protective clothing, gloves and footwear. Showers should be taken at the end of the work day and clean work clothes should be provided at the start of each day. Soiled work clothes should not be taken home.

4. Eye Contact
Eye contact must be prevented through the use of chemical safety goggles.

IX. SPILL HANDLING

Make sure all personnel involved in spill are aware of the hazards associated with this material.

A *small* spill can be handled routinely considering the physical and hazardous properties of the product as well as the location of the spill. Use adequate ventilation and wear an air supplied respirator to prevent inhalation contact. Wear protective clothing to prevent skin and eye contact. Soak up pooled liquid as follows:

1. Spread a suitable absorbent such as clay on the liquid.
2. Place sweepings in an open drum.
3. Generously cover the contaminated area with a common household detergent (e.g. TIDE*). Using a stiff brush, work the detergent into the spill material, forming a slurry. Brush the slurry into cracks and crevices; and allow to stand for 2 to 3 minutes. Be careful to completely avoid skin or eye contact; do not splatter on one's self or bystanders.
4. Spread absorbents on the slurried liquid, and shovel the abosrbed material into an open drum.
5. Repeat if necessary.
6. Flush the area with water, while observing proper environmental considerations.
7. Seal drum and dispose of contaminated material in an approved pesticide dump.
8. Do not contaminate water used for irrigation or domestic purposes. Do not contaminate water by cleaning of equipment or disposal of wastes.

Larger spills must be handled according to a predetermined plan. Part of this plan should include Section V: FIREFIGHTING TECHNIQUE. For assistance in developing a plan, contact Stauffer's Agricultural Chemical Division, Westport, CT. 06880.

In case of emergency, call collect, day or night, (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Not significantly corrosive to glass or metals but may soften or deteriorate some plastics.

XI. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry ventilated area away from flammable materials, sources of heat and flame, and foodstuffs.

XII. DISPOSAL OF UNUSED MATERIAL

Eptam Technical that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides. For assistance in disposing of unused material, contact Stauffer's Agricultural Chemical Division, Westport, CT. 06880.

XIII. DISPOSAL OF CONTAINER

Triple rinse (or equivalent) and offer for recycling, reconditioning, or disposal in approved landfill or bury in a safe place.

*Reg. T.M. Procter & Gamble Co.

Product Safety Information

EPTAM® 7-E
Selective Herbicide

This Product Safety Information Sheet is principally directed to the public carrier, distributor, dealer, warehouser, and applicator whose personnel may be exposed to this product.

The description of physical, chemical, and acute toxicological properties is intended as a starting point for the development of safe handling procedures. Refer to the product label for additional instructions. For any further information, contact Stauffer Chemical Company.

Eptam 7-E is a selective herbicide containing seven pounds of active ingredient per gallon of product.

I. PHYSICAL AND CHEMICAL PROPERTIES

Active Ingredient:
S-ethyl dipropylthiocarbamate (87.8%); CAS Registry Number: 759-94-4
Inert Ingredients: (12.2%) Contains kerosene; CAS Registry Number: 8008-20-6
Physical State/Description: Amber-colored liquid
Flash Point: 190° F (88° C) Tagliabue Closed Cup
Solubility: Not soluble in water. Readily forms an emulsion in water.
Specific Gravity: 0.9535 at 68° F/68° F (20° C/20° C)

II. CHEMICAL REACTIVITY

Relatively nonreactive.

III. STABILITY

Stable at ambient temperatures and atmospheric pressure.

IN CASE OF SUSPECTED POISONING, REFER TO THE INFORMATION IN SECTION VII: HUMAN HEALTH AND THE PROCEDURE AND EMERGENCY CONTACTS IN SECTION VIII: FIRST AID.

IN CASE OF SPILLAGE, REFER TO THE PROCEDURE AND EMERGENCY CONTACTS IN SECTION X: SPILL HANDLING OR CALL PESTICIDE TEAM SAFETY NETWORK/CHEMTREC (800) 424-9300.

IV. FIRE HAZARD

Considered combustible. Under fire conditions, supports combustion and decomposes to give off toxic materials. The product contains kerosene and a proprietary mixture of surfactants which contribute to its combustibility.

V. FIREFIGHTING TECHNIQUE

Products of combustion are irritating to the respiratory tract and may cause breathing difficulty and pulmonary edema. Symptoms may be delayed several hours or longer depending upon the extent of exposure.

As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate nonessential personnel from the fire area. Firefighters should wear full-face, self-contained breathing apparatus and impervious protective clothing.

Use standard firefighting techniques to extinguish fires involving this material — use water spray, dry chemicals or carbon dioxide.

If not leaking, keep fire-exposed containers cool with a water spray to prevent rupture due to excessive heat. High pressure water hose may spread product from broken containers increasing contamination or fire hazard.

Contaminated buildings, areas and equipment must not be used until they are properly decontaminated.

VI. TOXICOLOGY

For detailed toxicity information on the active ingredient, refer to the Product Safety Information Sheet on EPTAM Technical.

Ingestion
The acute oral LD50 is 1325 mg/kg in male rats. The acute oral LD50 is 1500 mg/kg in female rats. A single oral dose of 1000 mg/kg or greater produced decreased physical activity, ataxia, lacrimation, blood stained muzzles and salivation in male rats. A single oral dose of 1500 mg/kg or greater produced decreased physical activity, ataxia and blood stained muzzles in female rats. A single oral dose of 2500 mg/kg also produced lacrimation and salivation in female rats.

Skin Contact
The acute dermal LD50 is 2750 mg/kg in rabbits. A single dermal application of 2500 mg/kg or greater produced a mild to severe decrease in physical activity, diarrhea, salivation, weight loss, clonic seizures and grinding of teeth in rabbits. Local effects included mild to moderate erythema and edema. A single dermal application of 2000 mg/kg produced no mortality in rabbits.

Mild irritant to rabbit skin following a 4- or 24-hour exposure.

Eye Contact
Severe irritant to rabbit eyes. Mild corneal opacity, mild iritis and a mild to moderate chemosis and conjunctival discharge essentially cleared in 14 days.

Inhalation
The acute inhalation LC50 is 16 mg/l (nominal concentration, actual concentration not determined) in rats. A single 4-hour inhalation exposure of 10.3 mg/l (nominal concentration) or greater produced eye squint, dyspnea, lacrimination and salivation in rats. Corneal opacity, lung and liver congestion were observed in rats that died.

T-1303, T-5234, T-6137

VII. HUMAN HEALTH

Principal routes of exposure are skin contact and inhalation. Skin or eye contact may cause irritation. Inhalation

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Westport, Connecticut 06881

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of vapors or mist may cause respiratory irritation. There are no data available which address medical conditions that are generally recognized as being aggravated by exposure to this product. (Reader should consult SECTION VI: TOXICOLOGY for effects observed in experimental animals under controlled laboratory conditions using this product.)

The product contains kerosene. Health effects associated with kerosene are as follows:

Defatting action on skin can lead to irritation or infection.[1] Inhalation of high concentrations causes headache, drowsiness or coma.[2] Swallowing causes G.I. irritation with vomiting and diarrhea.[3] Aspiration of vomitus causes serious pneumonitis.[4]

VIII. FIRST AID

CALL A POISON CENTER OR
A PHYSICIAN IMMEDIATELY

If a known exposure occurs or is suspected, immediately start the recommended procedures below. Simultaneously contact a Poison Center, a physician, or the nearest hospital. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms, and follow the advice given.

FOR ADDITIONAL MEDICAL OR TOXICOLOGICAL INFORMATION, CALL COLLECT, DAY OR NIGHT, STAUFFER CHEMICAL COMPANY, (203) 226-6602 OR CHEMTREC (800) 424-9300.

Ingestion —*NOTE:* Contains kerosone
If swallowed, immediately give several glasses of water but *do not* induce vomiting. If vomiting does occur, give fluids again. Have a physician determine if condition of patient will permit induction of vomiting or evacuation of stomach. Do not give anything by mouth to an unconscious or convulsing person.

Skin Contact
Flush all affected areas with plenty of water for several minutes. Remove and clean any contaminated clothing and shoes. Seek medical attention if skin irritation occurs.

Eye Contact
Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used at this time. Continue the flushing for an additional 15 minutes if physician is not immediately available.

Inhalation
If inhaled, remove to fresh air. If breathing becomes difficult, oxygen may be given, preferably with a physician's advice. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IX. INDUSTRIAL HYGIENE

The recommendations described in this section are provided as general guidance for minimizing exposure when handling this product. Because use conditions will vary depending upon customer applications, specific safe handling procedures should be developed by a person knowledgeable of the intended use conditions and equipment. During the development of safe handling procedures, consideration should be given to the need for cleaning of equipment and piping systems to render them nonhazardous before maintenance and repair activities are performed.

[1] Merck & Company, Inc. 1983. *The Merck Index. An Encyclopedia of Chemicals, Drugs and Biologicals.* 10th Edition. Merck & Company, Rahway, N.J.
[2] Ibid
[3] Ibid
[4] Ibid

Engineering Controls
This product is intended for use outdoors where engineering controls would not be necessary. However, in those cases where engineering controls are indicated by the use conditions (e.g., product reformulation or repackaging), the following traditional exposure control techniques may be used to effectively minimize employee exposure: local exhaust ventilation, in combination with appropriate use of personal protective equipment.

Ingestion
All food should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for significant exposure to this material. Before eating, hands and face should be thoroughly washed.

Skin Contact
Skin contact with liquid or its aerosol should be minimized through the use of gloves and and suitable long-sleeved clothing selected with regard for use condition exposure potential.

Eye Contact
Eye contact with liquid or its aerosol should be prevented, through the use of chemical safety glasses, goggles or a face shield selected with regard for use condition exposure potential.

Inhalation
If use conditions generate airborne vapor or aerosol, the material should be handled in an open (e.g., outdoor) or well ventilated area. Where adequate ventilation is not available, use NIOSH-approved pesticide respirators to reduce exposure. Where exposure potential under the use conditions necessitates a higher level of protection, use a positive-pressure, air-supplied respirator.

Exposure Limit
No exposure limits have been established for this product.

X. SPILL HANDLING

Make sure all personnel involved in the spill cleanup follow good industrial hygiene practices (refer to SECTION IX: INDUSTRIAL HYGIENE).

Any person entering either a significant spill area or an unknown concentration of a vapor or aerosol, should use a positive-pressure self-contained breathing apparatus or a positive-pressure supplied-air respirator with escape pack.

Small spills can be handled routinely. Use adequate ventilation and/or wear a NIOSH-approved pesticide respirator to prevent inhalation exposure. Wear protective clothing to prevent skin and eye contact. Use the following procedures:

Soak up pooled liquid with a suitable absorbent such as clay, sawdust or kitty litter. Sweep up absorbed material and place in a chemical waste container for disposal (refer to SECTION XIII: DISPOSAL OF UNUSED MATERIAL). Generously cover contaminated area with a slurry of common household powdered laundry detergent and water. Using a stiff brush, work the slurry into cracks and crevices. Allow to stand for 2-3 minutes then flush with water. Repeat if necessary.

Large spills should be handled according to a predetermined plan. For assistance in developing a plan, contact the Agricultural Chemical Division, Stauffer Chemical Company, Westport, CT 06881.

IN CASE OF SPILL EMERGENCY, DAY OR NIGHT, CALL (800) 424-9300 PESTICIDE TEAM SAFETY NETWORK (CHEMTREC)

XI. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Noncorrosive to materials commonly used in the construction of process equipment and storage and shipping containers.

XII. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry, well ventilated area away from flammable materials and sources of heat or flame. Store away from foodstuffs or animal feed. Exercise due caution to prevent damage to or leakage from the container.

Keep container closed when not in use. Do not store near seeds or fertilizers. Store out of reach of children, pets and domestic animals.

XIII. DISPOSAL OF UNUSED MATERIAL

Material that cannot be used as directed on the product label must be disposed of according to any applicable regulations under the Resource Conservation and Recovery Act. *NOTE:* State and local regulations may be more stringent than Federal.

XIV. DISPOSAL OF CONTAINER

Dispose of empty containers according to any applicable regulations under the Resource Conservation and Recovery Act. *NOTE:* State and local regulations may be more stringent than Federal.

XV. PRECAUTIONARY STATEMENTS

Caution! Harmful if swallowed

- Avoid contact with skin, eyes and clothing.
- Avoid inhalation of spray mist.
- Wear rubber gloves and fresh clothing.
- Wear goggles to avoid contact with eyes.
- Wash with soap and water immediately after use or contact.
- Do not contaminate food or feed.

XVI. ENVIRONMENTAL PRECAUTIONS

This product is toxic to shrimp. Keep out of tidal marshes and estuaries. Do not contaminate water by cleaning equipment or disposal of wastes.

FOR NONEMERGENCY HANDLING INFORMATION, CONTACT THE AGRICULTURAL CHEMICAL DIVISION, STAUFFER CHEMICAL COMPANY, WESTPORT, CT 06881 OR PHONE (203) 222-3000.

New Issue 8/84
Supersedes Issue Dated 5/79

Product Safety Information

ORDRAM® TECHNICAL
Selective Herbicide

This Product Safety Information Sheet is principally directed to managerial, safety, hygiene and medical personnel. The description of physical, chemical and toxicological properties and handling advice is based on experimental results and past experience. It is intended as a starting point for the development of safety and health procedures.

Ordram is a herbicide for controlling certain weeds in rice. Ordram Technical Selective Herbicide is for further manufacturing use only.

I. PHYSICAL AND CHEMICAL PROPERTIES

1. Active Ingredient
S-ethyl hexahydro-1*H*-azepine-1-carbothioate

2. Physical State
Amber liquid

3. Flash Point
139°C/282°F (Tagliabue Open Cup)
Greater than 93.3°C/200°F (Tagliabue Closed Cup)

4. Specific Gravity of Liquid
1.063 at 20°C/20°C (68°F/68°F) (Typical)

5. Product pH
9.0 (40:40:20 vol.—% Ordram:Acetone:Water)

6. Water Miscibility
800 ppm at 20°C/68°F

7. Vapor Pressure
5.6 microns Hg at 25°C/77°F

II. CHEMICAL REACTIVITY
The product is relatively nonreactive. It will not react with water.

III. STABILITY
Stable under ambient temperatures and pressures.

IV. FIRE HAZARD
This liquid has an open cup flashpoint of 139°C/282°F. Ordram Technical is not considered flammable but may support combustion and will decompose under fire conditions to give off toxic materials.

V. FIREFIGHTING TECHNIQUE
Prevent human exposure to fire, smoke, fumes, or products of combustion. Evacuate nonessential personnel from the fire area. Vapors may be irritating to the respiratory tract and may cause breathing difficulty and pulmonary edema. Symptoms may be delayed several hours or longer depending upon exposure.

Wear full-face self-contained breathing apparatus and impervious clothing (such as gloves, hoods, suits and rubber boots).

Use standard firefighting techniques in extinguishing fires involving Ordram Technical. High-pressure water hose may spread the product from broken containers increasing contamination hazards. Use of contaminated buildings, areas, and equipment must be prevented until they are properly decontaminated.

VI. TOXICOLOGY

1. Ingestion
LD_{50} in rats, 316-1260 mg/kg; in mice 795-1260 mg/kg. Toxicity in rats resulting from single oral exposures (464 mg/kg) was observed as depression of activity, ataxia, depressed respiratory rate and, at higher exposure levels, tremors and convulsion.

Short-term repeated exposure in rats (4-45 mg/kg/day) resulted in decreased weight gain, increased thyroid weight (no microscopic evidence of altered thyroid morphology) and, in male rats, decreased fertility. No anti-fertility effect was observed in female rats. The anti-fertility effect in male rats was reversible after a 14 day exposure. Animals receiving high doses (60-180 mg/kg/day) for 90 days demonstrated altered renal morphology, and progressive testicular and ovarian morphologic and atrophic alterations.

Long-term ingestion studies in rats and mice showed Ordram to be noncarcinogenic. A teratogenicity study revealed no teratogenic or embryotoxic effects in mice.

2. Dermal
LD_{50} in rabbits, greater than 4600 mg/kg; in rats, 1200 mg/kg. Mild to moderate skin irritant.

3. Ocular
Mild to moderate eye irritant.

4. Mutagenicity
Ordram was examined for mutagenic activity in the following series of microbial assays: tests employing Salmonella or E. coli indicator organisms with and without the presence of metabolic activation; "rec" assay using two strains of Bacillus subtilis; and host-mediated assay with Salmonella. Ordram did not demonstrate

In case of suspected Ordram poisoning, refer to the procedure and emergency contacts in Section VII—FIRST AID.

In case of spillage, refer to the procedure and emergency contacts in Section IX—SPILL HANDLING.

In case of animal poisoning, call a veterinarian or call collect, day or night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

In case of contamination of other materials with Ordram, call (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

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A-10784 (3/79)

mutagenic activity in any of the assays conducted.

5. Threshold Limit Value (TLV)
The American Conference of Governmental Industrial Hygienists has not established a TLV for Ordram. Stauffer Chemical Company has established its own Industrial Hygiene Guide Value (IHGV) for use at internal manufacturing and processing locations. Stauffer's IHGV for Ordram is 0.1 mg/m^3.

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs, or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the procedures recommended below. Simultaneously contact either a physician, or the nearest hospital, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms, and follow the advice given. For additional information, call collect, day or night, Chemtrec (800) 424-9300 or Stauffer Chemical Company (203) 226-6602.

1. Ingestion
If swallowed— Immediately dilute the swallowed material by rapidly giving large quantities of water or milk, if available, and induce vomiting by gagging the victim with a finger or blunt object placed on the back of the victim's tongue. Continue fluid administration until vomitus is clear. Never give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

2. Eye Contact
Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not immediately available.

3. Skin Contact
Flush all affected areas with large amounts of water for at least 15 minutes. If clothing is contaminated, remove clothing and shower. Do not attempt to neutralize with chemical agents. Obtain medical advice immediately.

4. Inhalation
Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually-triggered oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous-flow inhalator, preferably with a physician's advice. Contact a physician immediately.

VIII. INDUSTRIAL HYGIENE

1. Ingestion
Eating, drinking, smoking and carrying of tobacco products are prohibited in areas where there is potential for exposure. Before eating, hands and face should be thoroughly washed.

2. Inhalation
Control of inhalation exposures can be achieved through the use of NIOSH approved pesticide respirators with an organic vapor filter. If there is potential for exposure from aerosols or mists, a particulate pre-filter is indicated.

3. Dermal Contact
Dermal contact and exposure must be prevented through the use of suitable clothing, gloves and footwear. Showers should be taken at the end of the work day and clean clothing should be provided at the start of each day. Soiled work clothes should not be taken home.

4. Eye Contact
Eye contact must be prevented through the use of chemical safety goggles.

IX. SPILL HANDLING

Make sure all personnel involved in the spill cleanup are aware of the hazards associated with this material.

A *small* spill can be handled routinely considering the physical and hazardous properties of the product as well as the location of the spill. Use adequate ventilation and wear protective clothing to prevent skin and eye contact. Soak up pooled liquid as follows:

1. Spread a suitable absorbent such as clay on the liquid.
2. Place sweepings in an open drum.
3. Generously cover the contaminated area with a common household detergent (e.g. TIDE*). Using a stiff brush, work the detergent into the spill material using sufficient water to form a slurry. Brush the slurry into cracks and crevices; and allow to stand for 2 to 3 minutes. Be careful to completely avoid skin or eye contact; do not splatter on one's self or bystanders.
4. Spread absorbents on the slurried liquid, and shovel the absorbed material into an open drum.
5. Repeat if necessary.
6. Flush the area with water, while observing proper environmental considerations.
7. Seal drum and dispose of contaminated material in an approved pesticide dump.

Larger spills must be handled according to a predetermined plan. Part of this plan should include Section V: FIREFIGHTING TECHNIQUE. For assistance in developing a plan, contact Stauffer's Agricultural Chemical Division, Westport, CT 06880.

In Case of Emergency, Call, Day or Night
(800) 424-9300
Pesticide Team Safety Network/Chemtrec

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Not significantly corrosive to glass or metals but may soften or dissolve some plastics.

XI. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry, ventilated area away from flammable materials, sources of heat and flame, and foodstuffs.

XII. DISPOSAL OF UNUSED MATERIAL

Ordram Technical that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides.

XIII. DISPOSAL OF CONTAINER

If metal, triple rinse (or equivalent) and offer for recycling, reconditioning, or disposal in approved landfill or bury in a safe place.

*Reg. Trademark of Procter & Gamble Co.

Product Safety Information

SUTAN® TECHNICAL

Selective Herbicide

This Product Safety Information Sheet is principally directed to managers, safety, hygiene and medical personnel. The description of physical, chemical and toxicological properties and handling advice is based on experimental results and past experience. It is intended as a starting point for the development of safety and health procedures.

Sutan Technical is a selective herbicide for further manufacturing use only.

I. PHYSICAL AND CHEMICAL PROPERTIES

1. Active Ingredient
S-ethyl diisobutylthiocarbamate

2. Application
Herbicide

3. Physical State
Amber Liquid

4. Flash Point
240° F (Tagliabue Closed Cup Tester)

5. Specific Gravity of Liquid
0.9402 at 25° C

6. Water Solubility
36 ppm at 20° C

7. Vapor Pressure
13 microns at 25° C

8. Boiling Point
71° C at 1.0 mm Hg

II. CHEMICAL REACTIVITY

Normally stable and is not reactive with water. No known violent chemical reactions have been reported.

III. STABILITY

Stable under normal storage conditions. Drums should be stored in a cool location out of the sun to prevent pressure build-up.

IV. FIRE HAZARD

A closed cup flashpoint of 240° F

V. FIREFIGHTING TECHNIQUE

Wear full face self-contained breathing apparatus and impervious clothing (gloves, hats, safety goggles, suits and boots) of rubber. Personnel exposure must be prevented and nonessential personnel evacuated from the immediate area. Sutan may decompose under fire conditions to give off toxic irritants.

If containers are not leaking, keep cooled with a water spray.

VI. TOXICOLOGY

1. Ingestion
LD50 in rats, 3500-5431 mg/kg. Single oral exposures of 2150 mg/kg produced depression. Single oral exposures of 4300 to 4640 mg/kg produced depression, labored breathing, piloerection, salivation, lacrimation and mortality. Additional toxicity observed at 10,000 mg/kg included spasms, prostration and hematuria.

LD50 in guinea pigs, 1659 mg/kg. Single oral exposures of 1659 mg/kg produced depression, weakness, prostration and mortality.

Daily ingestion of 10-40 mg/kg Sutan Technical by dogs for 16 weeks resulted in no significant adverse effects.

Daily ingestion of 8-180 mg/kg Sutan Technical by rats for up to 18 weeks did not result in treatment related effects at any dose level tested.

Daily ingestion of 4-24 mg/kg/day Sutan Technical by mice on days 6-18 of gestation was non-teratogenic.

2. Ocular
Non-irritating to the eye of rabbits.

3. Dermal
LD50 in rabbits, greater than 4640 mg/kg. Single dermal exposures of rabbits up to 4640 mg/kg produced no toxicity.

Non- to mild irritant to the skin of rabbits.

4. Mutagenicity
Negative in the Ames Test.

5. Threshold Limit Value (TLV)
The American Conference of Government Industrial Hygienists has not established a TLV for Sutan.

For Stauffer Reference Only: 1. (T-6294, T-6297), H-185, T-964, T-1046, T-1646, T-1724, T-2011, T-2052, T-2053, T-5989, T-6118, T-6294, T-6297, T-6310.

In case of suspected Sutan Technical poisoning, refer to procedure and emergency contacts in Section VII—FIRST AID.

In case of spillage, refer to procedure and emergency contacts in Section IX—SPILL HANDLING.

In case of animal poisoning, call a veterinarian or call collect day and night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

In case of contamination of other materials with Sutan Technical, call (800) 424-9300)Pesticide Team Safety Network/Chemtrec).

All information is offered in good faith, without guarantee or obligation for the accuracy or sufficiency thereof, or the results obtained, and is accepted at user's risk. The uses referred to are for the purpose of illustration only; user should investigate and establish the suitability of such use(s) in every case. Nothing herein shall be construed as a recommendation for uses which infringe valid patents or as extending license under valid patents

Stauffer CHEMICALS

STAUFFER CHEMICAL COMPANY
AGRICULTURAL CHEMICAL DIVISION
Westport, Connecticut 06880

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A-10812 (5/78)

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs, or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the recommended procedures below. Simultaneously contact a physician, the nearest hospital, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow his advice. For additional information, call collect, day or night, Chemtrec (800) 424-9300 or Stauffer Chemical Company (203) 226-6602.

1. Ingestion

If swallowed—immediately dilute the swallowed material by rapidly giving large quantities of water or milk, if available, and induce vomiting by gagging the victim with a finger or blunt object placed on the back of the victim's tongue. Continue fluid administration until vomitus is clear. Never give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

2. Eye Contact

Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the irrigation to ensure flushing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the irrigation for an additional 15 minutes if the physician is not immediately available.

3. Skin Contact

Immediately remove contaminated clothing under a safety shower. Flush all affected areas with large amounts of water for at least 15 minutes. Do not attempt to neutralize with chemical agents. Obtain medical advice immediately.

4. Inhalation

Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually triggered oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous flow inhalator, and preferably with a physician's advice. Contact a physician immediately.

VIII. INDUSTRIAL HYGIENE

1. Ingestion

Eating, drinking, smoking and carrying of tobacco products should be prohibited in areas where there is a potential for exposure. Before eating, drinking, or smoking, in places where it is permitted, persons who have been working with this product should thoroughly wash their hands and face.

2. Inhalation

This material should only be handled in well-ventilated work areas. Control of inhalation exposures can be achieved through the use of NIOSH-MESA approved pesticide respirators with an organic vapor filter. If there is potential for exposure from aerosols or mists a particulate pre-filter is indicated.

3. Skin Contact and Absorption

Dermal contact and exposure must be prevented through the use of protective clothing, gloves and footwear. Showers should be taken at the end of the work day and clean work clothes should be provided at the start of each day. Soiled work clothes should not be taken home.

4. Eye Contact

Eye contact must be prevented through the use of chemical safety goggles.

IX. SPILL HANDLING

Make sure all personnel involved in spill are aware of the hazards associated with this material.

A *small* spill can be handled routinely considering the physical and hazardous properties of the product as well as the location of the spill. Use adequate ventilation and wear an air supplied respirator to prevent inhalation contact. Wear protective clothing to prevent skin and eye contact. Soak up pooled liquid as follows:

1. Spread a suitable absorbent such as clay on the liquid.
2. Place sweepings in an open drum.
3. Generously cover the contaminated area with a common household detergent (e.g. TIDE*). Using a stiff brush, work the detergent into the spill material, forming a slurry. Brush the slurry into cracks and crevices; and allow to stand for 2 to 3 minutes. Be careful to completely avoid skin or eye contact; do not splatter on one's self or bystanders.
4. Spread absorbents on the slurried liquid, and shovel the absorbed material into an open drum.
5. Repeat if necessary.
6. Flush the area with water, while observing proper environmental considerations.
7. Seal drum and dispose of contaminated material in an approved pesticide dump.

Larger spills must be handled according to a predetermined plan. Part of this plan should include Section V: FIREFIGHTING TECHNIQUE. For assistance in developing a plan, contact Stauffer's Agricultural Chemical Division, Westport, CT. 06880.

In case of emergency, call collect, day or night, (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Not significantly corrosive to glass or metals but may soften or deteriorate some plastics.

XI. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry ventilated area away from flammable materials, sources of heat and flame, and foodstuffs.

XII. DISPOSAL OF UNUSED MATERIAL

Sutan Technical that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides. For assistance in disposing of unused material, contact Stauffer's Agricultural Chemical Division, Westport, CT. 06880.

XIII. DISPOSAL OF CONTAINER

Triple rinse (or equivalent) and offer for recycling, reconditioning, or disposal in approved landfill or bury in a safe place.

*Reg. T.M. Procter & Gamble Co.

Product Safety Information

SUTAN + 6.7-E
Selective Herbicide

This Product Safety Information Sheet is principally directed to the public carrier, distributor, dealer, warehouser and applicator whose personnel may be exposed to this product. It is primarily intended for use by nontechnical personnel.

The description of physical, chemical and acute toxicological properties is intended as a starting point for the development of safe handling procedures. Refer to the product label for additional instructions. For any further information, contact Stauffer Chemical Company.

Sutan + 6.7-E selective herbicide is an emulsifiable liquid containing 6.7 pounds of active ingredient per gallon.

I. PHYSICAL AND CHEMICAL PROPERTIES

1. Ingredients
Active Ingredient: (85.1%)
S-ethyl diisobutylthiocarbamate
Inert Ingredients: (14.9%)

2. Physical State
Amber colored liquid

3. Flash Point
92° C/197° F (Tagliabue Closed Cup)

4. Specific Gravity of Liquid
0.94 at 20° C/20° C (68° F/68° F)

5. Solubility
Not soluble in water.
Readily forms an emulsion in water.

II. CHEMICAL REACTIVITY
The product is relatively nonreactive. It will not react with water.

III. STABILITY
The product is stable at atmospheric pressures and temperatures.

IV. FIRE HAZARD
This liquid has a closed cup flash point of 92° C/197° F. It will support combustion and may decompose under fire conditions to give off toxic materials.

V. FIREFIGHTING TECHNIQUE
Vapors may be irritating to the respiratory tract and may cause breathing difficulty and pulmonary edema. Symptoms may be delayed several hours or longer depending upon exposure.

As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate nonessential personnel from the fire area.

Wear full face self contained breathing apparatus and impervious clothing (such as gloves, hoods, suits and rubber boots).

Use standard firefighting techniques in extinguishing fires involving this product. If drums are not leaking, keep cooled with a water spray. High pressure water hose may spread the product from broken containers increasing contamination hazards. Use of contaminated buildings, areas, and equipment must be prevented until they are properly decontaminated.

VI. TOXICOLOGY
Harmful if swallowed. Avoid contact with skin and eyes. Avoid breathing spray mist.

1. Ingestion
LD50 in rats, 3690 to 4500 mg/kg. Single oral exposures of 2150 mg/kg produced depression.

2. Skin Contact
LD50 in rabbits, greater than 4640 mg/kg. Signs of toxicity were not observed following single dermal exposures of 4640 mg/kg.
Irritating to the skin of rabbits.

3. Eye Contact
Moderate irritant to the eye of rabbits.

4. Threshold Limit Value (TLV)
The American Conference of Governmental Industrial Hygienists has not established a TLV for Sutan.

T-4758, T-4857, T-4875,
T-5230, T-5231, T-5945

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs, or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the recommended procedures below. Simultaneously contact a physician, the nearest hospital, or the

In case of suspected Sutan + 6.7-E poisoning, refer to procedure and emergency contacts in section VII—FIRST AID.

In case of spillage, refer to procedure and emergency contacts in Section IX—SPILL HANDLING.

In case of animal poisoning, call a veterinarian or call collect day and night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

In case of contamination or other materials with Sutan + 6.7-E call (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

SUTAN and SUTAN + are registered in the U.S. Patent & Trademark Office.

All information is offered in good faith, without guarantee or obligation for the accuracy or sufficiency thereof, or the results obtained, and is accepted at user's risk. The uses referred to are for the purpose of illustration only; user should investigate and establish the suitability of such use(s) in every case. Nothing herein shall be construed as a recommendation for uses which infringe valid patents or as extending license under valid patents

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nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow the advice given. For additional information, call collect, day or night, Stauffer Chemical Company (203) 226-6602 or Chemtrec (800) 424-9300.

1. Ingestion

Do *NOT* induce vomiting. This product contains hydrocarbon solvent. Immediately give large quantities of water or milk, if available. If vomiting does occur, give fluids again. Never give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

2. Eye Contact

Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not immediately available.

3. Skin Contact

Immediately flush all affected areas with water for at least 15 minutes. Remove any contaminated clothing. Seek medical attention if irritation occurs.

4. Inhalation

Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually-triggered, oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous-flow inhalator, preferably with a physician's advice. Contact a physician immediately.

VIII. INDUSTRIAL HYGIENE

1. Ingestion

All food should be kept in a separate area, away from the working location. Eating, drinking and smoking should be prohibited in areas where there is potential for significant exposure to the product. Before eating, hands and face should be thoroughly washed.

2. Inhalation

This material should only be handled in open areas. Work involving this material should not be performed in a confined, unventilated environment.

3. Dermal Contact

Dermal contact and exposure should be minimized through the use of gloves and suitable long sleeved clothing.

4. Eye Contact

Eye contact should be prevented through the use of chemical safety glasses, goggles, or a face shield.

IX. SPILL HANDLING

Make sure all personnel involved in the spill cleanup follow good industrial hygiene practices (Refer to Section VIII).

A small spill can be handled routinely. Use adequate ventilation or wear an air supplied respirator to prevent inhalation contact. Wear protective clothing to prevent skin and eye contact. Use the following procedures:

1. Spread a suitable absorbent such as clay on the liquid.
2. Place the sweepings in an open drum.
3. Generously cover the the contaminated areas with a common household detergent (e.g. TIDE*). Using a stiff brush and small amounts of water, work the detergent into the spill material forming a slurry. Brush the slurry into cracks and crevices; and allow to stand for 2 to 3 minutes. Be careful to completely avoid skin or eye contact; do not splatter on one's self or bystanders.
4. Spread absorbents on the slurried liquid, and shovel the absorbed material into an open drum.
5. Repeat if necessary.
6. Flush the area with water, while observing proper environmental considerations.
7. Seal drum and dispose of contaminated material in an approved pesticide dump.

Large spills must be handled according to a predetermined plan. For assistance in developing a plan, contact Stauffer's Agricultural Chemical Division, Westport, CT 06880.

IN CASE OF EMERGENCY, CALL, DAY OR NIGHT
(800) 424-9300
PESTICIDE TEAM SAFETY NETWORK/CHEMTREC

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

The product is not corrosive to materials commonly used in the construction of process equipment, storage and shipping containers.

XI. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry, well ventilated area. Store away from flammable materials and sources of heat and flame. Do not store near seeds, fertilizer or foodstuffs. Exercise due caution to prevent damage to or leakage from the container.

XII. DISPOSAL OF UNUSED MATERIAL

Pesticide that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides. Consult Federal, State, or Local disposal authorities for approved alternative disposal procedures.

XIII. DISPOSAL OF CONTAINER

Triple rinse the container (or equivalent). Dispose of rinsate and rinsed container in a landfill approved for pesticides. Consult Federal, State or Local disposal authorities for approved alternative disposal procedures.

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Product Safety Information

BETASAN® TECHNICAL

Selective Herbicide

This Product Safety Information Sheet is principally directed to managers, safety, hygiene and medical personnel. The description of physical, chemical and toxicological properties and handling advice is based on experimental results and past experience. It is intended as a starting point for the development of safety and health procedures.

Betasan Technical is a selective herbicide for further manufacturing use only.

I. PHYSICAL AND CHEMICAL PROPERTIES

1. Active Ingredient
S-(*0,0*-diisopropyl phosphorodithioate) of N-(2-mercaptoethyl) benzenesulfonamide

2. Application
Herbicide

3. Physical State
Clear to amber liquid or crystalline solid

4. Flash Point
315° F (Tagliabue Open Cup Tester)

5. Specific Gravity of Liquid
1.224 at 25° C/25° C

6. Melting Point
34° C—this product supercools and may solidify at temperatures below 34° C

7. Water Solubility
25 ppm in water at 20° C

8. Vapor Pressure
0.001 microns at 25° C

9. Boiling Point
Decomposes

II. CHEMICAL REACTIVITY

Normally stable and is not reactive with water. No known violent chemical reactions have been reported.

III. STABILITY

Stable under normal storage conditions. Drums should be stored in a cool location out of the sun to prevent pressure build-up.

IV. FIRE HAZARD

An open cup flash point of 315° F

V. FIREFIGHTING TECHNIQUE

Wear full face self-contained breathing apparatus and impervious clothing (gloves, hats, safety goggles, suits and boots) of rubber. Personnel exposure must be prevented and nonessential personnel evacuated from the immediate area. Betasan may decompose under fire conditions to give off toxic irritants.

If containers are not leaking, keep cooled with a water spray.

VI. TOXICOLOGY

1. Ingestion
LD50 in rats, 271-1470 mg/kg. Single oral exposures of 215 to 4640 mg/kg produced salivation, lacrimation, urination, diarrhea, dyspnea, depression and mortality.

Daily ingestion of 625, 1250 and 2500 ppm in the diet by dogs for 14 weeks resulted in a no-effect level at 625 ppm, minimal hepatic cellular changes at 1250 ppm and reduced body weight, elevated serum enzyme levels and moderate degenerative hepatic changes at 2500 ppm.

Daily ingestion of 4 and 12 mg/kg/day by dogs for 14 weeks resulted in moderate inhibition of plasma cholinesterase at 4 and 12 mg/kg.

Daily ingestion of 20, 40, 80, 160 and 320 mg/kg/day by mice for 6 weeks resulted in decreased food consumption and body weight at 320 mg/kg.

Daily ingestion of 10 and 30 mg/kg/day by mice and 100 mg/kg/day by female mice for 12 months was without observable effect. Daily ingestion of 100 mg/kg/day by male mice for 12 months resulted in very slight to slight multi focal hepatocellular hypertrophy.

Daily ingestion of 12.5, 25 and 50 mg/kg/day by rats for 14 weeks resulted in no significant changes at 12.5 and 25 mg/kg, and slight hepatic and renal changes observed by histopathology at 50 mg/kg.

Daily ingestion of 5 or 15 mg/kg/day by rats for 13 weeks resulted in transient inhibition of plasma cholinesterase.

2. Dermal
LD50 in rabbits, approximately 4 g/kg. Toxicity was not observed in rabbits at 1000 mg/kg.

Non-irritating to the skin of rabbits.

3. Inhalation
LC50 in rats, greater than 3.07 mg/l for 1-hour exposure. No signs of toxicity were observed at 3.07 mg/l.

4. Mutagenicity
Negative in bacterial mutagenicity assay without activation.

In case of suspected Betasan Technical poisoning, refer to procedure and emergency contacts in Section VII—FIRST AID.

In case of spillage, refer to procedure and emergency contacts in Section IX—SPILL HANDLING.

In case of animal poisoning, call a veterinarian or call collect day and night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

In case of contamination of other materials with Betasan Technical, call (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

All information is offered in good faith without guarantee or obligation for the accuracy or sufficiency thereof or the results obtained, and is accepted at user's risk. The uses referred to are for the purpose of illustration only; user should investigate and establish the suitability of such use(s) in every case. Nothing herein shall be construed as a recommendation for uses which infringe valid patents or as extending license under valid patents.

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5. Threshold Limit Value (TLV)

The American Conference of Government Industrial Hygienists has not established a TLV for Betasan.

For Stauffer Reference Only: H-150, H-190, T-202, T-401, T-433, T-531, T-532, T-1078, T-1659, T-2007, T-2022, T-2023, T-2032, T-2033, T-2034, T-2091, T-2092, T-2166, T-5040, T-5118, T-5986, T-6155, T-6388, T-6389.

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs, or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the recommended procedures below. Simultaneously contact a physician, the nearest hospital, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow his advice. For additional information, call collect, day or night, Chemtrec (800) 424-9300 or Stauffer Chemical Company (203) 226-6602. **Note:** *Be sure to advise the physician that the compound is a cholinesterase inhibitor,* and follow his or her advice.

1. Ingestion

If swallowed—immediately dilute the swallowed material by rapidly giving large quantities of water or milk, if available, and induce vomiting by gagging the victim with a finger or blunt object placed on the back of the victim's tongue. Continue fluid administration until vomitus is clear. Never give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

2. Eye Contact

Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the irrigation to ensure flushing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the irrigation for an additional 15 minutes if the physician is not immediately available.

3. Skin Contact

Immediately remove contaminated clothing under a safety shower. Flush all affected areas with large amounts of water for at least 15 minutes. Do not attempt to neutralize with chemical agents. Obtain medical advice immediately.

4. Inhalation

Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually triggered oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous flow inhalator, and preferably with a physician's advice. Contact a physician immediately.

VIII. INDUSTRIAL HYGIENE

1. Ingestion

All food must be kept in a separate area away from the working location. Eating, drinking, smoking and carrying of tobacco products should be prohibited in areas where there is a potential for exposure. Before eating or consuming beverages, face and hands should be thoroughly washed.

2. Inhalation

This material should only be handled in well-ventilated areas. Where adequate ventilation is not available and there is a possibility of exposure to vapor, aerosol, or mist, inhalation exposure can be controlled through the use of a NIOSH-MESA approved pesticide respirator with an organic vapor filter in combination with a particulate pre-filter.

3. Skin Contact and Absorption

Dermal contact and exposure must be prevented through the use of protective clothing, gloves and footwear. Showers should be taken before lunch and clean clothes provided. Showers should be taken at the end of the work day and clean clothing should be provided at the start of each day. Soiled work clothes should not be taken home.

4. Eye Contact

Chemical safety goggles must be worn whenever a potential for eye contact exists.

IX. SPILL HANDLING

Make sure all personnel involved in spill are aware of the hazards associated with this material.

A *small* spill can be handled routinely considering the physical and hazardous properties of the product as well as the location of the spill. Use adequate ventilation and wear an air supplied respirator to prevent inhalation contact. Wear protective clothing to prevent skin and eye contact. Soak up pooled liquid as follows:

1. *If Betasan is in the liquid state:* spread a suitable absorbent such as clay on the liquid.

If Betasan is in the solid state: sweep up the powder being careful not to create dust.

2. Place sweepings in an open drum.
3. Generously cover the contaminated area with a common household detergent (e.g. TIDE*). Using a stiff brush, work the detergent into the spill material (adding sufficient water to the solid product) to form a slurry. Brush the slurry into cracks and crevices; and allow to stand for 2 to 3 minutes. Be careful to completely avoid skin or eye contact; do not splatter on one's self or bystanders.
4. Spread absorbents on the slurried liquid, and shovel the absorbed material into an open drum.
5. Repeat if necessary.
6. Flush area with water, while observing proper environmental considerations.
7. Seal drum and dispose of contaminated material in an approved pesticide dump.
8. This product is toxic to fish. Do not contaminate water by cleaning of equipment or disposal of wastes.

Large spills must be handled according to a predetermined plan. Part of this plan should include Section V: FIREFIGHTING TECHNIQUE. For assistance in developing a plan, contact Stauffer's Agricultural Chemical Division, Westport, Ct. 06880.

In case of emergency, call collect, day or night, (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

IX. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Not significantly corrosive to glass or metals but may soften or deteriorate some plastics.

X. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry ventilated area away from flammable materials, sources of heat and flame, and foodstuffs.

XI. DISPOSAL OF UNUSED MATERIAL

Betasan Technical that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides. For assistance in disposing of unused material, contact Stauffer's Agricultural Chemical Division, Westport, Ct. 06880

XII. DISPOSAL OF CONTAINER

Triple rinse, (or equivalent) and offer for recycling, reconditioning, or disposal in approved landfill or bury in a safe place.

*Reg. T.M. Procter & Gamble Co.

Product Safety Information

SUTAZINE™+

Selective Herbicide

This Product Safety Information Sheet is principally directed to the public carrier, distributor, dealer, warehouser, and applicator whose personnel may be exposed to this product.

The description of physical, chemical and acute toxicological properties is intended as a starting point for the development of safe handling procedures. Refer to the product label for additional instructions. For any further information, contact Stauffer Chemical Company.

Sutazine+ selective herbicide contains 6 pounds of active ingredients per gallon of product.

I. PHYSICAL AND CHEMICAL PROPERTIES

Active Ingredients

S-ethyl diisobutylthiocarbamate (56.8%),
CAS Registry Number: 2008-41-5;
atrazine: 2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine (13.9%),
CAS Registry Number: 1912-24-9;
related triazines (.3%)

Inert Ingredients

(29%)

Physical State/Description

Tan colored liquid

Flash Point

Greater than 212°F (100°C) Setaflash Closed Cup

Specific Gravity

1.018 at 68°F/68°F (20°C/20°C)

Viscosity

Approximately 250 cP at 68°F (20°C) Brookfield #2 Spindle at 60 RPM

II. CHEMICAL REACTIVITY

Relatively nonreactive.

III. STABILITY

Stable at ambient temperatures and atmospheric pressure.

IV. FIRE HAZARD

Not considered flammable. However, under fire conditions may support combustion and decompose to give off toxic materials.

IN CASE OF SUSPECTED POISONING, REFER TO THE PROCEDURE AND EMERGENCY CONTACTS IN SECTION VII: FIRST AID.

IN CASE OF SPILLAGE, REFER TO THE PROCEDURE AND EMERGENCY CONTACTS IN SECTION IX: SPILL HANDLING OR CALL PESTICIDE TEAM SAFETY NETWORK (CHEMTREC) (800) 424-9300.

V. FIREFIGHTING TECHNIQUE

As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate nonessential personnel from the fire area. Firefighters should wear full-face, self-contained breathing apparatus and impervious protective clothing.

Use standard firefighting techniques to extinguish fires involving this material—use water spray, dry chemicals or carbon dioxide.

If not leaking, use a water spray to keep fire-exposed containers cool to prevent rupture due to excessive heat. High pressure water hose may spread product from broken containers increasing contamination or fire hazard.

VI. TOXICOLOGY

Refer to the Product Safety Information Sheet on Sutan Technical for detailed toxicity information on the active ingredient, Sutan Technical. Atrazine is also an active ingredient.

DANGER! Corrosive, causes irreversible eye damage. Harmful if swallowed. Avoid contact with skin, eyes and clothing. Avoid breathing spray mist.

Ingestion

The acute oral LD50 is 3,200 mg/kg in female rats. The acute oral LD50 is 4,450 mg/kg in male rats. A single oral dose of 1,995 mg/kg produced a mild to moderate decrease in physical activity, ataxia, piloerection, ptosis, salivation, red facial stains, and no mortality in female rats. Signs of toxicity at higher doses also included prostration, ano-genital stains, chromodacryorrhea, labored respiration, and wet and unkempt fur in female rats. A single oral dose of 3,162 mg/kg produced a moderate to severe decrease in physical activity, ataxia, chromodacryorrhea, piloerection, prostration, ptosis, labored respiration, red facial stains, salivation, and 10 percent mortality in male rats.

Skin Contact

The acute dermal LD50 is greater than 2,000 mg/kg in rabbits. A single dermal application of 2,000 mg/kg did not produce signs of toxicity in rabbits. Local effects included mild erythema and mild to moderate edema.

Moderate irritant to rabbit skin following a 24-hour exposure.

Eye Contact

Corrosive to rabbit eyes. All unwashed rabbit eyes showed moderate to severe corneal opacity, iritis, and conjunctival irritation. All irritation subsided in 4 of 6 unwashed eyes within 14 days. The other two rabbit eyes showed significant remission by day 52 but persisted through day 63. Three animals had eyes washed 20-30 seconds after exposure. Two of three washed eyes showed mild corneal opacity and mild conjunctival irritation. One of three washed eyes showed mild conjunctival irritation. All irritation subsided completely by 72 hours.

T-10674

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Stauffer CHEMICALS

STAUFFER CHEMICAL COMPANY
AGRICULTURAL CHEMICAL DIVISION
Westport, Connecticut 06881

Printed in U.S.A. A-11263 (3/83)

VII. FIRST AID

CALL A POISON CENTER OR
A PHYSICIAN IMMEDIATELY.

If a known exposure occurs or if poisoning is suspected, *do not wait for symptoms to develop.* Immediately initiate the recommended procedures below and simultaneously contact a Poison Center, a physician, or the nearest hospital. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms, and follow the advice given.

FOR ADDITIONAL MEDICAL OR TOXICOLOGICAL INFORMATION, CALL COLLECT, DAY OR NIGHT STAUFFER CHEMICAL COMPANY (203) 226-6602 OR CHEMTREC (800) 424-9300.

Ingestion
If swallowed—Immediately give several glasses of water but *do not* induce vomiting. If vomiting does occur, give fluids again. Have a physician determine if condition of patient will permit induction of vomiting or evacuation of stomach. Do not give anything by mouth to an unconscious person.

Skin Contact
Immediately flush all affected areas with large amounts of water for at least 15 minutes while removing any contaminated clothing and shoes. Do not attempt to neutralize with chemical agents. Get medical attention immediately. Wash clothing before re-use.

Eye Contact
Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not immediately available.

Inhalation
Remove from contaminated atmosphere. If breathing has ceased, clear victim's airway and start mouth-to-mouth artificial respiration which may be supplemented by the use of a bag-mask respirator or a manually triggered oxygen supply capable of delivering one liter/second or more. If the victim is breathing, oxygen may be delivered from a demand-type or continuous-flow inhaler preferably with a physician's advice. Get medical attention immediately.

VIII. INDUSTRIAL HYGIENE

Ingestion
All food should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for significant exposure to this material. Before eating, hands and face should be thoroughly washed.

Skin Contact
Skin contact with liquid or its aerosol should be prevented through the use of suitable protective clothing, gloves and footwear selected with regard for use condition exposure potential.

Safety showers—with quick opening valves which stay open—should be readily available in all areas where the material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freeze ups in cold weather.

Eye Contact
Eye contact with liquid or aerosol must be prevented through the use of chemical safety glasses, goggles or a face shield selected with regard for use condition exposure potential.

Eye wash fountains—or other means of washing the eyes with a gentle flow of tap water should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freeze ups in cold weather.

Inhalation
If use conditions generate airborne liquid, vapor or mist, this material should be handled only in an open (e.g., outdoor) or well ventilated area. Where adequate ventilation is not available, use NIOSH-approved pesticide respirators to reduce exposure. Where exposure potential under the use conditions necessitates a higher level of protection, use a positive-pressure, air-supplied respirator.

Either half-face respirators in combination with chemical goggles or full-face respirators may be required in certain use conditions to prevent eye contact or irritation.

Exposure Limits
No exposure limits have been established for this product. However, the American Conference of Governmental Industrial Hygienists (ACGIH) has recommended a Threshold Limit Value (TLV) of 10 mg/m^3 as an 8-hour time-weighted average for atrazine. ([1])

TLV's refer to airborne concentrations measured in the breathing zone by appropriate sampling techniques.

IX. SPILL HANDLING

Make sure all personnel involved in the spill cleanup follow good industrial hygiene practices (refer to SECTION VIII: INDUSTRIAL HYGIENE). Any person entering either a significant spill area or an unknown concentration of a gas or vapor, should wear a positive-pressure, self-contained breathing apparatus or a positive-pressure, supplied-air respirator with escape pack.

Small spills can be handled routinely. Use adequate ventilation and wear a respirator to prevent inhalation exposure. Wear protective clothing to prevent skin and eye contact. Use the following procedures:

Soak up pooled liquid with a suitable absorbent such as clay, sawdust or kitty litter. Sweep up absorbed material and place in a chemical waste container for disposal (refer to SECTION XII: DISPOSAL OF UNUSED MATERIAL). Generously cover contaminated area with a slurry of common household powdered laundry detergent and water. Using a stiff brush, work the slurry into cracks and crevices. Allow to stand for 2-3 minutes then flush with water. Repeat if necessary.

Large spills should be handled according to a predetermined plan. For assistance in developing a plan, contact Stauffer Chemical Company, Westport, CT 06881.

IN CASE OF SPILL EMERGENCY, DAY OR NIGHT,
CALL (800) 424-9300
PESTICIDE TEAM SAFETY NETWORK/CHEMTREC.

([1]) The American Conference of Governmental Industrial Hygienists (ACGIH). 1982. *Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1982.* ACGIH: Cincinnati, Ohio.

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Corrosive to aluminum and carbon steel in prolonged contact. Stainless steel and phenolic-lacquer coated steel are recommended for use.

XI. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry, well ventilated area away from flammable materials and sources of heat or flame. Store away from foodstuffs or animal feed. Exercise due caution to prevent damage to or leakage from the container.

XII. DISPOSAL OF UNUSED MATERIAL

Material that cannot be used as directed on the product label must be disposed of according to any applicable regulations under the Resource Conservation and Recovery Act.

NOTE: State and local regulations may be more stringent than Federal.

XIII. DISPOSAL OF CONTAINER

Do not re-use empty container. Dispose of empty containers according to any applicable regulations under the Resource Conservation and Recovery Act.

NOTE: State and local regulations may be more stringent than Federal.

XIV. ENVIRONMENTAL PRECAUTIONS

Do not contaminate water sources by cleaning of equipment or disposal of wastes.

Product Safety Information

VERNAM® TECHNICAL

Selective Herbicide

This Product Safety Information Sheet is principally directed to managers, safety, hygiene and medical personnel. The description of physical, chemical and toxicological properties and handling advice is based on experimental results and past experience. It is intended as a starting point for the development of safety and health procedures.

Vernam Technical is a selective herbicide for further manufacturing use only.

I. PHYSICAL AND CHEMICAL PROPERTIES

1. Active Ingredient
S-propyl dipropylthiocarbamate

2. Application
Herbicide

3. Physical State
Amber Liquid

4. Flash Point
250° F (Tagliabue Open Cup)

5. Specific Gravity of Liquid
0.954 at 20° C/20° C

6. Water Solubility
90 ppm at 20° C

7. Vapor Pressure
10.4 microns at 25° C

8. Boiling Point
100° C at 8.1 mm Hg

II. CHEMICAL REACTIVITY

Normally stable and is not reactive with water. No known violent chemical reactions have been reported.

III. STABILITY

Stable under normal storage conditions. Drums should be stored in a cool location out of the sun to prevent pressure build-up.

IV. FIRE HAZARD

An open cup flash of 250° F.

V. FIREFIGHTING TECHNIQUE

Wear full face self-contained breathing apparatus and impervious clothing (gloves, hats, safety goggles, suits and boots) of rubber. Personnel exposure must be prevented and nonessential personnel evacuated from the immediate area. Vernam may decompose under fire conditions to give off toxic irritants.

If containers are not leaking, keep cooled with a water spray.

VI. TOXICOLOGY

1. Ingestion

LD50 in rats, 1780 mg/kg. Single oral exposures of 1000 to 10,000 mg/kg produced depression, lacrimation, irritation, labored respiration, ptosis and ataxia. Mortality was observed at doses of 3160 mg/kg.

LD50 in guinea pigs, 1710 mg/kg. Single oral exposures of 2150 mg/kg produced depression, ptosis, weakness, piloerection, diarrhea and mortality.

Daily ingestion of 10-40 mg/kg/day Vernam Technical in the diet by dogs for 16 weeks resulted in no change attributable to the test compound.

Daily ingestion of 1-160 mg/kg/day Vernam Technical in the diet by rats for up to 17 weeks resulted in dose dependent anticoagulation effects at 20 mg/kg and higher. At doses of 80 mg/kg and higher, prothrombin and activated partial thromboplastin times were prolonged and deaths due to hemorrhage occurred as early as 16 days after initiation of treatment.

Resistance to the anticoagulation effect develops with time.

Growth retardation was observed at 80 mg/kg while relative liver weight was increased at 160 mg/kg.

Daily ingestion of 1470, 2150 and 3160 ppm in the rat diet for six weeks caused 5-15% reduction in terminal body weight, increased relative liver weight at 2150 and 3160 ppm and increased thyroid weight at 3160 ppm.

Daily ingestion of 20 to 640 mg/kg/day by mice for six weeks resulted in decreased food consumption and decreased body weight at 320 and 640 mg/kg.

Daily ingestion of 8 to 24 mg/kg/day Vernam Technical by mice during days 6 to 18 of gestation was non teratogenic.

2. Ocular

Mild irritant to the eyes of rabbits.

3. Dermal

LD50 in rabbits, greater than 4640 mg/kg. No signs of toxicity were observed at this dose level.

Mildly irritating to the rabbit's skin.

In case of suspected Vernam Technical poisoning, refer to procedure and emergency contacts in Section VII—FIRST AID.

In case of spillage, refer to procedure and emergency contacts in Section IX—SPILL HANDLING.

In case of animal poisoning, call a veterinarian or call collect day and night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

In case of contamination of other materials with Vernam Technical, call (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

All information is offered in good faith, without guarantee or obligation for the accuracy or sufficiency thereof, or the results obtained, and is accepted at user's risk. The uses referred to are for the purpose of illustration only; user should investigate and establish the suitability of such use(s) in every case. Nothing herein shall be construed as a recommendation for uses which infringe valid patents or as extending license under valid patents.

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Stauffer CHEMICALS

STAUFFER CHEMICAL COMPANY
AGRICULTURAL CHEMICAL DIVISION
Westport, Connecticut 06880

A-10814 (5/78)

4. Mutagencity
Negative in the Ames Test.

5. Threshold Limit Value (TLV)
The American Conference of Government Industrial Hygienists has not established at TLV for Vernam.

For Stauffer Reference Only: 1. (T-6161, T-2132). 2. (T-1005), 3. (T-1005). 4. (T-6311); H-246, T-198, T-1005, T-2059, T-2063, T-2132, T-5987, T-6311, RR-77-16.

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs, or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the recommended procedures below. Simultaneously contact a physician, the nearest hospital, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow his advice. For additional information, call collect, day or night, Chemtrec (800) 424-9300 or Stauffer Chemical Company (203) 226-6602.

1. Ingestion
If swallowed—immediately dilute the swallowed material by rapidly giving large quantities of water or milk, if available, and induce vomiting by gagging the victim with a finger or blunt object placed on the back of the victim's tongue. Continue fluid administration until vomitus is clear. Never give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

2. Eye Contact
Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the irrigation to ensure flushing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the irrigation for an additional 15 minutes if the physician is not immediately available.

3. Skin Contact
Immediately remove contaminated clothing under a safety shower. Flush all affected areas with large amounts of water for at least 15 minutes. Do not attempt to neutralize with chemical agents. Obtain medical advice immediately.

4. Inhalation
Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually triggered oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous flow inhalator, and preferably with a physician's advice. Contact a physician immediately.

VIII. INDUSTRIAL HYGIENE

1. Ingestion
Eating, drinking, smoking and carrying of tobacco products should be prohibited in areas where there is a potential for exposure. Before eating, drinking, or smoking, in places where it is permitted, persons who have been working with this product should thoroughly wash their hands and face.

2. Inhalation
This material should only be handled in well-ventilated work areas. Control of inhalation exposures can be achieved through the use of NIOSH-MESA approved pesticide respirators with an organic vapor filter. If there is potential for exposure from aerosols or mists a particulate pre-filter is indicated.

3. Skin Contact and Absorption
Dermal contact and exposure must be prevented through the use of protective clothing, gloves and footwear. Showers should be taken at the end of the work day and clean work clothes should be provided at the start of each day. Soiled work clothes should not be taken home.

4. Eye Contact
Eye contact must be prevented through the use of chemical safety goggles.

IX. SPILL HANDLING

Make sure all personnel involved in spill are aware of the hazards associated with this material.

A *small* spill can be handled routinely considering the physical and hazardous properties of the product as well as the location of the spill. Use adequate ventilation and wear an air supplied respirator to prevent inhalation contact. Wear protective clothing to prevent skin and eye contact. Soak up pooled liquid as follows:

1. Spread a suitable absorbent such as clay on the liquid.
2. Place sweepings in an open drum.
3. Generously cover the contaminated area with a common household detergent (e.g. TIDE*). Using a stiff brush, work the detergent into the spill material, forming a slurry. Brush the slurry into cracks and crevices; and allow to stand for 2 to 3 minutes. Be careful to completely avoid skin or eye contact; do not splatter on one's self or bystanders.
4. Spread absorbents on the slurried liquid, and shovel the absorbed material into an open drum.
5. Repeat if necessary.
6. Flush the area with water, while observing proper environmental considerations.
7. Seal drum and dispose of contaminated material in an approved pesticide dump.

Larger spills must be handled according to a predetermined plan. Part of this plan should include Section V: FIREFIGHTING TECHNIQUE. For assistance in developing a plan, contact Stauffer's Agricultural Chemical Division, Westport, CT. 06880.

In case of emergency, call collect, day or night, (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Not significantly corrosive to glass or metals but may soften or deteriorate some plastics.

XI. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry ventilated area away from flammable materials, sources of heat and flame, and foodstuffs.

XII. DISPOSAL OF UNUSED MATERIAL

Vernam Technical that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides. For assistance in disposing of unused material, contact Stauffer's Agricultural Chemical Division, Westport, CT. 06880.

XIII. DISPOSAL OF CONTAINER

Triple rinse (or equivalent) and offer for recycling, reconditioning, or disposal in approved landfill or bury in a safe place.

*Reg T.M Procter & Gamble Co.

Product Safety Information

ERADICANE® EXTRA

Selective Herbicide

This Product Safety Information Sheet is principally directed to the public carrier, distributor, dealer, warehouser and applicator whose personnel may be exposed to this product.

The description of physical, chemical and acute toxicological properties is intended as a starting point for the development of safe handling procedures. Refer to the product label and the Product Safety Information Sheet on the active ingredient of this product for additional instructions. For any further information, contact Stauffer Chemical Company.

Contains six pounds of active ingredient per gallon of product.

I. PHYSICAL AND CHEMICAL PROPERTIES

Product Ingredients

Active Ingredient: *S*-Ethyl dipropylthiocarbamate (72.2%); CAS #759-94-4
Inert ingredients: (27.8%)

Physical State
Amber colored liquid

Specific Gravity
.997 at 68°F/68°F (20°C/20°C)

Flash Point
194°F (90°C) Setaflash closed cup

Solubility
Not soluble in water.
Readily forms an emulsion in water.

Viscosity
6 centipoise at 68°F (20°C) Brookfield #1 spindle at 60 rpm

II. CHEMICAL REACTIVITY

Relatively nonreactive.

III. STABILITY

Stable at ambient temperatures and atmospheric pressure.

IV. FIRE HAZARD

Under fire conditions may support combustion and decompose to give off toxic materials.

V. FIREFIGHTING TECHNIQUE

Vapors are irritating to the respiratory tract and may cause breathing difficulty and pulmonary edema. Symptoms may be delayed several hours or longer depending upon exposure.

As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate nonessential personnel from the fire area.

Firefighters should wear full-face, self-contained breathing apparatus and impervious clothing such as gloves, hoods, suits and rubber boots.

Use standard firefighting techniques in extinguishing fires involving this material — use water spray, dry chemicals, foam or carbon dioxide. High pressure water hoses may spread product from broken containers, increasing contamination hazard. Contaminated buildings, areas and equipment must not be used until they are properly decontaminated.

VI. TOXICOLOGY

CAUTION: Harmful if swallowed. Avoid contact with skin, eyes, and clothing. Avoid inhalation of spray mist.

Ingestion
The acute oral LD50 is 776 mg/kg in female rats. The acute oral LD50 is 1330 mg/kg in male rats. Toxic signs observed in female rats included decreased physical activity, cannibalization, dyspnea, prostration, facial and ano-genital stains, ruffled and unkempt fur, vocalization, and pale eyes and ears. Signs of toxicity observed in male rats included decreased physical activity, cannibalization, dyspnea, prostration, salivation, facial and ano-genital stains, tremors, vocalization, and pale eyes and ears. Necropsies of both sexes revealed hemorrhagic lungs and gastrointestinal tracts and discolored organs.

Skin Contact
The acute dermal LD50 is greater than 2000 mg/kg in rabbits. A single dermal application of 2000 mg/kg produced ten percent mortality. Local effects included moderate erythema and edema.

Mild irritant to rabbit skin following a 24-hour exposure.

In case of suspected exposure, refer to the procedure and emergency contacts in Section VII — FIRST AID.

In case of spillage, refer to the procedure and emergency contacts in Section IX — SPILL HANDLING.

In case of suspected animal exposure, call a veterinarian or call collect, day or night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (CHEMTREC).

In case of contamination with other materials, call (800) 424-9300 (CHEMTREC).

NOTE: For CHEMTREC assistance when calling from Washington, D.C. or outside the Continental United States, call collect, day or night (202) 483-7616.

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Stauffer CHEMICALS

STAUFFER CHEMICAL COMPANY
AGRICULTURAL CHEMICAL DIVISION
Westport, Connecticut 06881

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Eye Contact
Moderate irritant to rabbit eyes. Corneal opacity and irritation cleared by 14 days.

T-6884

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs or is suspected, immediately initiate the recommended procedures below. Simultaneously contact a Poison Center, a physician or the nearest hospital. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms, and follow the advice given. For additional information call collect, day or night, Stauffer Chemical Company (203) 226-6602 or CHEMTREC (800) 424-9300. For CHEMTREC assistance when calling from Washington, D.C. or outside the Continental United States, call collect, day or night (202) 483-7616.

Ingestion
If swallowed — Immediately give large quantities of water but *do not* induce vomiting. If vomiting does occur, give fluids again. Have a physician determine if condition of patient will permit evacuation of stomach. Do not give anything by mouth to an unconscious person.

Note to Physician: If ingested give supportive treatment of cardio-vascular and respiratory systems.

Skin Contact
Flush all affected areas with plenty of water for at least 15 minutes while removing any contaminated clothing and shoes. Seek medical attention if irritation occurs. Wash clothing before reuse.

Eye Contact
Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not immediately available.

Inhalation
Remove from contaminated atmosphere. Seek medical attention it respiratory irritation or breathing difficulty occurs.

VIII. INDUSTRIAL HYGIENE

Ingestion
All food should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for significant exposure to this material. Before eating, hands and face should be thoroughly washed.

Skin Contact
Skin contact with liquid or its aerosol should be minimized through the use of suitable protective clothing, gloves and footwear, selected with regard for use condition exposure potential. Unprotected skin exposed to vapors, aerosol or mist should be thoroughly washed at the end of the work shift.

Eye Contact
Eye contact with liquid or its aerosol should be avoided through the use of chemical safety glasses, goggles or a face shield, selected with regard for use condition exposure potential.

Inhalation
If use conditions generate airborne vapor, aerosol or mist, the material should be handled in an open (e.g. outdoor) or well ventilated area. Where adequate ventilation is not available, NIOSH-approved respirators should be employed to reduce exposure. Respirator selection must address the potential for exposure under the use conditions.

Exposure Limit Information
No exposure limit has been established for this material.

IX. SPILL HANDLING

Make sure all personnel involved in the spill cleanup follow good industrial hygiene practices (refer to Section VIII).

Small spills can be handled routinely. Use adequate ventilation and wear an air-supplied respirator to prevent inhalation. Wear suitable protective clothing to prevent skin and eye contact. Use the following procedures:

1. Spread a suitable absorbent such as clay, sawdust or kitty litter on the spilled material.
2. Place sweepings in an appropriate chemical waste container.
3. Generously cover the contaminated areas with a common household detergent (e.g. TIDE* detergent). Using a stiff brush and small amounts of water, work the detergent into the spill material forming a slurry. Do not splatter on one's self or bystanders, and completely avoid skin or eye contact with this material. Brush the slurry into cracks and crevices; and allow to stand for 2-3 minutes.
4. Again spread absorbents on the slurried liquid and shovel the absorbed material into the container.
5. Repeat if necessary.
6. Flush the area with water while observing proper environmental considerations.
7. Seal container and offer for disposal (see SECTION XII).

Large spills must be handled according to a predetermined plan. For assistance in developing a plan, contact the Agricultural Chemical Division, Stauffer Chemical Company, Westport, CT 06881.

IN CASE OF EMERGENCY, CALL, DAY OR NIGHT
(800) 424-9300
PESTICIDE TEAM SAFETY NETWORK/CHEMTREC

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

Noncorrosive to most materials commonly used in the construction of process equipment, storage and shipping containers.

XI. STORAGE REQUIREMENTS

Store containers in a cool, dry, well ventilated area away from flammable materials and sources of heat or flame and foodstuffs. Do not store or transport with food or animal feed. Prevent damage to or leakage from the container.

XII. DISPOSAL OF UNUSED MATERIAL

Material that cannot be used as directed on the product label should be disposed of in an approved facility in accordance with any applicable regulations under the Resource Conservation and Recovery Act (RCRA).

Note: State and local regulations may be more stringent than Federal.

XIII. DISPOSAL OF CONTAINER

Empty containers should be disposed of according to applicable regulations under the Resource Conservation and Recovery Act.

XIV. PRECAUTIONS

Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposal of waste.

*Registered trademark of Procter & Gamble Co.

Product Safety Information

ERADICANE® 6.7-E
Selective Herbicide

This Product Safety Information Sheet is principally directed to the public carrier, distributor, dealer, warehouser and applicator whose personnel may be exposed to this product. It is primarily intended for use by non-technical personnel.

The description of physical, chemical and acute toxicological properties is intended as a starting point for the development of safe handling procedures. Refer to the product label for additional instructions. For any further information, contact Stauffer Chemical Company.

Eradicane 6.7-E selective herbicide is an emulsifiable liquid containing 6.7 pounds of active ingredient per gallon.

I. PHYSICAL AND CHEMICAL PROPERTIES

Ingredients

Active Ingredient: (82.6%)
S-ethyl dipropylthiocarbamate
Inert Ingredients: (17.4%)

Physical State

Amber colored liquid

Specific Gravity of Liquid (typical)

0.97 @ 20° C/20° C (68° F/68° F)

Flash Point

85.6° C/186° F (Tagliabue Closed Cup)

Solubility

Not soluble in water.
Readily forms an emulsion in water.

II. CHEMICAL REACTIVITY

The product is relatively nonreactive. It will not react with water.

III. STABILITY

The product is stable at atmospheric pressures and temperatures.

IV. FIRE HAZARD

This liquid has a closed cup flash point of 85.6° C/186° F. It will support combustion and may decompose under fire conditions to give off toxic materials.

V. FIREFIGHTING TECHNIQUE

Vapors may be irritating to the respiratory tract and may cause breathing difficulty and pulmonary edema. Symptoms may be delayed several hours or longer depending upon exposure.

As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate nonessential personnel from the fire area.

Wear full face self contained breathing apparatus and impervious clothing (such as gloves, hoods, suits and rubber boots).

Use standard firefighting techniques in extinguishing fires involving this product. If drums are not leaking, keep cooled with a water spray. High pressure water hose may spread the product from broken containers increasing contamination hazards. Use of contaminated buildings, areas, and equipment must be prevented until they are properly decontaminated.

VI. TOXICOLOGY

Harmful if swallowed. May be harmful if inhaled. Avoid inhalation of spray mist. Avoid contact with skin, eyes and clothing.

Ingestion

LD50 in rats, 2000 mg/kg to 2870 mg/kg.

Skin Contact

LD50 in rabbits, 3830 mg/kg to greater than 4640 mg/kg. Mild irritant to rabbit skin.

Eye Contact

Severe irritant to rabbit eyes.

Threshold Limit Value (TLV)

The American Conference of Governmental Industrial Hygienists has not established a TLV for Eradicane.

T-4760, T-4872

VII. FIRST AID

CALL A PHYSICIAN IMMEDIATELY

If a known exposure occurs, or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the recommended procedures below. Simultaneously contact a physician, the nearest hospital, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow the advice given. For ad-

In case of suspected Eradicane 6.7-E poisoning, refer to procedure and emergency contacts in Section VII—FIRST AID.

In case of spillage, refer to procedure and emergency contacts in Section IX—SPILL HANDLING.

In case of animal poisoning, call a veterinarian or call collect day and night (203) 226-6602 (Stauffer Chemical Company) or (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

In case of contamination of other materials with Eradicane 6.7-E call (800) 424-9300 (Pesticide Team Safety Network/Chemtrec).

All information is offered in good faith without guarantee or obligation for the accuracy or sufficiency thereof, or the results obtained, and is accepted at user's risk. The uses referred to are for the purpose of illustration only. User should investigate and establish the suitability of such use(s) in every case. Nothing herein shall be construed as a recommendation for uses which infringe valid patents or as extending license under valid patents.

Stauffer CHEMICALS
STAUFFER CHEMICAL COMPANY
AGRICULTURAL CHEMICAL DIVISION
Westport, Connecticut 06881

Printed in U.S.A. A-10830 (11/80)

ditional information, call collect, day or night, Stauffer Chemical Company (203) 226-6602 or Chemtrec (800) 424-9300.

Ingestion
Do *NOT* induce vomiting. This product contains hydrocarbon solvent. Immediately give large quantities of water or milk, if available. If vomiting does occur, give fluids again. Never give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

Eye Contact
Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not immediately available.

Skin Contact
Immediately flush all affected areas with water for at least 15 minutes. Remove any contaminated clothing. Seek medical attention if irritation occurs.

Inhalation
Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually-triggered, oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous-flow inhalator, preferably with a physician's advice. Contact a physician immediately.

VIII. INDUSTRIAL HYGIENE

Ingestion
All food should be kept in a separate area, away from the working location. Eating, drinking and smoking should be prohibited in areas where there is potential for significant exposure to the product. Before eating, hands and face should be thoroughly washed.

Inhalation
This material should only be handled in open areas. Where adequate ventilation is not available and there is a possibility of vapor, aerosol or mist generation, control of inhalation exposures can be achieved through the use of a NIOSH approved full-face piece, cartridge, air-purifying respirator.

Dermal Contact
Dermal contact and exposure should be prevented through the use of suitable protective clothing, gloves and footwear. A face shield should be used where splattering of the material may occur.

Eye Contact
Eye contact should be prevented through the use of chemical safety glasses, goggles, or a face shield.

IX. SPILL HANDLING

Make sure all personnel involved in the spill cleanup follow good industrial hygiene practices (Refer to Section VIII).

A small spill can be handled routinely. Use adequate ventilation or wear an air supplied respirator to prevent inhalation contact. Wear protective clothing to prevent skin and eye contact. Use the following procedures:

1. Spread a suitable absorbent such as clay on the liquid.
2. Place the sweepings in an open drum.
3. Generously cover the contaminated areas with a common household detergent (e.g. TIDE*). Using a stiff brush and small amounts of water, work the detergent into the spill material forming a slurry. Brush the slurry into cracks and crevices; and allow to stand for 2 to 3 minutes. Be careful to completely avoid skin or eye contact; do not splatter on one's self or bystanders.
4. Spread absorbents on the slurried liquid, and shovel the absorbed material into an open drum.
5. Repeat if necessary.
6. Flush the area with water, while observing proper environmental considerations.
7. Seal drum and dispose of contaminated material in an approved pesticide dump.

Large spills must be handled according to a predetermined plan. For assistance in developing a plan, contact Stauffer's Agricultural Chemical Division, Westport, CT 06881.

IN CASE OF EMERGENCY, CALL, DAY OR NIGHT
(800) 424-9300
PESTICIDE TEAM SAFETY NETWORK/CHEMTREC

X. CORROSIVITY TO MATERIALS OF CONSTRUCTION

The product is not corrosive to materials commonly used in the construction of process equipment, storage and shipping containers.

XI. STORAGE REQUIREMENTS

Containers should be stored in a cool, dry, well ventilated area. Store away from flammable materials and sources of heat and flame. Do not store near seeds, fertilizer or foodstuffs. Exercise due caution to prevent damage to or leakage from the container.

XII. DISPOSAL OF UNUSED MATERIAL

Pesticide that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides. Consult with Federal, State, or Local disposal authorities for approved alternative disposal procedures.

XIII. DISPOSAL OF CONTAINER

Triple rinse the container (or equivalent). Dispose of rinsate and rinsed container in a landfill approved for pesticides. Consult with Federal, State, or Local disposal authorities for approved alternative disposal procedures.

*Reg Trademark of Procter & Gamble Co

Witco

WITCO MATERIAL SAFETY DATA SHEET

NFPA HAZARD RATING (0=insignificant; 1=slight;2=moderate;3=high;4=extreme):

Fire: 1 Reactivity:0
Toxicity: 1 Special:

'ODUCT: Sponto 221ER

SECTION I - WITCO MANUFACTURING DIVISION

[1] Organics Division
[2] 3200 Brookfield Houston,TX 77045
[3] CHEMICAL NAME OR FAMILY:
Proprietary Mixture of Surfactants

Emergency Telephone: (713)433-7281
CHEM TREC: 1-800-424-9300
[4] FORMULA:
NA

SECTION II - CHEMICAL AND PHYSICAL PROPERTIES

[5] HAZARDOUS DECOMPOSITION PRODUCTS: NA
[6] INCOMPATABILITY: NA
[7] TOXIC & HAZARDOUS INGREDIENTS:
None

[8] FORM: Liquid
[9] ODOR: Solvent
[10] APPEARANCE: Viscous liquid
[11] COLOR: Dark amber
[12] SPECIFIC GRAVITY (water=1):1.07
[13] BOILING PT.: NA
[14] MELTING POINT: NA
[15] SOLUBILITY IN WATER at 25°C:Emulsion
[16] % VOLATILE BY % Wt.: 16-20
[17] EVAP. RATE (n-BuAc=1): NA
[18] VAPOR PRESSURE (mm Hg at 20°C): 5.5
[19] VAPOR DENSITY (air=1): NA
[20] pH AS IS:
pH (5%): 5-7
[21] STRONG ACID:
STRONG BASE:
STABLE: Yes
[22] VISCOSITY SUS at 100°F:
Less than 100:
Greater than 100: Yes
[23] CAS #: NA

SECTION III - FIRE AND EXPLOSION DATA

[24] For fires involving this material, do not enter without proper protective equipment including self-contained breathing apparatus.
[25] UNUSUAL FIRE AND EXPLOSION HAZARDS:
None
[26] FLASH POINT (Method used):
PMCC: 108° F
[27] FLAMMABLE LIMITS %: NA
[28] EXTINGUISHING AGENTS:

Drychemical:	Yes	CO_2:	Yes
Waterspray:	Yes	Foam:	Yes
Waterfog:	Yes	Sand/earth:	Yes
Other:			

SECTION IV - HEALTH HAZARD DATA

[29] PERMISSIBLE CONCENTRATIONS (Air):
NA
[30] EFFECTS OF OVEREXPOSURE:
NDA
[31] TOXICOLOGICAL PROPERTIES:
NDA

NA = NOT APPLICABLE NDA = NO DATA AVAILABLE + = GREATER THAN - = LESS THAN

EMERGENCY FIRST AID PROCEDURES:

[32] Eyes: Flush immediately with plenty of water for fifteen minutes and call a physician.

[33] Skin Contact: Flush with plenty of water for fifteen minutes.

[ ] Inhalation: NA

[ ] If swallowed: Call a physician.

SECTION V - SPECIAL PROTECTION INFORMATION

[36] VENTILATION TYPE REQUIRED: Mechanical [37] RESPIRATORY PROTECTION:

[38] PROTECTIVE GLOVES:
Plastic coated or rubber
Safety goggles or splash shield

[40] OTHER PROTECTIVE EQUIPMENT:
Protective apron

SECTION VI - HANDLING OF SPILLS OR LEAKS

[41] PROCEDURES FOR CLEAN-UP:
Absorb with an inert ingredient such as sand, earth, or vermiculite and dispose of in accordance federal, state, and local regulations.

[42] WASTE DISPOSAL:
By methods consistent with federal, state, and local regulations.

SECTION VII - SPECIAL PRECAUTIONS

[43] PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Store between 40° and 120°F

SECTION VIII - TRANSPORTATION DATA

[44] UNREGULATED BY D.O.T.: [45] REGULATED BY D.O.T.: Yes

[46] TRANSPORTATION EMERGENCY INFORMATION: CHEM TREC 1-(800)-424-9300

[47] U.S.D.O.T. PROPER SHIPPING NAME: Combustible liquid NOS

[48] U.S.D.O.T. HAZARD CLASS: Combustible liquid

[49] I.D. NUMBER: NA 1993 [50] RQ: 1,000 [51] LABEL(S) REQUIRED: None

[52] FREIGHT CLASSIFICATION: Adjuvant Spreader or Sticker

[53] SPECIAL TRANSPORTATION NOTES: None

SECTION IX - COMMENTS

[54]

Signature Charles R Green Title: Group Manager - Analytical

Revision Date: 10/85

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

5

WITCO MATERIAL SAFETY DATA SHEET

ODUCT: Sponto N-140B

NFPA HAZARD RATING (0=insignificant; 1=slight;2=moderate;3=high;4=extreme):

Fire: 2 Reactivity:0
Toxicity: 1 Special:

SECTION I - WITCO MANUFACTURING DIVISION

[1] Organics Division
[2] 3200 Brookfield Houston,TX 77045
[3] CHEMICAL NAME OR FAMILY:
Proprietary Mixture of Surfactants

Emergency Telephone: (713)433-7281
CHEM TREC: 1-800-424-9300
[4] FORMULA:
NA

SECTION II - CHEMICAL AND PHYSICAL PROPERTIES

[5] HAZARDOUS DECOMPOSITION PRODUCTS: NA
[6] INCOMPATABILITY: NA
[7] TOXIC & HAZARDOUS INGREDIENTS:
Xylene
CAS #: 1330-20-7

[8] FORM: Liquid
[9] ODOR: Solbent
[10] APPEARANCE: Hazy liquid
[11] COLOR: Dark amber
[12] SPECIFIC GRAVITY (water=1):1.02
[13] BOILING PT.: NA
[14] MELTING POINT: NA
[15] SOLUBILITY IN WATER at 25°C:Emulsion
[16] % VOLATILE BY % Wt.: 28-32
[17] EVAP. RATE (n-BuAc=1): NA
[18] VAPOR PRESSURE (mm Hg at 20°C): 15
[19] VAPOR DENSITY (air=1): NA
[20] pH AS IS:
pH (5%): 6-7
[21] STRONG ACID:
STRONG BASE:
STABLE: Yes
[22] VISCOSITY SUS at 100°F:
Less than 100:
Greater than 100: Yes
[23] CAS #:

SECTION III - FIRE AND EXPLOSION DATA

[24] For fires involving this material, do not enter without proper protective equipment including self-contained breathing apparatus.
[25] UNUSUAL FIRE AND EXPLOSION HAZARDS:
None
[26] FLASH POINT (Method used):
PMCC: 99° F
[27] FLAMMABLE LIMITS %: NA
[28] EXTINGUISHING AGENTS:
Drychemical: CO_2:
Waterspray: Foam:
Waterfog: Sand/earth:
Other:

SECTION IV - HEALTH HAZARD DATA

[29] PERMISSIBLE CONCENTRATIONS (Air):
NA
[30] EFFECTS OF OVEREXPOSURE:
NDA
[31] TOXICOLOGICAL PROPERTIES:
NDA

NA = NOT APPLICABLE NDA = NO DATA AVAILABLE + = GREATER THAN - = LESS THAN

ST AID PROCEDURES:
Flush immediately with plenty of water for fifteen minutes and call a physician.
Contact: Flush with plenty of water for fifteen minutes.
lation: NA
swallowed: Call a physician.

SECTION V - SPECIAL PROTECTION INFORMATION

VENTILATION TYPE REQUIRED: Mechanical [37] RESPIRATORY PROTECTION:
] PROTECTIVE GLOVES:
Plastic coated or rubber
Safety goggles or splash shield
[40] OTHER PROTECTIVE EQUIPMENT:
Protective apron

SECTION VI - HANDLING OF SPILLS OR LEAKS

[41] PROCEDURES FOR CLEAN-UP:

[42] WASTE DISPOSAL:
By methods consistent with federal, state, and local regulations.

SECTION VII - SPECIAL PRECAUTIONS

[43] PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Store between 40° and 120°F

SECTION VIII - TRANSPORTATION DATA

[44] UNREGULATED BY D.O.T.: [45] REGULATED BY D.O.T.: Yes
[46] TRANSPORTATION EMERGENCY INFORMATION: CHEM TREC 1-(800)-424-9300
[47] U.S.D.O.T. PROPER SHIPPING NAME: Flammable liquid NOS
[48] U.S.D.O.T. HAZARD CLASS: Flammable liquid
[49] I.D. NUMBER: UN 1993 [50] RQ: 1000 [51] LABEL(S) REQUIRED: Red
[52] FREIGHT CLASSIFICATION: Adjuvant Spreader or Sticker
[53] SPECIAL TRANSPORTATION NOTES: None

SECTION IX - COMMENTS

[54]

Signature Charles R. Green Title: Group Manager - Analytical
Revision Date: 3/85

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

REFERENCE 12

AGRICULTURAL
CHEMICAL DIVISION

Stauffer CHEMICALS

Stauffer Chemical Company

P.O. Box 188 / North Little Rock, Arkansas 72115 / Phone (501) 374-7445

RECEIVED
NOV 30 1987

November 23, 1987

Mr. Rodger Payne
State of Arkansas
Department of Pollution Control and Ecology
8001 National Drive, P.O.Box 9583
Little Rock, AR 72209

Dear Rodger:

As of January 1, 1988, Stauffer Chemical Company's North Little Rock plant will drop the Stauffer name. The plant will resume operation under the management of I.C.I. Americas Inc.

I have made the necessary corrections on the NPDES permit application forms to reflect the name change. I am also returning the application forms with the signature of the company authorized representative, plant manager, Irvin Wheeler.

If you have any questions or need additional information or documnets please contact me. Thank you.

Sincerely,

R. Hayes Baber
Quality Control Supervisor

NPDES PERMIT FILE
CSN ..... NPDES # 42901
1 Routing
2 Application
3 Permit, PN
4 Correspondence
5 Legal Doc,
6 Technical Backup

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
P. O. BOX 8913
LITTLE ROCK, AR 72219 (501)570-2867

1991
HAZARDOUS WASTE
ANNUAL REPORT

SITE EPA ID NO ARD006354484
NAME ICI AMERICAS, INC.

FORM IC
PART I

1. SITE PHYSICAL LOCATION
824 E 12TH ST
N LITTLE ROCK, AR 72114
COUNTY PULASKI

2. MAILING ADDRESS
P.O. BOX 188
N LITTLE ROCK, AR 72115

3. COMPANY CONTACT
LAST NAME DAYS FIRST NAME FREDERICK
TITLE SAFETY & TRAINING SPECIALIST TELEPHONE 374-7445

4. HAS THE FACILITY CHANGED NAMES? (leave blank if no)
NEW NAME _____ OLD NAME _____

5. HAS THE FACILITY HAD A CHANGE IN OWNERSHIP? (leave blank if no)
NEW OWNER NAME _____
ADDRESS _____

6. DID THE FACILITY CLOSE? (leave blank if no, enter date if yes)
DATE CLOSED _____ _____ _____
month day year

7. STANDARD INDUSTRIAL CLASSIFICATION CODES
A. 2879 B. _ _ _ _ C. _ _ _ _ D. _ _ _ _
(the SIC Code is a four-digit number. See instructions for list of SIC Codes)

8. FACILITY CERTIFICATION

"I certify under penalty of law that this document and attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties under Section 3008 of the Resource Conservation and Recovery Act and Arkansas Code, Annotated, 8-7-204 for submitting false information, including the possibility of fine and imprisonment for knowing violations."

PRINT LAST NAME DAYS
FIRST NAME FREDERICK MI L

SIGNATURE Frederick L. Days DATE 92 02 26
yr mo day

EPA FORM 8700-13A/B REVISED (ADPCE 10-91R)

MAR 02 1992

2

SITE EPA ID NO ARD006354484
NAME ICI AMERICAS, INC.

1991 ANNUAL REPORT
FORM IC
PART II

1. WHAT IS THIS SITE'S GENERATION STATUS FOR 1991?

____Category 1 (generated 2200 pounds or more per calendar month)
____Category 2 (generated between 220 pounds and 2200 pounds per calendar month)
✓ Category 3 (generated less than 220 pounds per calendar month)
____Category 4 (PCB generator--STATE-DEFINED CATEGORY)

2. Was hazardous waste generated as a one-time event during 1991? (spill cleanup, remedial actions, one-time elimination of on-site waste.)

✓ No ____Yes

Was shipment made using a provisional number? If yes, list the provisional number.

ARP0600 __ __ __ __ __

If one-time event took place, briefly describe actions taken:

3. LIST AMOUNT OF HAZARDOUS WASTE GENERATION FOR 1991. DO NOT INCLUDE NON-HAZARDOUS WASTE. ENTER AMOUNT AS POUNDS (P) OR TONS (T).

1991 TOTAL GENERATION 1,590 P

WHAT AMOUNT OF THE TOTAL GENERATION WAS SHIPPED OFF-SITE FOR MANAGEMENT 1,590 P

WHAT AMOUNT OF THE TOTAL GENERATION WAS HANDLED BY ON-SITE TREATMENT, STORAGE, DISPOSAL Ø

4. LIST THE AMOUNT OF HAZARDOUS WASTE GENERATED IN 1990 AND CARRIED OVER INTO 1991 105 P

WHAT AMOUNT OF THE 1990 CARRY-OVER WAS SHIPPED OFF-SITE IN 1991 105 P

5. CERTIFICATION OF GENERATION STATUS AND GENERATION TOTALS:

I certify that the generation status and the generation totals shown on this report are true, accurate, and complete for the reporting year.

NAME FREDERICK L. DAYS TITLE SAFETY & TRAINING SPECIALIST

Frederick L. Days DATE 2/26/92
signature

SITE EPA ID NO ARD006354484 NAME ICI AMERICAS, INC	1991 ANNUAL REPORT FORM IC PART II (A)

HAZARDOUS WASTE FEE DETERMINATION

TOTAL HAZARDOUS WASTE GENERATION FOR 1991 1,590 P

THE HAZARDOUS WASTE FEES ASSESSED BY THIS DEPARTMENT ARE BASED ON THE TOTAL AMOUNT OF HAZARDOUS WASTE GENERATED BY ANY FACILITY IN ARKANSAS, AS REPORTED IN EACH HAZARDOUS WASTE ANNUAL REPORT OR BY MANIFESTS. THERE ARE TWO ANNUAL FEES: THE SUPERFUND FEE, DUE BY JULY 1 OF EACH YEAR, AND THE MONITORING/INSPECTION FEE, DUE BY JANUARY 1 OF EACH YEAR.

THIS FORM IS INTENDED TO ASSIST FACILITIES IN DETERMINING THE FEE THAT WILL BE ASSESSED BY THE DEPARTMENT. THIS IS NOT AN INVOICE AND DOES NOT HAVE TO BE RETURNED WITH THE ANNUAL REPORT SUBMISSION. IT IS INTENDED FOR INFORMATIONAL PURPOSES ONLY.

SUPERFUND ANNUAL FEES:

CATEGORY	POUNDS GENERATED	FEE AMOUNT
1	0 to 29,999	0
2	30,000 to 99,999	$750.00
3	100,000 to 199,999	$1,500.00
4	200,000 to 299,999	$3,000.00
5	300,000 to 399,999	$5,000.00
6	400,000 to 499,999	$7,500.00
7	500,000 and above	$10,000.00

note: SUPERFUND FEES CAN BE FOUND IN SECTION 23 OF THE ARKANSAS HAZARDOUS WASTE MANAGEMENT CODE.

MONITORING\INSPECTION FEES:

FACILITY TYPE	POUNDS GENERATED	FEE AMOUNT
COMMERCIAL TSDF		$1,500.00
NONCOMMERCIAL TDF		$1,000.00
NONCOMMERCIAL STORAGE		$750.00
GENERATOR	250,000 and above	$500.00
GENERATOR	26,401 to 249,999	$250.00
GENERATOR	2,640 to 26,400	$100.00

note: MONITORING/INSPECTION FEES CAN BE FOUND IN SECTION 11, l, m, n, o, OF THE ARKANSAS HAZARDOUS WASTE MANAGEMENT CODE.

DEFINITIONS:

1. TSDF: treatment, storage, disposal facility.
2. TDF: treatment, disposal facility, not including storage.
3. NONCOMMERCIAL FACILITY: a hazardous waste management facility which is constructed and operated to store, treat, and/or dispose of hazardous waste which has been generated by the owners or operators of said facility and which storage, treatment, or disposal is not undertaken for profit.
4. COMMERCIAL FACILITY: a hazardous waste management facility which does not meet the definition of a noncommercial facility as defined in Section 2 of the Arkansas Hazardous Waste Management Code.

SITE ID # ARD006354484 NAME ICI AMERICAS, INC.	1991 ANNUAL REPORT FORM IC PART III

WASTE MINIMIZATION ACTIVITY

DID THIS SITE BEGIN OR EXPAND ONE OF THE FOLLOWING ACTVITIES IN 1991:

1. SOURCE REDUCTION	2. RECYCLING	3. ASSESSMENT
✓1 YES __2 NO	✓1 YES __2 NO	✓SOURCE REDUCTION ✓RECYCLING

4. WHAT FACTORS HAVE LIMITED THIS SITE FROM INITIATING NEW SOURCE REDUCTION ACTIVITIES? (check applicable factors)

__01 no factors have limited new source reduction activities
__02 insufficient capital to install new source reduction equipment or implement new source reduction practices
__03 lack of technical information on source reduction techniques applicable to my specific production processes
__04 source reduction is not economically feasible
__05 concern that product quality may decline due to source reduction
__06 technical limitations of the production process
__07 permitting burdens
__08 other_____

5. WHAT FACTORS HAVE LIMITED THIS SITE FROM INITIATING NEW ON-SITE OR OFF-SITE RECYCLING ACTIVITIES DURING THE REPORTING YEAR? (check applicable factors)

__01 no factors have limited new recycling activities
__02 insufficient capital to install new recycling equipment or implement new recycling practices
__03 lack of technical information on recycling techniques applicable to this site's specific production processes
__04 recycling is not economically feasible
__05 concern that product quality may decline due to recycling
__06 requirements to manifest waste inhibit shipments off-site
__07 financial liability provisions inhibit shipments off-site
__08 technical limits of product processes inhibit shipments
__09 technical limits of production processes inhibit on-site recycling
__10 permitting burdens prohibit recycling
__11 lack of permitted recycling facilities
__12 unable to identify a market for recyclable materials
__13 other_____

additional comments:

_____

_____

_____

Box Fc-1

SITE ID # ARD006354484
NAME ICI AMERICAS, INC.

1991 ANNUAL REPORT
FORM GM
PART I

WASTE GENERATION AND MANAGEMENT

1. waste description BETASAN FILTER CAKE (OFF-SPEC-LAA3090977) *

2. EPA/STATE waste code	3. SIC code	4. origin code	system type	5. source code
D001	2879	1	M	A 32

6. point of measurement	7. form code	8. RCRA-Radioactive mixed
2	B 3 0 1	__1. YES ✓2. NO __3. DON'T KNOW

9. TRI CONSTITUENT
__1. Site did not file TRI Report
__2. Site filed a TRI Report;waste contains no TRI constituents
✓3. Site filed a TRI Report;waste contains TRI constituents
__8. Don't know

IF WASTE CONTAINS TRI CONSTITUENTS, COMPLETE THIS SECTION BY LISTING TRI CONSTITUENTS INCLUDED IN THE WASTE.

1. ETHYL BENZENE 2. m-XYLENE
3. O-XYLENE 4.

10. Quantity of this waste generated in 1991 (in pounds or tons)
1,046 UOM P

11. Was this waste treated on-site,disposed of on-site,recycled on-site or discharged to a sewer/POTW?
__1. YES (COMPLETE THE ON-SITE MANAGEMENT SECTION AND A FORM PS FOR EACH ON-SITE SYSTEM)
✓2. NO (CONTINUE TO OFF-SITE SHIPMENT QUESTIONS)

ON-SITE WASTE MANAGEMENT SYSTEMS

12. SYSTEM TYPE: M __ __ __	QUANTITY:	UOM
SYSTEM TYPE: M __ __ __	QUANTITY:	UOM
SYSTEM TYPE: M __ __ __	QUANTITY:	UOM

OFF-SITE WASTE MANAGEMENT

13. TRANSPORTER EPA ID # ILD099202681
NAME CHEMICAL WASTE MANAGEMENT

ADDITIONAL TRANSPORTERS USED TO TRANSPORT THIS WASTE:

EPA ID # EPA ID #
NAME NAME

14. TREATMENT/STORAGE/DISPOSAL FACILITY

EPA ID # LAD000777201 NAME CHEMICAL WASTE MANAGEMENT
ADDRESS RT 2 Box 1455 CITY CARLYSS
STATE LA ZIP 70663

Bet Fc-2

SITE EPA ID # ARD006354484 NAME ICI AMERICAS, INC.	1991 ANNUAL REPORT FORM GM PART II

OFF-SITE WASTE MANAGEMENT

15. SYSTEM TYPE SHIPPED TO: M 1 3 2

16. OFF-SITE AVAILABILITY CODE
✓ 1. OFF-SITE FACILITY IS COMMERCIAL FACILITY
__ 2. OFF-SITE FACILITY IS RESTRICTED TO ONE COMPANY
__ 3. DON'T KNOW

17. QUANTITY OF THIS WASTE SHIPPED TO THIS TSD FACILITY IN 1991 (IN POUNDS OR TONS)
1,046 UOM P

NEW WASTE MINIMIZATION ACTIVITY OCCURRING IN 1991 FOR THIS WASTE

✓ NO NEW WASTE MINIMIZATION IN 1991 (DO NOT COMPLETE ITEMS 18-21)

18. WASTE MINIMIZATION ACTIVITY CODES
W __ __ W __ __ W __ __
W __ __ W __ __ W __ __

19. OTHER EFFECTS DUE TO WASTE MINIMIZATION
__ 1. YES __ 2. NO

20. QUANTITY RECYCLED IN 1991 DUE TO NEW ACTIVITIES
_____ UOM _____

21. ACTIVITY/PRODUCTION INDEX
__ __. __

22. 1991 SOURCE REDUCTION QUANTITY
_____ UOM _____

This block intentionally left blank.

NON-HAZARDOUS OR NON-REGULATED SHIPMENTS

23. DID THIS SITE SHIP NON-HAZARDOUS OR NON-REGULATED WASTE TO A HAZARDOUS WASTE FACILITY IN 1991?

✓ 1. YES __ 2. NO IF YES, COMPLETE FORM GM FOR NHAZ WASTE

24. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OUT OF STATE?

✓ 1. YES __ 2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

25. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED IN ARKANSAS?

__ 1. YES ✓ 2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

Lab-S -1

SITE ID # ARD006354484
NAME ICI AMERICAS, INC.

1991 ANNUAL REPORT
FORM GM
PART I

WASTE GENERATION AND MANAGEMENT

1. waste description SPENT LAB SOLVENTS *

2. EPA/STATE waste code	3. SIC code	4. origin code	system type	5. source code
F003 ____	2879	1	M ___	A 94
F005 ____				
____ ____				

6. point of measurement	7. form code	8. RCRA-Radioactive mixed
1	B 2 0 3	__1. YES ✓2. NO __3. DON'T KNOW

9. TRI CONSTITUENT
__1. Site did not file TRI Report
✓2. Site filed a TRI Report;waste contains no TRI constituents
__3. Site filed a TRI Report;waste contains TRI constituents
__8. Don't know

IF WASTE CONTAINS TRI CONSTITUENTS, COMPLETE THIS SECTION BY LISTING TRI CONSTITUENTS INCLUDED IN THE WASTE.

1. ____ 2. ____
3. ____ 4. ____

10. Quantity of this waste generated in 1991 (in pounds or tons)
544 UOM P

11. Was this waste treated on-site,disposed of on-site,recycled on-site or discharged to a sewer/POTW?
__1. YES (COMPLETE THE ON-SITE MANAGEMENT SECTION AND A FORM PS FOR EACH ON-SITE SYSTEM)
✓2. NO (CONTINUE TO OFF-SITE SHIPMENT QUESTIONS)

ON-SITE WASTE MANAGEMENT SYSTEMS

12. SYSTEM TYPE: M ___	QUANTITY: ____	UOM ____
SYSTEM TYPE: M ___	QUANTITY: ____	UOM ____
SYSTEM TYPE: M ___	QUANTITY: ____	UOM ____

OFF-SITE WASTE MANAGEMENT

13. TRANSPORTER EPA ID # ARD069748192
NAME ENSCO

ADDITIONAL TRANSPORTERS USED TO TRANSPORT THIS WASTE:

EPA ID # ____ EPA ID # ____
NAME ____ NAME ____

14. TREATMENT/STORAGE/DISPOSAL FACILITY

EPA ID # ARD069748192 NAME ENSCO
ADDRESS AMERICAN OIL RD CITY EL DORADO
STATE AR ZIP 71730

8

Lab-S-2

SITE EPA ID # ARD006354484 NAME ICI AMERICAS, INC.	1991 ANNUAL REPORT FORM GM PART II

OFF-SITE WASTE MANAGEMENT

15. SYSTEM TYPE SHIPPED TO: M 0 4 1

16. OFF-SITE AVAILABILITY CODE
✓ 1. OFF-SITE FACILITY IS COMMERCIAL FACILITY
__ 2. OFF-SITE FACILITY IS RESTRICTED TO ONE COMPANY
__ 3. DON'T KNOW

17. QUANTITY OF THIS WASTE SHIPPED TO THIS TSD FACILITY IN 1991 (IN POUNDS OR TONS) 544 UOM P

NEW WASTE MINIMIZATION ACTIVITY OCCURRING IN 1991 FOR THIS WASTE

✓ NO NEW WASTE MINIMIZATION IN 1991 (DO NOT COMPLETE ITEMS 18-21)

18. WASTE MINIMIZATION ACTIVITY CODES
W __ __ W __ __ W __ __
W __ __ W __ __ W __ __

19. OTHER EFFECTS DUE TO WASTE MINIMIZATION
__ 1. YES __ 2. NO

20. QUANTITY RECYCLED IN 1991 DUE TO NEW ACTIVITIES
_____ UOM _____

21. ACTIVITY/PRODUCTION INDEX
__ __. __

22. 1991 SOURCE REDUCTION QUANTITY
_____ UOM _____

This block intentionally left blank.

NON-HAZARDOUS OR NON-REGULATED SHIPMENTS

23. DID THIS SITE SHIP NON-HAZARDOUS OR NON-REGULATED WASTE TO A HAZARDOUS WASTE FACILITY IN 1991?

✓ 1. YES __ 2. NO IF YES, COMPLETE FORM GM FOR NHAZ WASTE

24. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OUT OF STATE?

✓ 1. YES __ 2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

25. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED IN ARKANSAS?

__ 1. YES ✓ 2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

SITE EPA ID # ARD006354484 ~~ICI AMERICAS INC~~
NAME ICI AMERICAS, INC

1991 ANNUAL REPORT
NON-HAZARDOUS WASTE

4 NON-HAZARDOUS WASTE SURVEY FORM 4

1. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: BETASAN FILTER CAKE

AMOUNT SHIPPED 13,204 P

RECEIVING FACILITY NAME CHEMICAL WASTE MANAGEMENT
ADDRESS RT 2 BOX 1455
CARLYSS, LA 70663

2. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: EPTAM/SUTAN FILTER CAKE

AMOUNT SHIPPED 11,870 P

RECEIVING FACILITY NAME CHEMICAL WASTE MGMT
ADDRESS RT 2 BOX 1455
CARLYSS, LA 70663

3. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: GRANULAR PRODUCTION REFUSE

AMOUNT SHIPPED 28,773 P

RECEIVING FACILITY NAME CHEMICAL WASTE MGMT
ADDRESS RT 2 BOX 1455
CARLYSS, LA 70663

4. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: LIQUID UNIT FLOOR SWEEPINGS

AMOUNT SHIPPED 67,614

RECEIVING FACILITY NAME CHEMICAL WASTE MGMT
ADDRESS RT 2 BOX 1455
CARLYSS, LA 70663

5. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: VAPAM PRODUCTION WASTE

AMOUNT SHIPPED 10,960 P

RECEIVING FACILITY NAME CHEMICAL WASTE MGMT
ADDRESS RT 2 BOX 1455
CARLYSS, LA 70663

SITE EPA ID # ARD 006354484
NAME ICI AMERICAS, INC.

1991 ANNUAL REPORT
NON-HAZARDOUS WASTE

NON-HAZARDOUS WASTE SURVEY FORM

1. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: LAB GLASSWARE & PLASTICWARE

AMOUNT SHIPPED 8,493 P

RECEIVING FACILITY NAME CHEMICAL WASTE MGMT
ADDRESS RT 2, BOX 1455
CARLYSS, LA 70663

2. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: IMIDAN & DEVRINOL QC SAMPLES

AMOUNT SHIPPED 1,150 P

RECEIVING FACILITY NAME CHEMICAL WASTE MGMT
ADDRESS RT 2, BOX 1455
CARLYSS, LA 70663

3. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE: NON-REGULATED LIQUID WASTE

AMOUNT SHIPPED 150,576 P

RECEIVING FACILITY NAME RESIDUAL TECHNOLOGIES, INC.
ADDRESS 2700 S 25TH W AV
TULSA, OK 74119

4. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE:

AMOUNT SHIPPED

RECEIVING FACILITY NAME
ADDRESS

5. DESCRIBE THE TYPE OF NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OFF-SITE:

AMOUNT SHIPPED

RECEIVING FACILITY NAME
ADDRESS

2 of 2

11

NRD-1

SITE ID # ARD006354484
NAME ICI AMERICAS, INC.

1991 ANNUAL REPORT
FORM GM
PART I

WASTE GENERATION AND MANAGEMENT

1. waste description RCRA NON-REGULATED WASTE (SOLID)

2. EPA/STATE waste code	3. SIC code	4. origin code	system type	5. source code
NH	2879		M	A

6. point of measurement	7. form code	8. RCRA-Radioactive mixed
	B	1. YES 2. NO 3. DON'T KNOW

9. TRI CONSTITUENT
__1. Site did not file TRI Report
__2. Site filed a TRI Report;waste contains no TRI constituents
__3. Site filed a TRI Report;waste contains TRI constituents
__8. Don't know

IF WASTE CONTAINS TRI CONSTITUENTS, COMPLETE THIS SECTION BY LISTING TRI CONSTITUENTS INCLUDED IN THE WASTE.

1. _____ 2. _____
3. _____ 4. _____

10. Quantity of this waste generated in 1991 (in pounds or tons)
142,064 UOM P

11. Was this waste treated on-site,disposed of on-site,recycled on-site or discharged to a sewer/POTW?
__1. YES (COMPLETE THE ON-SITE MANAGEMENT SECTION AND A FORM PS FOR EACH ON-SITE SYSTEM)
✓2. NO (CONTINUE TO OFF-SITE SHIPMENT QUESTIONS)

ON-SITE WASTE MANAGEMENT SYSTEMS

12. SYSTEM TYPE: M	QUANTITY:	UOM
SYSTEM TYPE: M	QUANTITY:	UOM
SYSTEM TYPE: M	QUANTITY:	UOM

OFF-SITE WASTE MANAGEMENT

13. TRANSPORTER EPA ID # ILD099202681
NAME CHEMICAL WASTE MANAGEMENT

ADDITIONAL TRANSPORTERS USED TO TRANSPORT THIS WASTE:

EPA ID # _____ EPA ID # _____
NAME _____ NAME _____

14. TREATMENT/STORAGE/DISPOSAL FACILITY

EPA ID # LAD000777201 NAME CHEMICAL WASTE MGMT
ADDRESS RT 2 BOX 1455 CITY CARLYSS
STATE LA ZIP 70663

NRD-2

SITE EPA ID # ARD006354484 NAME ICI AMERICAS, INC.	1991 ANNUAL REPORT FORM GM PART II

OFF-SITE WASTE MANAGEMENT

15. SYSTEM TYPE SHIPPED TO: M 1 3 2

16. OFF-SITE AVAILABILITY CODE
✓1. OFF-SITE FACILITY IS COMMERCIAL FACILITY
__2. OFF-SITE FACILITY IS RESTRICTED TO ONE COMPANY
__3. DON'T KNOW

17. QUANTITY OF THIS WASTE SHIPPED TO THIS TSD FACILITY IN 1991 (IN POUNDS OR TONS)
142,064 UOM P

NEW WASTE MINIMIZATION ACTIVITY OCCURRING IN 1991 FOR THIS WASTE

✓ NO NEW WASTE MINIMIZATION IN 1991 (DO NOT COMPLETE ITEMS 18-21)

18. WASTE MINIMIZATION ACTIVITY CODES
W __ __ W __ __ W __ __
W __ __ W __ __ W __ __

19. OTHER EFFECTS DUE TO WASTE MINIMIZATION
__1. YES __2. NO

20. QUANTITY RECYCLED IN 1991 DUE TO NEW ACTIVITIES
_____ UOM _____

21. ACTIVITY/PRODUCTION INDEX
__ __. __

22. 1991 SOURCE REDUCTION QUANTITY
_____ UOM _____

This block intentionally left blank.

NON-HAZARDOUS OR NON-REGULATED SHIPMENTS

23. DID THIS SITE SHIP NON-HAZARDOUS OR NON-REGULATED WASTE TO A HAZARDOUS WASTE FACILITY IN 1991?

___1. YES ___2. NO IF YES, COMPLETE FORM GM FOR NHAZ WASTE

24. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OUT OF STATE?

___1. YES ___2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

25. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED IN ARKANSAS?

___1. YES ___2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

NRL-1

SITE ID # ARD006354484
NAME ICI AMERICAS, INC.

1991 ANNUAL REPORT
FORM GM
PART I

WASTE GENERATION AND MANAGEMENT

1. waste description RCRA NON-REGULATED WASTE (LIQUID)

2. EPA/STATE waste code	3. SIC code	4. origin code	system type	5. source code
NH ___ ___	2879	___	M ___ ___ ___	A ___ ___

6. point of measurement	7. form code	8. RCRA-Radioactive mixed
___	B ___ ___ ___	___1. YES ___2. NO ___3. DON'T KNOW

9. TRI CONSTITUENT
___1. Site did not file TRI Report
___2. Site filed a TRI Report;waste contains no TRI constituents
___3. Site filed a TRI Report;waste contains TRI constituents
___8. Don't know

IF WASTE CONTAINS TRI CONSTITUENTS, COMPLETE THIS SECTION BY LISTING TRI CONSTITUENTS INCLUDED IN THE WASTE.

1. ___ 2. ___
3. ___ 4. ___

10. Quantity of this waste generated in 1991 (in pounds or tons)
150,576 UOM P

11. Was this waste treated on-site,disposed of on-site,recycled on-site or discharged to a sewer/POTW?
___1. YES (COMPLETE THE ON-SITE MANAGEMENT SECTION AND A FORM PS FOR EACH ON-SITE SYSTEM)
✓2. NO (CONTINUE TO OFF-SITE SHIPMENT QUESTIONS)

ON-SITE WASTE MANAGEMENT SYSTEMS

12. SYSTEM TYPE: M ___ ___ ___	QUANTITY: ___	UOM ___
SYSTEM TYPE: M ___ ___ ___	QUANTITY: ___	UOM ___
SYSTEM TYPE: M ___ ___ ___	QUANTITY: ___	UOM ___

OFF-SITE WASTE MANAGEMENT

13. TRANSPORTER EPA ID # OKD000402396
NAME RESIDUAL TECHNOLOGIES, INC.

ADDITIONAL TRANSPORTERS USED TO TRANSPORT THIS WASTE:

EPA ID # OKT000610329 EPA ID # ___
NAME EASON & SMITH, INC NAME ___

14. TREATMENT/STORAGE/DISPOSAL FACILITY

EPA ID # RESIDUAL TECHNOLOGIES, INC NAME ___
ADDRESS 2700 S 25TH W AV CITY TULSA
STATE ~~[illegible]~~ OK ZIP 74119

14

NRL-2

SITE EPA ID # ARD006354484 NAME ICI AMERICAS, INC.	1991 ANNUAL REPORT FORM GM PART II

OFF-SITE WASTE MANAGEMENT

15. SYSTEM TYPE SHIPPED TO: M 1 3 4

16. OFF-SITE AVAILABILITY CODE
✓ 1. OFF-SITE FACILITY IS COMMERCIAL FACILITY
__ 2. OFF-SITE FACILITY IS RESTRICTED TO ONE COMPANY
__ 3. DON'T KNOW

17. QUANTITY OF THIS WASTE SHIPPED TO THIS TSD FACILITY IN 1991 (IN POUNDS OR TONS)
150,576 UOM _____

NEW WASTE MINIMIZATION ACTIVITY OCCURRING IN 1991 FOR THIS WASTE

✓ NO NEW WASTE MINIMIZATION IN 1991 (DO NOT COMPLETE ITEMS 18-21)

18. WASTE MINIMIZATION ACTIVITY CODES
W __ __ W __ __ W __ __
W __ __ W __ __ W __ __

19. OTHER EFFECTS DUE TO WASTE MINIMIZATION
__ 1. YES __ 2. NO

20. QUANTITY RECYCLED IN 1991 DUE TO NEW ACTIVITIES
_____ UOM _____

21. ACTIVITY/PRODUCTION INDEX
__ __. __

22. 1991 SOURCE REDUCTION QUANTITY
_____ UOM _____

This block intentionally left blank.

NON-HAZARDOUS OR NON-REGULATED SHIPMENTS

23. DID THIS SITE SHIP NON-HAZARDOUS OR NON-REGULATED WASTE TO A HAZARDOUS WASTE FACILITY IN 1991?

___ 1. YES ___ 2. NO IF YES, COMPLETE FORM GM FOR NHAZ WASTE

24. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED OUT OF STATE?

___ 1. YES ___ 2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

25. WAS NON-HAZARDOUS OR NON-REGULATED WASTE SHIPPED IN ARKANSAS?

___ 1. YES ___ 2. NO IF YES, COMPLETE THE NON-HAZARDOUS WASTE SURVEY

REFERENCE 13

USES EPA SUPERFUND PROGRAM
GENERIC LISTS
REGION 06 REPORT 03

EPA ID	SITE NAME / CITY / COUNTY	DISCOVERY	PA COMPLETE	PA QUALIFIER	SI COMPLETE	SI QUALIFIER
AR4140090008	HOPE WILDLIFE AREA HOPE / HEMPSTEAD	12/01/79	09/01/82	L		
AR0000023176	HOT SPRINGS CITY OF SOLID WASTE BUILDING HOT SPRINGS / GARLAND	01/01/80	09/01/80	L		
AR0983266370	HWY 64 DUMP MORTON / WOODRUFF	05/01/82	11/01/89	L	09/11/91	L
AR0980496343	HYRUM SMITH DUMP ROYAL / GARLAND	05/01/80	05/01/80	L		
AR0006354484	ICI AMERICAS INC NORTH LITTLE ROCK / PULASKI	11/01/79	12/01/79	L	02/01/80	L
AR0983285255	ICI OF AMERICA NORTH LITTLE ROCK / PULASKI	09/09/92				

REGIONAL UTILITY CODE	REGIONAL UTILITY DESCRIPTION	REGIONAL UTILITY DATE
6TRA01	FILE REOPENED TO CONDUCT SI	02/15/91
6NRF01	RCRA LISTING - NON-HANDLER	12/01/87
6TRA01	FILE REOPENED TO CONDUCT SI	02/15/91
6TRA01	PRELIMINARY ASSESSMENT CONDUCTED BY FIT	09/01/89
SSR001	SSSP-FURTHER PRE-REMEDIAL INVESTIGATIVE ACTION NEEDED UNDER	07/16/91
6TRA02	SITE INSPECTION CONDUCTED BY EPA	07/10/91
6TRA03	(OTHER) HRS PRESCORE COMPLETED	09/10/91
6TRA01	FILE REOPENED TO CONDUCT SI	02/15/91
6GER01	RCRA LISTING - GENERATORS WHO GENERATE 100 KG/MO BUT LESS TH	12/01/87
6TRA01	FILE REOPENED TO CONDUCT SI PRIORITIZE	02/15/91

NEW LISTING TO ADDRESS BURIAL SITE!

REFERENCE 14

TELECON NOTE

AR DEPT. OF POLLUTION CONTROL & ECOLOGY

SITE ID. NUMBER:	DATE:	TIME:
ARD983285255	November 5, 1991	1235 Hours

DISTRIBUTION: Stauffer Chemical Company (ICI)
12th and Cedar Streets
North Little Rock, AR

BETWEEN:	OF:	PHONE:
(b) (6) [redacted]	Complainant (citizen)	(b) (6) [redacted]

AND: Tammie J. Hynum
Tammie J. Hynum, Inspector, ADPC&E

DISCUSSION:

Requested information (b) (6) [redacted] had regarding the burial of 7 Dust at the Old Stauffer Chemical site (currently ICI). (b) (b) (6) [redacted] stated ICI bought out Stauffer several years ago. He remembers the burial; happened about 20 years ago. He was watching TV the other night and heard where Arkansas Wildlife was suing ICI on 80 different accounts. He thought he better phone in a complaint. He actually saw the burial take place. The 7 Dust came onsite in an enclosed truck from possibly Union Carbide. There were 800 bags (50 pounds each) making a total of about 40,000 pounds. The chemical was about 50% 7 Dust. The friction of transporting the chemicals caused it to catch on fire. A large hole was dug, a fire hose was used to cool the chemicals off in the truck, chemicals dumped into the hole, and covered up. (b) (6) [redacted] states he could pinpoint the exact burial location today. Company contacts would be QC Supervisor, Hayes Baber, and Safety Manager, Fred Days.

ACTION ITEMS:

SF-01

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
LITTLE ROCK, ARKANSAS

"COMPLAINT REPORT"

DATE INFORMATION RECEIVED 11-5-91

COMPLAINANT NAME (b) (6) [redacted] PHONE (b) (6) [redacted]

ADDRESS _____ CITY _____ COUNTY _____

COMPLAINT AGAINST Stauffer Chemical (ICI) PHONE _____

LOCATION 12th Street / Cedar Street in North Little Rock

DESCRIPTION IN DETAIL The complainant observed Stauffer burying approximately 40,000 lbs of 50% 7 Dust (800 bags of 50 pounds each) some 20 years ago. The complainant states he can point out the burial site. The 7 Dust came on-site in an enclosed truck, a hole was dug and the 800 bags were dumped. The friction caused the bags to catch fire so the company put the fire out and brought a bull dozer in to cover the chemicals. The current owner of Stauffer Chemical is ICI of America (Imperial Chemicals Industries).

HOW RECEIVED: PHONE X LETTER _____ VERBAL _____

PERSON RECEIVING REPORT Dennis Green

INSPECTOR REFERRED _____ DISTRICT _____

NOTE: ICI is on the CERCLIS ARD006354484
Discovery 11/1/79
PA 12/1/79
SI 2/1/80

Tammie Hy

REFERENCE 15

Agricultural Products

RECD FEB 0 1 1991

CSN: 60-0851 Permit No. AR0042901
Media: Water
Sort: Permit, Compliance

January 29, 1991

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

RECEIVED FEB 4 1991

Samuel P. Sawyer
Water Division
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Re: CSN: 60-0851; NPDES Permit No. AR0042901

Dear Samuel:

This is a response to your letter of January 3, 1991, regarding your inspection on December 17, 1990.

The following actions will be taken to correct each item listed in the above mentioned letter:

1. All lab reports will contain the date and time of sample collection and analysis. This will begin on all samples collected on and after February 1, 1991. Sample collection dates and times have been recorded in our laboratory NPDES sample log book since receiving our permit on November 1, 1988.

2. We have established a pH meter calibration log book. The pH meter will be calibrated using buffer solutions of 7 pH and 10 pH immediately before measuring pH of NPDES samples. Calibration data will be recorded in the log book at that time.

   NPDES pH measurements will occur within 15 minutes after sample collection.

3. We will change our flow measurement method to a more accurate method. We are investigating building either a weir or a flume at outfall collection points. Outfalls drain from open channels running through very low, flat areas. Measuring devices that cause flow restrictions will also cause large volumes of water to backup on our facility.

4. At present the collection point for outfall 001 best represents the stormwater drainage from that portion of our property. It does drain some of the property west of our facility. However, most of the stormwater runoff in this open channel drains from our facility (tank farms and western portion of our property).

   We do recognize that this collection point is not ideal

COMPLIANCE FILES
PERMIT # 42901
DMR'S
NCR
CORRESPONDENCE
CRAS

2

and we are taking steps to insure that samples collected at this point are strictly representative of stormwater runoff from our facility.

Because of the low, flat topography of our facility site, it is difficult to insure that all stormwater runoff collected from our outfalls is exclusive to our site. Some stormwater runoff from areas adjacent to our facility site will inevitably be collected in our samples. We try to minimize this effect as much as possible.

Your assistance in answering questions over the telephone in the past few weeks has been very helpful in drafting our response. Thank you.

Sincerely,

Irvin Wheeler
Plant Manager

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501) 562-7444
FAX: (501) 562-4632

January 3, 1991

RECEIVED JAN 2 4 1991

Mr. Irwin Wheeler, Plant Manager
I.C.I. Americas, Inc.
Post Office Box 188
North Little Rock, AR 72115

Re: CSN: 60-0851; NPDES Permit No. AR0042901

Dear Mr. Wheeler:

On December 17, 1990, Eric Fleming and I conducted a routine inspection of your facility pursuant to the federal Water Pollution Control Act, the ARkansas Water and Air Pollution Control Act 472, and the regulations promulgated thereunder. During the inspection the following items were noted:

1. Lab reports listed no time that sample was obtained and no analysis time.

2. No records are kept of pH meter calibration. Buffers used in calibration should bracket the sample pH measurement, rather than always using the same buffers.

3. Flow measurement method is unsatisfactory. Using graduated cylinder and timing flow is not sufficient for heavy flows after rains.

4. Samples collected for outfall 001 are not representative because sample point is in ditch downstream from the discharge pipes for the tank farm runoff. This ditch also drains the property west of your facility.

Please submit a written response to these items to the NPDES Branch of this Department by February 3, 1991. If I can be of further assistance, please call me.

Sincerely,

Samuel P. Sawyer
District Field Inspector
Water Division

cc: NPDES Branch

NPDES COMPLIANCE FILES
NPDES # 42901
DMR'S
NCR
CORRESPONDENCE
CRTS

CSN: 60-0581 Permit No. AR0042901
Media: Water
Sort: Permit, Compliance

Minor Ind.

United States Environmental Protection Agency
Washington, D. C. 20460

EPA → NPDES Compliance Inspection Report

Form Approved
OMB No. 2040-0003
Approval Expires 7-31-85

Section A: National Data System Coding

Transaction Code	NPDES	yr/mo/day	Inspection Type	Inspector	Fac Type
1 N 2 5	3 AR0042901 11	12 901217 17	18 C	19 S	20 2

Remarks
21 CSN 60-08511 PULASKI COUNTY 66

Reserved	Facility Evaluation Rating	BI	QA	Reserved
67 69	70 1	71 N	72 N	73 74 75 80

Section B: Facility Data

Name and Location of Facility Inspected	Entry Time	Permit Effective Date
I.C.I. Americas, Inc. 824 E. 12th North Little Rock, Ar. 72115	1:05 ☐ AM ☒ PM Exit Time/Date: 2:30PM 12/17/90	11-1-88 Permit Expiration Date: 12-31-93

Name(s) of On-Site Representative(s)	Title(s)	Phone No(s)
Kathryn Dorn	Senior Plant Chemist	(501) 374-7445
Mathew Cooper	Lab Technician	Ext. 306

Name, Address of Responsible Official	Title	Contacted
Irwin Wheeler P.O. Box 188 North Little Rock, Ar. 72115	Plant Manager Phone No.: (501) 374-7445	☐ Yes ☐ No

Section C: Areas Evaluated During Inspection
(S = Satisfactory, M = Marginal, U = Unsatisfactory, N = Not Evaluated)

S	Permit	U	Flow Measurement	N	Pretreatment	N/A	Operations & Maintenance
U	Records/Reports	M	Laboratory	N	Compliance Schedules	N/A	Sludge Disposal
S	Facility Site Review	S	Effluent/Receiving Waters	U	Self-Monitoring Program		Other:

Section D: Summary of Findings/Comments *(Attach additional sheets if necessary)*

G. (a)(i) No sample time (ii) No analysis time
(iv) [Also K (Part 3)(a)] Contract Lab Method reference is EPA 1979 - should be updated.
(c) [Also K (Part 3)(d)] No records of pH meter calibration. Permittee should bracket pH calibration buffers according to the sample pH measurement rather than always using same two buffers
K (Part 1) Permittee is using a graduated cylinder to catch and "time" flow. Flow path is too wide and flows, as observed during inspection, are too high to measure by this method

Name(s) and Signature(s) of Inspector(s)	Agency/Office/Telephone	Date
Samuel P. Sawyer	ADPCE/LITTLEROCK/501 562-7444	1-3-91

Signature of Reviewer	Agency/Office	Date

Regulatory Office Use Only

Action Taken	Date	Compliance Status
	RECEIVED JAN 4 1991	☐ Noncompliance ☐ Compliance

EPA Form 3560-3 (Rev. 3-85) Previous editions are obsolete. ACI-5684

4

Form Approved
OMB No. 158-R0073

Sections F thru L: Complete on all inspections, as appropriate. N/A = Not Applicable

PERMIT NO. AR0042901

SECTION F - Facility and Permit Background

ADDRESS OF PERMITTEE IF DIFFERENT FROM FACILITY *(Including City, County and ZIP code)*	DATE OF LAST PREVIOUS INVESTIGATION BY EPA/STATE: None found in files FINDINGS:
N/A	N/A

SECTION G - Records and Reports

RECORDS AND REPORTS MAINTAINED AS REQUIRED BY PERMIT. ☐ YES ☒ NO ☐ N/A *(Further explanation attached* YES *)*
DETAILS:

(a) ADEQUATE RECORDS MAINTAINED OF:			
(i) SAMPLING DATE, TIME, EXACT LOCATION	☐ YES	☒ NO	☐ N/A
(ii) ANALYSES DATES, TIMES	☐ YES	☒ NO	☐ N/A
(iii) INDIVIDUAL PERFORMING ANALYSIS	☐ YES	☒ NO	☐ N/A
(iv) ANALYTICAL METHODS/TECHNIQUES USED See Comments Section	☒ YES	☐ NO	☐ N/A
(v) ANALYTICAL RESULTS *(e.g., consistent with self-monitoring report data)*	☒ YES	☐ NO	☐ N/A
(b) MONITORING RECORDS *(e.g.,flow, pH, D.O., etc.)* MAINTAINED FOR A MINIMUM OF THREE YEARS INCLUDING ALL ORIGINAL STRIP CHART RECORDINGS *(e.g. continuous monitoring instrumentation, calibration and maintenance records).*	☒ YES	☐ NO	☐ N/A
(c) LAB EQUIPMENT CALIBRATION AND MAINTENANCE RECORDS KEPT.	☐ YES	☒ NO	☐ N/A
(d) FACILITY OPERATING RECORDS KEPT INCLUDING OPERATING LOGS FOR EACH TREATMENT UNIT.	☐ YES	☐ NO	☒ N/A
(e) QUALITY ASSURANCE RECORDS KEPT. Contract Lab	☒ YES	☐ NO	☐ N/A
(f) RECORDS MAINTAINED OF MAJOR CONTRIBUTING INDUSTRIES *(and their compliance status)* USING PUBLICLY OWNED TREATMENT WORKS.	☐ YES	☐ NO	☒ N/A

SECTION H - Permit Verification

INSPECTION OBSERVATIONS VERIFY THE PERMIT. ☒ YES ☐ NO ☐ N/A *(Further explanation attached* NO *)*
DETAILS:

(a) CORRECT NAME AND MAILING ADDRESS OF PERMITTEE.	☒ YES	☐ NO	☐ N/A
(b) FACILITY IS AS DESCRIBED IN PERMIT. NOT DESCRIBED	☐ YES	☐ NO	☒ N/A
(c) PRINCIPAL PRODUCT(S) AND PRODUCTION RATES CONFORM WITH THOSE SET FORTH IN PERMIT APPLICATION. (PRODUCTION RATE NOT DETAILED)	☒ YES	☐ NO	☐ N/A
(d) TREATMENT PROCESSES ARE AS DESCRIBED IN PERMIT APPLICATION.	☒ YES	☐ NO	☐ N/A
(e) NOTIFICATION GIVEN TO EPA/STATE OF NEW, DIFFERENT OR INCREASED DISCHARGES.	☐ YES	☐ NO	☒ N/A
(f) ACCURATE RECORDS OF RAW WATER VOLUME MAINTAINED.	☐ YES	☐ NO	☒ N/A
(g) NUMBER AND LOCATION OF DISCHARGE POINTS ARE AS DESCRIBED IN PERMIT.	☒ YES	☐ NO	☐ N/A
(h) CORRECT NAME AND LOCATION OF RECEIVING WATERS.	☒ YES	☐ NO	☐ N/A
(i) ALL DISCHARGES ARE PERMITTED.	☒ YES	☐ NO	☐ N/A

SECTION I - Operation and Maintenance

TREATMENT FACILITY PROPERLY OPERATED AND MAINTAINED. ☐ YES ☐ NO ☒ N/A *(Further explanation attached* NO *)*
DETAILS: NO TREATMENT OCCURRS; STORMWATER RUNOFF ONLY

(a) STANDBY POWER OR OTHER EQUIVALENT PROVISIONS PROVIDED.	☐ YES	☐ NO	☒ N/A
(b) ADEQUATE ALARM SYSTEM FOR POWER OR EQUIPMENT FAILURES AVAILABLE.	☐ YES	☐ NO	☒ N/A
(c) REPORTS ON ALTERNATE SOURCE OF POWER SENT TO EPA/STATE AS REQUIRED BY PERMIT.	☐ YES	☐ NO	☒ N/A
(d) SLUDGES AND SOLIDS ADEQUATELY DISPOSED.	☐ YES	☐ NO	☒ N/A
(e) ALL TREATMENT UNITS IN SERVICE.	☐ YES	☐ NO	☒ N/A
(f) CONSULTING ENGINEER RETAINED OR AVAILABLE FOR CONSULTATION ON OPERATION AND MAINTENANCE PROBLEMS.	☐ YES	☐ NO	☒ N/A
(g) QUALIFIED OPERATING STAFF PROVIDED.	☒ YES	☐ NO	☐ N/A
(h) ESTABLISHED PROCEDURES AVAILABLE FOR TRAINING NEW OPERATORS.	☒ YES	☐ NO	☐ N/A
(i) FILES MAINTAINED ON SPARE PARTS INVENTORY, MAJOR EQUIPMENT SPECIFICATIONS, AND PARTS AND EQUIPMENT SUPPLIERS.	☐ YES	☐ NO	☒ N/A
(j) INSTRUCTIONS FILES KEPT FOR OPERATION AND MAINTENANCE OF EACH ITEM OF MAJOR EQUIPMENT.	☐ YES	☐ NO	☒ N/A
(k) OPERATION AND MAINTENANCE MANUAL MAINTAINED.	☐ YES	☐ NO	☒ N/A
(l) SPCC PLAN AVAILABLE.	☒ YES	☐ NO	☐ N/A
(m) REGULATORY AGENCY NOTIFIED OF BY PASSING. *(Dates* _____ _____*)*	☐ YES	☐ NO	☒ N/A
(n) ANY BY-PASSING SINCE LAST INSPECTION. NO PREVIOUS INSPECTION	☐ YES	☐ NO	☒ N/A
(o) ANY HYDRAULIC AND/OR ORGANIC OVERLOADS EXPERIENCED.	☐ YES	☒ NO	☐ N/A

5

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OMB No. 158-R0073

PERMIT NO. AR0042901

SECTION J - Compliance Schedules

PERMITTEE IS MEETING COMPLIANCE SCHEDULE. ☐ YES ☐ NO ☒ N/A *(Further explanation attached _____)*

CHECK APPROPRIATE PHASE(S):

- ☐ (a) THE PERMITTEE HAS OBTAINED THE NECESSARY APPROVALS FROM THE APPROPRIATE AUTHORITIES TO BEGIN CONSTRUCTION.
- ☐ (b) PROPER ARRANGEMENT HAS BEEN MADE FOR FINANCING *(mortgage commitments, grants, etc.)*.
- ☐ (c) CONTRACTS FOR ENGINEERING SERVICES HAVE BEEN EXECUTED.
- ☐ (d) DESIGN PLANS AND SPECIFICATIONS HAVE BEEN COMPLETED.
- ☐ (e) CONSTRUCTION HAS COMMENCED.
- ☐ (f) CONSTRUCTION AND/OR EQUIPMENT ACQUISITION IS ON SCHEDULE.
- ☐ (g) CONSTRUCTION HAS BEEN COMPLETED.
- ☐ (h) START-UP HAS COMMENCED.
- ☐ (i) THE PERMITTEE HAS REQUESTED AN EXTENSION OF TIME.

SECTION K - Self-Monitoring Program

Part 1 – Flow measurement *(Further explanation attached YES)*

PERMITTEE FLOW MEASUREMENT MEETS THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS:	☐ YES	☒ NO	☐ N/A
(a) PRIMARY MEASURING DEVICE PROPERLY INSTALLED. GRADUATED CYLINDER	☐ YES	☐ NO	☒ N/A
TYPE OF DEVICE: ☐ WEIR ☐ PARSHALL FLUME ☐ MAGMETER ☐ VENTURI METER ☒ OTHER *(Specify _____)*			
(b) CALIBRATION FREQUENCY ADEQUATE. *(Date of last calibration _____)*	☐ YES	☐ NO	☒ N/A
(c) PRIMARY FLOW MEASURING DEVICE PROPERLY OPERATED AND MAINTAINED.	☐ YES	☐ NO	☒ N/A
(d) SECONDARY INSTRUMENTS *(totalizers, recorders, etc.)* PROPERLY OPERATED AND MAINTAINED.	☐ YES	☐ NO	☒ N/A
(e) FLOW MEASUREMENT EQUIPMENT ADEQUATE TO HANDLE EXPECTED RANGES OF FLOW RATES.	☐ YES	☒ NO	☐ N/A

Part 2 – Sampling *(Further explanation attached YES)*

PERMITTEE SAMPLING MEETS THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS:	☐ YES	☒ NO	☐ N/A
(a) LOCATIONS ADEQUATE FOR REPRESENTATIVE SAMPLES.	☐ YES	☒ NO	☐ N/A
(b) PARAMETERS AND SAMPLING FREQUENCY AGREE WITH PERMIT.	☒ YES	☐ NO	☐ N/A
(c) PERMITTEE IS USING METHOD OF SAMPLE COLLECTION REQUIRED BY PERMIT. IF NO, ☐ GRAB ☐ MANUAL COMPOSITE ☐ AUTOMATIC COMPOSITE FREQUENCY _____	☒ YES	☐ NO	☐ N/A
(d) SAMPLE COLLECTION PROCEDURES ARE ADEQUATE.	☒ YES	☐ NO	☐ N/A
(i) SAMPLES REFRIGERATED DURING COMPOSITING	☐ YES	☐ NO	☒ N/A
(ii) PROPER PRESERVATION TECHNIQUES USED	☒ YES	☐ NO	☐ N/A
(iii) FLOW PROPORTIONED SAMPLES OBTAINED WHERE REQUIRED BY PERMIT	☐ YES	☐ NO	☒ N/A
(iv) SAMPLE HOLDING TIMES PRIOR TO ANALYSES IN CONFORMANCE WITH 40 CFR 136.3	☒ YES	☐ NO	☐ N/A
(e) MONITORING AND ANALYSES BEING PERFORMED MORE FREQUENTLY THAN REQUIRED BY PERMIT.	☐ YES	☒ NO	☐ N/A
(f) IF (e) IS YES, RESULTS ARE REPORTED IN PERMITTEE'S SELF-MONITORING REPORT.	☐ YES	☐ NO	☒ N/A

Part 3 – Laboratory *(Further explanation attached YES)*

PERMITTEE LABORATORY PROCEDURES MEET THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS:	☐ YES	☒ NO	☐ N/A
(a) EPA APPROVED ANALYTICAL TESTING PROCEDURES USED. *(40 CFR 136.3)*	☐ YES	☒ NO	☐ N/A
(b) IF ALTERNATE ANALYTICAL PROCEDURES ARE USED, PROPER APPROVAL HAS BEEN OBTAINED.	☐ YES	☐ NO	☒ N/A
(c) PARAMETERS OTHER THAN THOSE REQUIRED BY THE PERMIT ARE ANALYZED.	☐ YES	☒ NO	☐ N/A
(d) SATISFACTORY CALIBRATION AND MAINTENANCE OF INSTRUMENTS AND EQUIPMENT.	☐ YES	☒ NO	☐ N/A
(e) QUALITY CONTROL PROCEDURES USED.	☒ YES	☐ NO	☐ N/A
(f) DUPLICATE SAMPLES ARE ANALYZED. >10 % OF TIME.	☒ YES	☐ NO	☐ N/A
(g) SPIKED SAMPLES ARE USED. >10 % OF TIME.	☒ YES	☐ NO	☐ N/A
(h) COMMERCIAL LABORATORY USED.	☒ YES	☐ NO	☐ N/A
(i) COMMERCIAL LABORATORY STATE CERTIFIED.	☒ YES	☐ NO	☐ N/A

LAB NAME Entek (501) 455-1316

LAB ADDRESS P.O. Box 780 Mabelvale, Ar. 72103

6

Form Approved
OMB No. 2040-0004
Expires 2-29-84

PERMIT NO. AR0042901

SECTION L - Effluent/Receiving Water Observations *(Further explanation attached _____)*

OUTFALL NO.	OIL SHEEN	GREASE	TURBIDITY	VISIBLE FOAM	VISIBLE FLOAT SOL	COLOR	OTHER
001	NONE	NONE	NONE	NONE	NONE	NONE	
002	NONE	NONE	SLIGHT	TRACE	NONE	SLIGHT GREY	
003	NONE	NONE	NONE	NONE	NONE	NONE	

(Sections M and N: Complete as appropriate for sampling inspections)

SECTION M - Sampling Inspection Procedures and Observations *(Further explanation attached NO)*

- ☐ GRAB SAMPLES OBTAINED
- ☐ COMPOSITE OBTAINED
- ☐ FLOW PROPORTIONED SAMPLE
- ☐ AUTOMATIC SAMPLER USED
- ☐ SAMPLE SPLIT WITH PERMITTEE
- ☐ CHAIN OF CUSTODY EMPLOYED
- ☐ SAMPLE OBTAINED FROM FACILITY SAMPLING DEVICE

N/A

COMPOSITING FREQUENCY _____ PRESERVATION _____

SAMPLE REFRIGERATED DURING COMPOSITING: ☐ YES ☐ NO

SAMPLE REPRESENTATIVE OF VOLUME AND NATURE OF DISCHARGE _____

SECTION N - Analytical Results *(Attach report if necessary)*

N/A

Date 12-17-90

Permit No. AR0042901

NPDES Compliance Inspection Report
Further Explanations

Page 3 of 4

Section K Part 3

Detail

Lab reports on site during inspection were from Entek (address on page 3). Permittee has switched to: American Interplex (501) 224-5060
8600 Kanis Rd.
Little Rock, Ar. 72205

Page of 4

Section Part

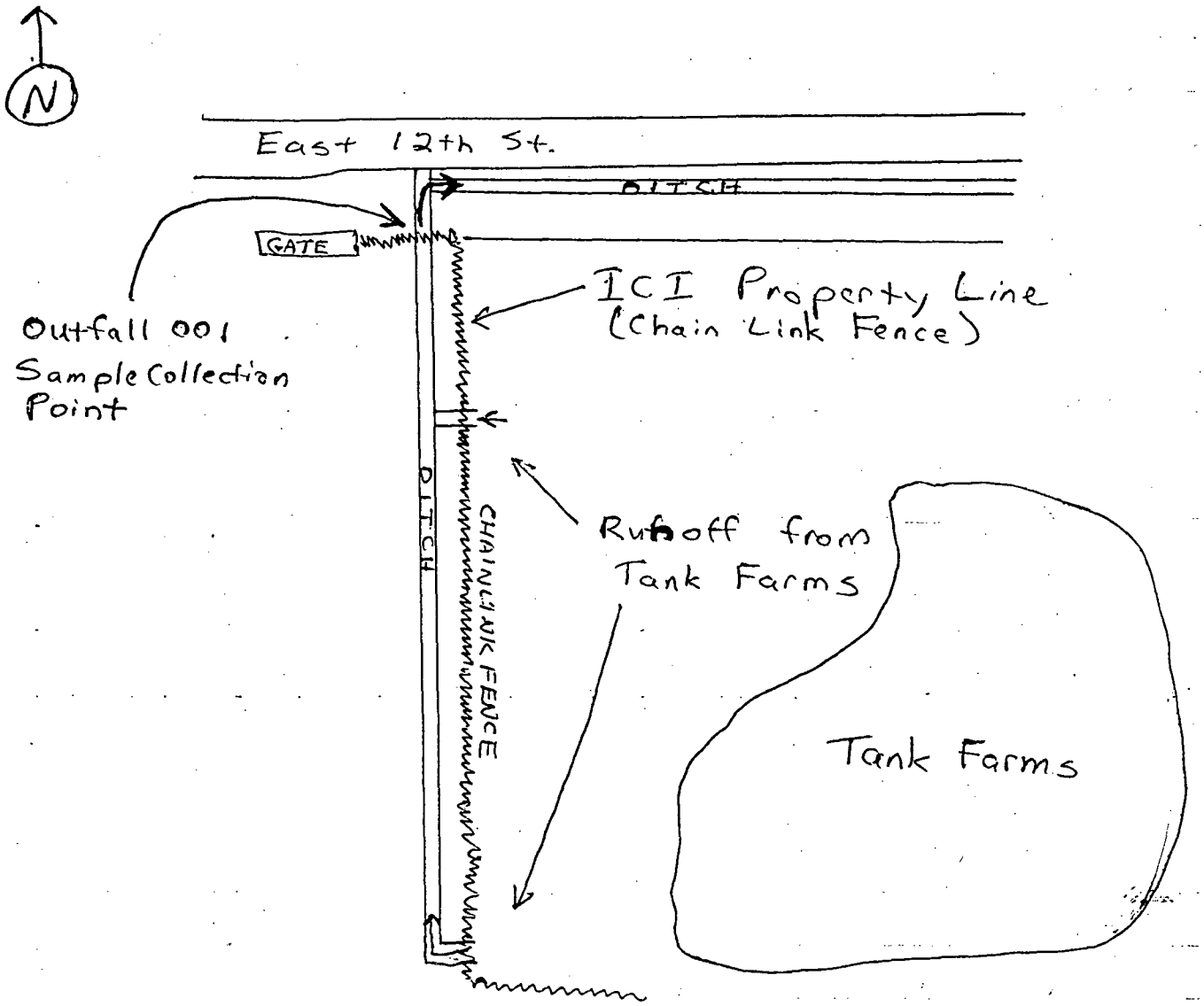
Detail

Page of 4

Section Part

Detail

R6-68 (11-77)



K. (Part 2)(a) Permittee is collecting samples for Outfall 001 just outside fence near East 12th Street. Samples are probably not representative because the sample point is approximately 50 feet and 120 feet downstream from points where runoff from tank farms enters ditch. Ditch also drains another firm's property to the west. Permittee may need to install sample port(s) on I.C.I. property.

OUTFALL 001

SECTION B - Effluent Characteristics (Additional sheets attached _____) (Continued)

	PARAMETER/ OUTFALL		MINIMUM	AVERAGE	MAXIMUM	ADDITIONAL
AUGUST 1990	COD mg/L	SAMPLE MEASUREMENT		(MONTHLY AVERAGE NOT REQUIRED ON PERMIT)	104	(Excursion)
		PERMIT REQUIREMENT			75	
	pH, s.u.	SAMPLE MEASUREMENT	6.8		7.2	
		PERMIT REQUIREMENT	6.0		9.0	
	TSS mg/L	SAMPLE MEASUREMENT			15	
		PERMIT REQUIREMENT			50	
	O&G mg/L	SAMPLE MEASUREMENT			5.9	
		PERMIT REQUIREMENT			15	
	Arsenic, Total mg/L	SAMPLE MEASUREMENT			0.003	
		PERMIT REQUIREMENT			0.3	
	Zinc, Total mg/L	SAMPLE MEASUREMENT			<0.1	
		PERMIT REQUIREMENT			0.3	
	Phenol mg/L	SAMPLE MEASUREMENT			<0.1	
		PERMIT REQUIREMENT			0.5	
JULY 1990	COD mg/L	SAMPLE MEASUREMENT			96	(Excursion)
		PERMIT REQUIREMENT			75	
	pH, s.u.	SAMPLE MEASUREMENT	6.5		6.6	
		PERMIT REQUIREMENT	6.0		9.0	
	TSS, mg/L	SAMPLE MEASUREMENT			6.6	
		PERMIT REQUIREMENT			50	
	O&G, mg/L	SAMPLE MEASUREMENT			<5	
		PERMIT REQUIREMENT			15	
	Arsenic, Total mg/L	SAMPLE MEASUREMENT			0.004	
		PERMIT REQUIREMENT			0.3	
	Zinc, Total mg/L	SAMPLE MEASUREMENT			0.3	
		PERMIT REQUIREMENT			0.3	
	Phenol, mg/L	SAMPLE MEASUREMENT			0.1	
		PERMIT REQUIREMENT			0.5	

ACI —5685

REFERENCE 16

Hayes please review
Thanks
JL

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501) 562-7444
FAX: (501) 562-4632

April 22, 1991

NO. LITTLE ROCK
APR 23 1991
RECEIVED

Mr. Irwin Wheeler, Plant Manager
I.C.I. Americas, Inc.
P.O. Box 188
North Little Rock, AR 72115

RE: Consent Administrative Order 91-074, NPDES Permit No. AR0042901

Dear Mr. Wheeler:

Attached is approved Consent Administrative Order 91-074. The effective date is 4-16-91.

If you have any questions, let me know.

Sincerely,

Mark K. Bradley

Mark K. Bradley, P.E.
Enforcement Engineer
NPDES Enforcement Section

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

IN THE MATTER OF LIS 91-074

ICI Americas, Inc.

RECEIVED APR 19 1991

CONSENT ADMINISTRATIVE ORDER

This Consent Administrative Order is issued pursuant to the authority of the Arkansas Water and Air Pollution Act (Act 472 of 1949, as amended, A.C.A. Section 8-4-101 et seq.)(hereinafter "the Act") and the regulations issued thereunder.

Pursuant to the authority of Ark. Code Ann. Section 8-4-207(1)(B), the Director of the Arkansas Department of Pollution Control and Ecology (hereinafter "ADPC&E") is authorized to set schedules of compliance for facilities permitted under the Arkansas Water and Air Pollution Control Act necessary to assure compliance with both applicable State and Federal effluent limitations, including those mandated by Section 301 (b)(1)(c) and 301 (i)(1) of the Federal Clean Water Act and those necessary to achieve and maintain compliance with Arkansas Water Quality Standards (Regulation No. 2).

The issues herein having been settled by the agreement of the ICI Americas, Inc. (hereinafter the "Permittee") and ADPC&E, it is hereby agreed and stipulated that the following Findings of Fact and Order and Agreement be entered.

FINDINGS OF FACT

1. The Permittee is duly incorporated under the laws of the State of Arkansas and has been issued Arkansas State NPDES Permit Number AR0042901. The permit authorizes discharges in accordance with the Act and the regulations promulgated thereunder. The permit also requires the submission of Discharge Monitoring Reports and Noncompliance Reports.

2. The following effluent limitations are found necessary for the Permittee to achieve and maintain compliance with the terms and conditions of State NPDES Permit Number AR0042901 for Outfall 001, 002 and 003:

Effluent Characteristics	Discharge Limitations Concentration (mg/l) Monthly Maximum
Chemical Oxygen Demand	75
Total Suspended Solids	50
Oil and Grease	15
Total Recoverable Arsenic	0.3
Total Recoverable Zinc	0.3
Single Compound Phenol	0.5

pH shall not be less than 6.0 standard units nor greater than 9.0 standard units.

3. Currently, the Permittee's effluent is failing to meet the limitations as set forth in paragraph 2. Recent violations of State NPDES Permit Number AR0042901 are as follows:

Date	Parameter	Reported
Outfall 001:		
1/90	COD - Max. concentration	98
	TSS - Max. concentration	148
	Zinc - Max. concentration	0.37
	Phenol - Max. concentration	0.57
3/90	TSS - Max. concentration	78
4/90	COD - Max. concentration	105
	Zinc - Max. concentration	0.7
5/90	COD - Max. concentration	170
	Zinc - Max. concentration	0.37
6/90	COD - Max. concentration	184
	pH - Maximum	9.2
	Oil & Grease - Max. concentration	26.0
7/90	COD - Max. concentration	96
8/90	COD - Max. concentration	104
9/90	COD - Max. concentration	238
	Zinc - Max. concentration	0.37
10/90	COD - Max. concentration	89
	pH - Maximum	9.4
	TSS - Max. concentration	310
11/90	COD - Max. concentration	110
	Zinc - Max. concentration	0.41
12/90	Zinc - Max. concentration	0.78
1/91	COD - Max. concentration	89
	TSS - Max. concentration	84
	Zinc - Max. concentration	0.52
Outfall 002:		
10-12/90	Zinc - Max. concentration	0.58
Outfall 003:		
4-6/90	Zinc - Max. concentration	0.84
7-9/90	COD - Max. concentration	82
	TSS - Max. concentration	110

10-12/90 Zinc - Max. concentration 0.58

Note: Loading is reported in lbs/day, concentration in mg/l.

ORDER AND AGREEMENT

Therefore, the parties do hereby stipulate and agree:

1. The Permittee, within thirty (30) days of the effective date of this Order, shall take whatever corrective action is necessary to eliminate and prevent recurrence of the effluent violations cited in the Findings of Fact. In addition, the Permittee shall, within the thirty (30) days, submit a report detailing the specific actions taken and why such actions are sufficient to prevent recurrence of the noncompliant discharges.

2. In the event the Permittee believes that complete correction of the previously cited noncompliant discharges is not physically possible within thirty (30) days of the effective date of this Order, the Permittee shall submit to ADPC&E a comprehensive plan for the expeditious elimination and prevention of noncompliant discharges. Such plan shall provide for specific corrective actions to be taken and shall include a milestone schedule for the achievement of compliance within the shortest time possible.

3. In compromise and full settlement of the civil penalties for violations (specified in the Findings of Fact), the Permittee agrees to pay to ADPC&E the total sum of One Thousand Dollars ($1000) as a voluntary civil penalty. Payment of the penalty shall be made within thirty (30) days of the date of this Order, made payable to the Arkansas Department of Pollution Control and Ecology and mailed to the attention of Steve Weaver, Chief Counsel, Arkansas

Department of Pollution Control and Ecology, P.O. Box 8913, Little Rock, Arkansas 72219-8913.

4. All submittals required by this Order are subject to approval by ADPC&E. In the event of any deficiency, the Permittee shall, within fifteen (15) days of notification by ADPC&E, submit any additional information requested. Failure to adequately respond to the notice of deficiency within fifteen (15) days constitutes a failure to meet a deadline and is subject to the civil penalties established in paragraph 5 below.

5. Failure to meet the requirements, effluent limits or deadlines of this Order or the approved schedules provided for herein constitutes a violation of said Order. If the Permittee should fail to meet any such requirements, effluent limits or deadlines, the Permittee consents and agrees to pay, on demand, to ADPC&E civil penalties according to the following schedule:

(a) First day through the tenth day: $ 100.00 per day

(b) Eleventh day through twentieth day: $ 200.00 per day

(c) Twenty-first day through the thirtieth day : $ 300.00 per day

(d) Each day beyond the thirtieth day: $ 500.00 per day

These stipulated penalties for delay in performance shall be in addition to any other remedies or sanctions which may be available to ADPC&E by reason of the Permittee's failure to comply with the requirements of this Consent Administrative Order.

6. If any event, including but not limited to an Act of God, occurs which causes or may cause delay in the achievement of compliance by the Permittee with the requirements or deadlines of this Consent Administrative Order,

the Permittee shall so notify ADPC&E, in writing, as soon as reasonably possible after it is apparent that delay will result, but in no case after the due dates specified in the schedules above. The notification shall describe in detail the anticipated length of the delay, the precise cause of the delay, the measures being taken and to be taken to minimize the delay, and the timetable by which those measures will be implemented.

7. ADPC&E may grant an extension of any provision of this Consent Administrative Order, provided that the Permittee requests such an extension in writing and provided that the delay or anticipated delay has been or will be caused by circumstances beyond the control of and without the fault of the Permittee. The time for performance may be extended for a reasonable period but in no event longer than the period of delay resulting from such circumstances. The burden of proving that any delay is caused by circumstances beyond the control of and without the fault of the Permittee and the length of delay attributable to such circumstances shall rest with the Permittee. Failure to notify the ADPC&E promptly, as provided in paragraph 6, shall be grounds for denial of an extension.

8. Nothing in this Consent Administrative Order shall be construed as a waiver by ADPC&E of its enforcement authority over alleged violations not specifically addressed herein. Also, this Consent Administrative Order does not exonerate the Permittee from any past, present, or future conduct which is not expressly addressed herein.

SO ORDERED THE 16 DAY OF April, 1991.

Randall Mathis
Randall Mathis, Director

APPROVED AS TO FORM AND CONTENT:

ICI Americas, Inc.

BY: Irvin Wheeler

TITLE: Plant Manager

DATE: April 10, 1991

REFERENCE 17

MB

TRIAL LAWYERS FOR PUBLIC JUSTICE, P.C.
A PROJECT OF THE TLPJ FOUNDATION
SUITE 100
1625 MASSACHUSETTS AVE., N.W.
WASHINGTON, D.C. 20036

(202) 797-8600
Fax (202) 232-7203

July 2, 1991

CERTIFIED MAIL, RETURN RECEIPT REQUESTED (# P 138 633 888)

Irwin Wheeler
Plant Manager
I.C.I. Americas, Inc.
P.O. Box 188
Little Rock, Arkansas 72115

Dear Mr. Wheeler:

Section 505(b) of the Federal Water Pollution Control Act, 33 U.S.C. § 1365(b), requires that 60 days prior to the filing of a citizen suit in federal district court under Section 505(a) of the Act, the alleged violator, the U.S. Environmental Protection Agency, and the State in which the alleged violations occur must be given notice of the alleged violations.

The Arkansas Wildlife Federation, 7509 Cantrell Road, Little Rock, Arkansas 72207 (501-663-7255), hereby places you on notice, pursuant to Section 505(b) of the Act, that it believes that your facility in North Little Rock, Pulaski County, Arkansas, which discharges to an unnamed tributary of the West Branch of Dark Hollow Canal, a tributary of the Arkansas River, has violated and continues to violate "an effluent standard or limitation" under Section 505(a)(1)(A) of the Act, 33 U.S.C. § 1365(a)(1)(A), by failing to comply with NPDES permit number AR0042901 in at least the instances enumerated in the attached chronological list of permit violations.

The attached list is based on available permit records on file at the offices of the Arkansas Department of Pollution Control and Ecology in Little Rock. In some instances, information was missing from the public files. We therefore expect to request information from your records to obtain this data and to supplement the list of violations based on that information. However, we do not believe that it is necessary to provide you with additional notice concerning any supplemental violations before filing a judicial enforcement action.

We intend, at the close of the 60-day notice period or shortly thereafter, to file a citizen suit under Section 505(a) of the Act against your company for the violations of NPDES permit number AR0042901.

During the 60-day notice period, we would be willing to

discuss effective remedies for the violations noted in this letter. However, if you wish to pursue such negotiations in the absence of litigation, we suggest that you initiate those discussions within the next 10 days so that they may be completed before the end of the 60-day notice period. We do not intend to delay the filing of a complaint in federal court if discussions are continuing when that period ends.

Sincerely,

James M. Hecker

James M. Hecker

Samuel E. Ledbetter by JMH

Samuel E. Ledbetter
Nichols, Wolff & Ledbetter
P.O. Box 47
Little Rock, AR 72203
(501) 372-5659

Counsel for the Arkansas
Wildlife Federation

cc: William Reilly, Administrator (# P 138 633 881)
U.S. Environmental Protection Agency, A-100
401 M Street, S.W.
Washington, D.C. 20460

Robert Layton, Jr., Regional
Administrator (# P 138 633 882)
EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Randall Mathis, Director (# P 138 633 883)
Arkansas Department of Pollution
Control and Ecology
8001 National Drive
P.O. Box 9583
Little Rock, Arkansas 72209

The Corporation Company (# P 138 633 884)
417 Spring Street
Little Rock, Arkansas 72201

ICI AMERICAS INC.

	DMR	OUTFALL	PARAMETER	UNITS	TYPE	LIMIT	REPORTED VALUE	% OVER LIMIT	# OF VIOL
1	11/88	001	COD	mg/l	M	75	101	35	2
2	11/88	001	pH	SU		6-9	NVR		
3	11-12/88	002	COD	mg/l	M	75	238	217	
4	11-12/88	003	COD	mg/l	M	75	77.6	3	
5	12/88	001	TSS	mg/l	M	50	80	60	
6	1/89	001	COD	mg/l	M	75	182	143	4
7	1/89	001	TSS	mg/l	M	50	58	16	
8	1/89	001	O&G	mg/l	M	15	18.5	23	
9	2/89	001	COD	mg/l	M	75	132	76	2
10	2/89	001	TSS	mg/l	M	50	52	4	
11	1-3/89	003	Zn	mg/l	M	0.3	0.41	37	
12	3/89	001	COD	mg/l	M	75	133	77	3
13	3/89	001	TSS	mg/l	M	50	214	328	2
14	4/89	001	COD	mg/l	M	75	92	23	2
15	4/89	001	Zn	mg/l	M	0.3	0.4	33	
16	5/89	001	COD	mg/l	M	75	98	31	
17	5/89	001	TSS	mg/l	M	50	52	4	
18	5/89	001	Zn	mg/l	M	0.3	0.42	40	
19	6/89	001	COD	mg/l	M	75	77.3	3	
20	7/89	001	COD	mg/l	M	75	123	64	2
21	8/89	001	All		Sample Type Not Reported				
22	7-9/89	003	COD	mg/l	M	75	106	41	
23	7-9/89	003	TSS	mg/l	M	50	128	156	
24	10/89	001	COD	mg/l	M	75	78.1	4	
25	11/89	001	COD	mg/l	M	75	117	56	
26	1/90	001	COD	mg/l	M	75	98	31	2
27	1/90	001	TSS	mg/l	M	50	148	196	
28	1/90	001	Zn	mg/l	M	0.3	0.37	23	2
29	1/90	001	Phenol	mg/l	M	0.5	0.57	14	
30	1-3/90	001	Bio	%	Min	80	0	-80	
31	3/90	001	TSS	mg/l	M	50	78	56	
32	4/90	001	COD	mg/l	M	75	105	40	
33	4/90	001	Zn	mg/l	M	0.3	0.7	133	
34	5/90	001	COD	mg/l	M	75	170	127	2
35	5/90	001	Zn	mg/l	M	0.3	0.37	23	
36	4-6/90	003	Bio	%	Min	80	0	-80	
37	4-6/90	003	Zn	mg/l	M	0.3	0.84	180	
38	6/90	001	COD	mg/l	M	75	184	145	2
39	6/90	001	pH	SU	M	9	9.2	2	
40	6/90	001	pH	SU	Min	6	NVR		
41	6/90	001	O&G	mg/l	M	15	26	73	
42	7/90	001	COD	mg/l	M	75	96	28	
43	8/90	001	COD	mg/l	M	75	104	39	
44	7-9/90	003	COD	mg/l	M	75	82	9	
45	7-9/90	003	TSS	mg/l	M	50	110	120	
46	9/90	001	COD	mg/l	M	75	238	217	2
47	9/90	001	Zn	mg/l	M	0.3	0.37	23	
48	10/90	001	COD	mg/l	M	75	89	19	
49	10/90	001	pH	SU	M	9	9.4	4	
50	10/90	001	pH	SU	Min	6	NVR		
51	10/90	001	TSS	mg/l	M	50	310	520	

52	11/90	001	COD	mg/l	M	75	110	47	
53	11/90	001	Zn	mg/l	M	0.3	0.41	37	
54	10-12/90	002	Zn	mg/l	M	0.3	0.58	93	
55	12/90	001	Zn	mg/l	M	0.3	0.78	160	3
56	1/91	001	TSS	mg/l	M	50	84	68	
57	1/91	001	COD	mg/l	M	75	89	19	
58	1/91	001	Zn	mg/l	M	0.3	0.52	73	
59	2/91	001	TSS	mg/l	M	50	140	180	
60	2/91	001	Zn	mg/l	M	0.3	0.75	150	
61	3/91	001	TSS	mg/l	M	50	58	16	
62	3/91	001	Zn	mg/l	M	0.3	0.65	117	
63	3/91	001	Phenol	mg/l	M	0.5	0.66	32	
64	4/91	001	TSS	mg/l	M	50	80	60	
65	4/91	001	Zn	mg/l	M	0.3	0.38	27	

ABBREVIATIONS

COD	Chemical Oxygen Demand
M	Maximum
Min	Minimum
NVR	No Value Reported
SU	Standard Units
TSS	Total Suspended Solids
Zn	Zinc

TRIAL LAWYERS FOR PUBLIC JUSTICE, P.C.
A PROJECT OF THE TLPJ FOUNDATION
SUITE 100
1625 MASSACHUSETTS AVE., N.W.
WASHINGTON, D.C. 20036

(202) 797-8600
Fax (202) 232-7203

July 15, 1991

VIA TELECOPIER

R. Hayes Baber
I.C.I. Americas, Inc.
P.O. Box 1888
Little Rock, Arkansas 72115

Re: Notice Letter, Arkansas Wildlife Federation v. I.C.I. Americas, Inc.

Dear Mr. Baber:

You have advised Sam Ledbetter that you have reviewed the notice letter served upon I.C.I. Americas, Inc. by the Arkansas Wildlife Federation pursuant to Section 505(b) of the Clean Water Act and that the company is interested in discussing settlement.

We will need certain information in order to discuss settlement. Please provide the following information for the time period from November 1988 to the present:

1. The company's public comments on its NPDES permit.

2. Any adjudicatory hearing request by the company and related correspondence.

3. All noncompliance reports or letters.

4. An explanation of any errors the company maintains are contained in any of its discharge monitoring reports, the reason for and/or cause of the error, and the correct information.

5. A statement of the reasons for each violation listed in the 60-day notice letter or otherwise reported by the company in its submissions to the Arkansas Department of Pollution Control and Ecology (ADPC&E) or the U.S. Environmental Protection Agency (EPA).

6. EPA or ADPC&E inspection reports, draft or final administrative orders or civil penalty assessments, compliance schedules, warning letters, and notices of violation.

7. Correspondence, memoranda, treatability studies, engineering reports, or consultant's reports concerning any proposed, pending or completed changes in the company's

production processes or treatment facilities intended to bring the company into compliance with its permit.

8. A narrative description of the efforts the company has made to date and the efforts it intends to make in the future to comply with its permit, including:

a. A description of the control equipment, including the date it became or will become operational, its purpose, and the pollutant it was or is expected to affect;

b. The capital cost of that equipment;

c. The annual operation and maintenance cost of that equipment;

d. Any costs of sludge disposal associated with that equipment;

e. The year in which the dollars are expressed for each of the costs provided in response to items (a)-(d); and

f. The useful life of the control equipment.

9. Documents showing the company's total revenues and expenses, taxes, annual income before and after taxes, and total assets and liabilities for each year;

10. The company's proposed schedule for future compliance, including as many benchmarks as possible stating what additional equipment, if any, will be installed, when it will be installed, and when compliance will be achieved.

11. Any other information which you believe might assist us in our understanding of the company's compliance status.

After receiving this information, we expect to be able to make a specific settlement proposal. If you have any questions concerning any of these requests, please do not hesitate to call.

Sincerely,

James M. Hecker

James M. Hecker
Environmental Enforcement
Attorney

cc: Sam Ledbetter

REFERENCE 18

MB

Agricultural Products

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

August 5, 1991

James M. Hecker
Suite 100
1625 Massachusetts Ave., N.W.
Washington, D.C. 20036

Dear Mr. Hecker

I am writing in response to your recent letter on behalf of the Arkansas Wildlife Federation regarding NPDES permit compliance at ICI's North Little Rock, Arkansas, plant. ICI has had a plan and implementation process underway since November of 1990. A process that has already generated significant permit requirements. This is also to advise you that ICI has entered into a Consent Administrative Order with the State of Arkansas as of April 1991 which covers the NPDES permit violations referenced in your initial letter. The State of Arkansas has reviewed and accepted ICI's already in place plan to correct compliance problems. ICI's goal is to achieve 100% compliance by the end of 1991.

For information purposes, set forth below is detailed information regarding the NPDES permit at ICI's plant and ICI's plan to address the compliance issues and actions to date.

On November 1, 1988, the State of Arkansas issued NPDES permit AR0042901 authorizing ICI to discharge stormwater runoff from its property into an unnamed tributary of the West Branch of Dark Hollow Canal. Due to the intermittent and unpredictable nature of storms, it has been difficult to characterize the discharge and to identify the source(s) of contamination on ICI's large drainage area, including stormwater "run-on" from the adjacent non-ICI property. If the discharge were treated process wastewater, the task of wastewater characterization and source identification would be much easier.

ICI has developed and implemented a multi-step action plan to address the compliance issues surrounding NPDES permit AR0042901. Enclosed is a copy of a memorandum prepared by Mr. Larry Lapple, Director of Production for ICI's Agricultural Products Group, dated October 29,1990, describing our course of action. The plan was implemented on November 1, 1990. We have since completed many of the action items listed in the plan. Others are well underway.

We have seen positive results since the initiation of this action plan. For example, we have achieved our goal of eliminating COD noncompliance events and have not exceeded permit limits for COD during the last six (6) months.

We have recently entered into a Consent Administrative Order (CAO) with the State of Arkansas (copy enclosed) regarding our NPDES permit. Enclosed is a letter to Mr. Mark Bradley, Enforcement Engineer with the Arkansas Department of Pollution Control and Ecology (ADPC&E), NPDES Enforcement Section, dated April 22, 1991, describing our commitment to comply with the terms and conditions of NPDES permit AR0042901 by the end of 1991.

Set forth below is detailed information describing our compliance efforts and progress to date:

1. Source Identification. In addition to collection of routine NPDES permit samples, samples were collected from the areas that discharge stormwater runoff to outfall 001 (all tank farm discharge points) and outfall 001. Samples were collected during discharge and analyzed for contaminants that would likely be contributing to NPDES non-compliance events. The purpose of this action step was to determine 1) what contaminants, if any, exist in stormwater runoff discharging to outfall 001, 2) the source of the contaminants, and 3) any correlation that might exist between the contaminants and non-compliance events.

Status. The initial phase of this action step has been completed. Trace amounts of products/raw materials stored in and transported through the tank farms were found in stormwater runoff accumulated in the tank farms dikes. A correlation has been established between products/raw materials contamination and COD. We have also found trace amounts of zinc contamination in the tank farm areas sufficient to cause zinc excursions in outfall 001.

Follow-up samples will be collected at the completion of each phase of action step 3 of the action plan (engineering changes) to determine progress made in eliminating contaminants.

Follow-up sampling will include collecting samples from all areas sampled in the initial phase of this action step. Samples will be analyzed for COD, products/raw materials, and zinc.

COD

We have achieved one of our initial goals by reducing COD non-compliance events. There have been no exceptions in the last six months. The last event (January 28, 1991) was early on in our program.

Efforts have refocused on the remaining components generating exceptions; namely, zinc and total suspended solids (TSS).

Zinc

None of our processes, raw materials, or finished products use or contain zinc. We suspect the source of zinc contamination to be galvanized sheet metal used in our buildings and the externally galvanized piping used in our plant. We have painted portions of our building siding and are also replacing galvanized piping with stainless steel or painted carbon steel piping. It is anticipated that this will resolve the zinc exceptions.

TSS

TSS non-compliance events have been difficult to control due to the nature of the outfalls. Sampling sites for the outfalls are in open earthen ditches surrounded by vegetation. Stormwater runoff flow usually causes some turbidity problems. The standard is more appropriate for concrete lined outfall and waterways. They are not subject to disturbed earth contributing to TSS.

We are in the process of converting outfall 001 to a concrete channel with a flume at the end. We are confident that this will reduce turbidity problems and assist in meeting compliance limits.

2. Involvement by all plant personnel. We have conducted three meetings with all plant personnel (November, 1990, February and July 1991) to discuss our NPDES permit compliance project and our progress toward improved compliance. The meetings serve to reinforce strict housekeeping procedures.

We plan to continue meetings on at least a quarterly basis as the project progresses. This action step has kept plant personnel informed of the program and has enlisted their active participation in achieving compliance.

3. Engineering Changes. This action step is broken down into four phases.

Phase I consists of the addition of several new tanks (two 15,000 gallon formulation mix, two 25,000 gallon storage-formulation mix, and four 10,000 gallon storage tanks). These tanks are in tank farms ("400" & "500") discharging stormwater into outfall 001. I informed the NPDES Section ADPC&E of these additions in a letter dated October 18, 1990.

This phase has been installed using leak prevent, pressure relief tank valves and non-threaded, welded joint stainless steel or carbon steel piping (no galvanized piping). All pumps are being placed in enclosed areas for capture and

disposal of any leaks.

Phase I has been completed and operational. The total cost of Phase I was approximately $200,000. Its completion was necessary before proceeding to Phase II and III.

Phase II will consist of the following changes to the "100" and "200" tank farms:

a) Remove all pumps from inside the tank farms and place them on raised curbed platforms in a central area outside the tank farms. Pumps will be replaced with new mechanically sealed pumps or existing pumps will be equipped with new mechanical seals. This will prevent the possibility of pump leakage from occurring in the tank farms. It will also prevent leakage at the new pump sites as well as provide an easy to clean area in the event of a leak.

b) Replace all threaded piping with welded joint carbon or stainless steel piping. This will eliminate leaks from threaded joints. No galvanized piping will be used.

c) Remove all hose connections inside tank farms and replace with a welded pipe manifold. Any truck or rail car unloading hose connections remaining will be fitted with dry disconnects.

This will eliminate leaks from hose connections in and around the tank farms.

This phase is 40% complete. Completion target date is September 30, 1991. Estimated cost of the completed phase will be $47,000.

Phase III will consist of performing Phase II changes in the "300" tank farm area. Capital funding has been approved for this phase. Completion target date is September 30, 1991. Estimated cost of the completed phase will be $18,000.

Phase IV will consist of constructing roofs over products/raw material loading and unloading areas adjacent to liquid production and tank farm areas. This will prevent stormwater runoff from coming in contact with any small leaks on the concrete, thus preventing washdown into the outfall. Completion target date is October 31, 1991. Estimated cost of the completed phase is $155,000.

In addition to phases I through IV, we have constructed a concrete containment pad in the truck bulk loading and unloading area adjacent to the tank farm area. This area discharges to outfall 001. In the unlikely event of a bulk truck spill, we would easily be able to contain the entire contents of the truck until the spill could be cleaned up.

It also makes it easier to properly cleanup small spills that might occur in this area. This was completed at a cost of $15,000.

In order to minimize stormwater contact with galvanized surfaces, exposed galvanized sheet metal surfaces have been painted. If this does not prove to be effective in reducing zinc contamination to acceptable levels, we will also paint all exposed galvanized piping (we are replacing this piping with stainless or painted carbon steel piping as mentioned above). Cost of painting the sheet metal was approximately $600.

Estimated total cost of the completed engineering changes will be $435,000.

As each phase is completed, more sample data (refer to Action Step 1) will be collected to evaluate the progress of that phase toward improving compliance.

4. Treatment. This hopefully will not be necessary. We are, however, investigating water treatment as an option if phases I, II, & III of step (2) fail to achieve compliance. An activated carbon treatment system seems to be the most effective and practical means of treatment for our situation. This is not desired since it generates contaminated carbon, requiring disposal. Our tact has been to prevent, not treat.

5. Inspection Program. In addition to the above action steps, a weekly tank farm inspection is being conducted. The inspection is conducted by maintenance personnel. It is designed to check for leaking tanks, pumps, piping, and valves as well as housekeeping problems that might contribute to stormwater runoff contamination.

6. Proactive Approach - Regulatory Agency. We are keeping the Arkansas Dept. of Pollution Control & Ecology informed of the progress of this project.

On March 5, 1991, the plant manager and I met with two representatives of the Enforcement Section of the NPDES Section of ADPC&E, Mark Bradley and Joe Williford, to discuss events surrounding our NPDES permit. During the meeting, we presented a copy of our NPDES compliance project action plan and discussed each action step stated in the plan.

It was recognized that our project plan was well under way and met the objectives to move to complete compliance. Following the meeting on April 3, 1991, the previously mentioned CAO was issued to our plant for approval.

On April 8, 1991, I met with Mark Bradley, ADPC&E, to clarify the terms of the CAO as they pertained to our compliance project time table. Our NPDES compliance project objective is

to achieve 100% compliance within the 1991 calendar year (refer to the enclosed letter to Mark Bradley dated April 22, 1991).

The final draft of CAO 91-074 was issued to our plant on April 16, 1991 (enclosed).

The NPDES compliance project also addresses outfalls 002 and 003. Since the primary source of plant stormwater runoff contamination originates in the areas in and around the tank farms and the liquid production unit, that is the area of focus for the project.

In summary, our goal has been to achieve 100% compliance with our NPDES Permit. We have developed a plan and had progressed its implementation well in advance of any external intervention. We have been successful with COD, having consistently met limits for the last six months. The plan is fully expected to achieve satisfactory results for zinc and TSS within the time frame outlined. The Arkansas Department of Pollution Control and Ecology have reviewed and accepted our plan. They will monitor our progress.

We feel that any external distraction such as a civil suit will provide no additional incentive to an already in place plan and in fact will only dilute efforts and resources toward completing our plan. We would hope that your firm and the Arkansas Wildlife Federation, will recognize our progress, our positive intentions, and select a course of action consistent with our mutual goal of environmental compliance and ownership.

If you have any questions or comments please contact me.

Sincerely,

R. Hayes Baber

R. Hayes Baber

cc: S. Ledbetter
L. C. Lapple
P. L. Whisenant
E. K. Schuster
I. Wheeler
J. S. MacNeal
K. J. Herrold

REFERENCE 19

NPDES COMPLIANCE PROJECT ACTION PLAN
STATUS REPORT

July 17, 1991

On November 1, 1990, a NPDES compliance project was initiated by the ICI Americas, Inc. North Little Rock plant. The purpose of the project is to address and eliminate our NPDES permit non-compliance events. Our NPDES permit is for stormwater runoff only. No process water is released from our plant.

The following is a progress report on the project action plan. We have made progress in improving NPDES permit compliance since initiating the project. Our deadline for 100% compliance is December 31, 1991. This is in accordance with a consent order issued to us by the Arkansas Department of Pollution Control and Ecology on April 3, 1991.

1. Source Identification. The initial phase of this action step has been completed. We have expanded this to include source identification of zinc contamination. Follow-up sampling necessary to track the progress of action step (3), engineering changes, will be resumed this month.

Follow-up sampling will include collecting samples from all areas sampled in the initial phase of this action step. Samples will be analyzed for COD, zinc, and pesticides.

We have achieved one of our initial goals by reducing COD non-compliance episodes (the last one occurred in January, 1991). We have, however, had problems with zinc and total suspended solids (TSS) non-compliance events. We suspect that increased frequency of zinc non-compliance events is caused by contamination from galvanized sheet metal used in construction of an addition to the existing liquid production unit building. This construction took place in late 1990 as part of phase I of the engineering changes for the NPDES compliance project. It houses formulation pumps, lines, and manifolds. Its purpose is to eliminate stormwater from coming in contact with areas where leaks or spills could possibly occur.

We are in the process of painting all exposed galvanized surfaces.

TSS non-compliance events have been difficult for us to control due to the nature of the sampling sites for outfalls 001 and 003. Samples sites for these outfalls are in open earthen ditches surrounded by vegetation. Stormwater runoff flow usually causes some turbidity.

We are in the process of converting the outfall 001 ditch to a concrete channel with a flume at the end. We are confident that this will reduce turbidity and bring us into compliance for TSS.

2. TOWN MEETINGS. We have held three meetings with all plant employees (November,1990, and February and April, 1991) to discuss our NPDES permit compliance project and our progress toward improved compliance.

Another such meeting will be held on July 19, 1991.

3. ENGINEERING CHANGES. This action step is broken down into four phases. The engineering changes outlined in this action step will significantly reduce sources of stormwater runoff contamination from process equipment, tanks, and piping.

Phase I is complete and operational. Approximate cost of phase one was $200,000.

Phase II is 40% complete. Completion target is September 30, 1991. Cost of the completed phase will be approximately $47,000.

Phase III is 0% complete. Completion target is September 30, 1991. Cost of the completed phase will be approximately $18,000.

Phase IV is 0% complete. A capital expenditure proposal will be submitted for approval by the end of July,1991. This phase is targeted for completion by October 31, 1991. Estimated cost of the completed phase is $155,000.

In addition to phases I through IV, we have constructed a concrete containment pad in the truck bulk loading and unloading area at the west end of the area draining to outfall 001. In the unlikely event of a bulk truck spill, we would easily be able to contain the entire contents of the truck until the spill could be cleaned up. It also makes it much easier to properly clean up small spills that might occur in this area. This is 100% completed at a cost of approximately $15,000.

In order to minimize stormwater contact with galvanized surfaces, all exposed galvanized metal surfaces are being painted. This is 50% complete. Cost of the completed task will be approximately $600.

Total cost of the completed engineering changes action step will be approximately $435,000.

5. TREATMENT. We hope that treatment will not be necessary. It is being investigated as an option if we fail to achieve compliance through other means.

6. PROACTIVE APPROACH - REGULATORY AGENCY. We are keeping the Arkansas Department of Pollution Control and Ecology (ADPC&E) informed on the progress of the project.

On March 5, 1991, the plant manager and I met with two representatives of ADPC&E, Mark Bradley, Inspection Engineer for the NPDES Enforcement Section, and Joe Williford, Supervisor, NPDES

Enforcement Section. The purpose of the meeting was to discuss enforcement actions to be taken against our plant for NPDES permit non-compliance. We presented a copy of our NPDES compliance project action plan and discussed each action step stated in the plan.

On April 3, 1991, a Consent Administrative Order was issued to the ICI Americas, Inc. North Little Rock site for NPDES permit AR0042901.

On April 8, 1991, I met with Mark Bradley, ADPC&E, to clarify the terms of the consent order in reference to the our compliance project time table. Our NPDES compliance project objective is to achieve 100% compliance within the 1991 calendar year.

In addition, we are conducting weekly NPDES inspections to find and eliminate any and all sources of contamination that might contribute to non-compliance events.

R. Hayes Baber

REFERENCE 20

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501) 562-7444
FAX: (501) 562-4632

September 12, 1991

Mr. R. Hayes Baber
ICI Americas, Inc.
North Little Rock Plant
P.O. Box 188
North Little Rock, Arkansas 72115

Re: CSN: 60-0378 Permit Number: 1030-A

Dear Mr. Baber:

On September 6, 1991, I performed a routine inspection of your facility pursuant to the State Implementation Plan; the Arkansas Air Pollution Control Code and the regulations promulgated thereunder. The inspection revealed that you are in compliance with your permit, at this time.

If I can be of any assistance, feel free to contact me at 501/337-0776.

Sincerely,

Sam McCullen
for
Hank Wright
Inspector, Air Division

HW/pms

S.K.M.

ARKANSAS AIR INSPECTION FORM

CSN 600378 PERMIT NO 1030-A
Media:Air Sort:Compliance

Date of Inspection 6 SEPT. 91 Time In 12:55p.m Time Out 2:45p.m

Company Name ICI Americas

Address 824 E. 12th Street

Mailing Address (if different) P.O. Box 188
North Little Rock, AR 72115

Company Personnel	Name	Title	Phone
Plant Manager/Officer	Irvin Wheeler	Plt. Manager	374-7445
Environmental Manager	Hayes Baber	Quality Control Sup.	374-7445
Personnel Contacted	Hayes Baber	Quality Control Sup	374-7445

Type of Inspection (circle): SIP, NSPS, PSD, NESHAP, Complaint

NSPS Applicable Subpart Kb Required to keep records? Yes/No

If yes, what records? refer to "Specific Conditions" of permit 1030-A

SIP Permit Number(s) 1030-A

PSD Permit Number(s) N/A

Which additional sections are applicable for this inspection:

Continuous Emissions Monitors
Fossil Fuel Fired Boiler
Coal Preparation Plant
Asphalt Plant
Incinerator
VOC Storage ✓
Kraft Pulp Mill
Other

What sources or emission points at the facility are subject to NSPS?

TANKS - 201, 202, 203, 204, 205, 206, 207, 208, 101, 102, 104, 105

What sources or emission points at the facility are subject to PSD?

N/A

What sources or emission points at the facility are subject to SIP?

All tanks listed except Wastewater Storage #1 & #2 and above ground gasoline also SN-01 thru SN-08

Plant location: Commercial Residential Industrial

Operational Schedule: 8 hours/day 5 days/week 50 weeks/year

Production Rate: this date- granular) 200,000 lbs/day liquid 10,000 gal/day vapam 2,500 gals/day ~~2,500~~

max design- 250,000 lbs/day 300,000 lbs/day 15,000 gal/day 3,000 gal/day

Maintenance of Control Equipment:

Does facility maintain a program for control equipment? Yes/No

How often is control equipment checked and by whom?

Hayes Baber daily

Are records kept on maintenance of control equipment? Yes/No
If yes, ask to see records. N/A

Upsets: Have there been any upsets within the last three months which caused emissions above the allowable limits or odors to escape into the ambient air? Yes/No Was upset reported to ADPC&E? ~~Yes/No~~ N/A

Have there been any changes or modifications in plant's process or operation since the last air inspection? Yes/No
If yes, list and describe in comments section.
New permit issued & 500 tank farm constructed per letter to Alan Sharr dated 10/18/90

Are there any uncontrolled sources located at the facility? Yes/No

If yes, list sources.

ESP PARAMETERS: N/A

Manufacture_____

Type_____% Efficiency_____%

Design Sulfur Range_____% Design Ash Content_____%

Design Heating Value_____% No. Fields_____ No. T-R Sets_____

Fly Ash: Total Collected_____tons/year
Disposal Method_____

Bottom Ash: Total Collected_____tons/year
Disposal Method_____

T-R	Primary		Secondary		Spark Rate
Set No.	Amps	Volts	Amps	Volts	Sparks/Min

If additional space needed use back of this page.

WET SCRUBBER: N/A

Does the source measure the water flow going to the scrubber (injection) or after it has left the scrubber (discharge)? Or not measured? Circle one

If Venturi scrubber is used, what is the throat control setting?_____

Scrubber Discharge Color_____ Is oil present? Yes/No

Is water turbid? Yes/No Is water recycled? Yes/No

What is scrubber water discharged into? Pond, Stream, River, Ditch, Sewer

INSPECTOR COMMENTS, EXPLANATIONS, SUMMARY:

The inspection was conducted on September 6, 1991, to determine compliance with the State Implementation Plan (SIP), New Source Performance Standards (NSPS) Arkansas Air Pollution Control Code (Code) and permitted conditions. Upon arrival at the facility I met Hayes Baber, Quality Control Supv., to gather administrative information and discuss any modifications made at the facility.

All records were checked that are required in the "Specific Conditions" section of permit #1030-A. All records are being kept with no problems noted during the review. During this portion of the inspection Mr Baber produced letter dated Oct. 18, 1990, to Alan Shar, Air Division Engineer, discussing additional tanks. Two (2) 15,000 gallon mix tanks and two (2) 25,000 gallon ~~the~~ storage tanks to the existing 400 tank farm. Also the 500 tank farm will contain four (4) 10,000 gallon storage tanks.

The next process was to conduct the field portion of the inspection. We started in the granular herbicide production area were SV-01 is located that has

Compliance Status (In, Out, Ukn, N/A) IN Air Code IN SIP IN NSPS N/A PSD N/A NESHAP

Next Inspection Date

Inspector's Signature Frank Wright

Continuation of 600378 (CSN or FN) ____ (PPR) 91-9-6 (Yr, Mo, Day)

two baghouses and two Carbon absorber. At the time of inspection this source was not in production thus no emissions. No other source ~~at~~ at the facility has any control equipment. The number of tanks at the facility matches map submitted to Alan Shar dated Oct. 18, 1990.

I told Mr. Baker that I would check with Alan Shar, and my supervisors concerning compliance status. After talking with Alan Shar, Sam McMullen, and Jim McClenbar it was decided the facility is in compliance. The amount of VOC's emitted from additional tanks was minimal so Mr. Baker was informed to include all changes when they proceed with the proposed permit modification.

Compliance Status IN

Signature [signature]

REFERENCE 21

Agricultural Products

RECEIVED
FEB 25 1992

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

HAND DELIVERED

February 24, 1992

Ms. Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution Control & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

NPDES COMPLIANCE FILES
NPDES # 42901
DMR'S
NCR
CORRESPONDENCE
CRAS

Re: NPDES permit no. AR0042901

Dear Ms. Johnson:

This is a notification of non-compliance with our NPDES permit during January, 1992. The non-compliance occurred as follows:

Date	Outfall	Parameter	Sample Value	Limit
01-03-92	001	zinc	0.45 mg/l	0.30 mg/l
01-08-92	001	zinc	1.78 mg/l	0.30 mg/l
01-08-92	001	COD	83.7 mg/l	75.0 mg/l
01-14-92	001	zinc	0.42 mg/l	0.30 mg/l

Based on our meeting with Randy Oberlag and Joe Williford on December 23, 1991 and the subsequent amendment to CAO 91-074 extending our compliance deadline, we have begun an investigation of the source of the zinc contamination. Analytical data from samples collected in various plant areas, indicate that the source of zinc contamination in outfall 001 is the roofs over our existing and new buildings.

Construction of the new buildings was completed in December as a part of our NPDES compliance project in order to cover areas most likely to contribute to stormwater contamination in outfall 001. The construction contractors assured us on more than one occasion that the construction materials did not contain zinc. We have recently discovered that the weatherproofing coating on the roofs of the new buildings contains zinc. Roofs on many of our existing buildings are galvanized (coated with zinc to reduce corrosion). Some of these roofs are coated with a non-zinc sealer. We plan to continue to collect more stormwater samples from plant areas and structures to confirm our findings. However, we have not had sufficient rainfall in January and February to collect enough

samples to create a substantial database.

There is no zinc present in any of our finished products or raw materials. We do not manufacture or use zinc in any plant process.

We suspect that the COD non-compliance was caused by a residual oil layer on the roofs of the new buildings. This oil layer was created during the manufacture of the roofs. The oil and grease value for the stormwater collected that day is sightly higher than normal. We do not anticipate this to be a continuing problem.

On February 14, 1992, Jim Goodhart (Chisenhall, Nestrud, and Julian, P.A.) and I met with Marysia Jastzebski and Randy Oberlag (NPDES Branch) to discuss ICI's zinc non-compliance situation. We discussed strategies for resolving the problem. We conveyed our intent that the buildings were constructed to eliminate non-compliance and we did not anticipate that they would create a source of zinc contamination.

We are working hard to further evaluate these non-compliance events so that we may eliminate their cause. FTN Associates LTD, water resource consultants, are being retained to assist us in resolving this unexpected compliance setback.

We are currently operating under a Consent Administrative Order (#91-074) that addresses NPDES permit violations and corrective actions being taken to achieve compliance.

If you have questions concerning this matter, please contact me. Thank you.

Sincerely,

R. Hayes Baber

R. Hayes Baber

cc: I. Wheeler

Agricultural Products

RECEIVED
JAN 27 1992

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

HAND DELIVERED

January 24, 1992

Ms. Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution Control & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

NPDES COMPLIANCE FILES
NPDES # 42901
..... DMR'S
..... NCR
..... CORRESPONDENCE
..... CRAS

Re: NPDES permit no. AR0042901

Dear Ms. Johnson:

This is a notification of non-compliance with our NPDES permit during December, 1991. The non-compliance occurred as follows:

Date	Outfall	Parameter	Sample Value	Limit
12-12-91	001	zinc	0.33 mg/l	0.30 mg/l
12-23-91	001	zinc	0.37 mg/l	0.30 mg/l
12-02-91	002	TSS	70 mg/l	50 mg/l

There is no zinc present in any of our finished products or raw materials. The zinc non-compliance has to be a result of stormwater contamination from the galvanized roofing and piping in the plant or an unknown source. We do not manufacture or use zinc in any plant process.

On December 30, 1991, we received an extension of our NPDES compliance schedule through an amendment to our Consent Administrative Order (LIS 91-074-002). This was issued to allow us to evaluate the effectiveness of our NPDES Compliance Project. We are still experiencing problems with zinc non-compliance. We have initiated an aggressive sampling campaign to determine the source(s) of our zinc contamination.

The total suspended solids (TSS) non-compliance event in outfall 002 was most likely caused by particulate matter picked up by stormwater runoff from the parking lot and lawn area draining to that outfall.

We are currently operating under a Consent Administrative Order (#91-074) that addresses past NPDES permit violations and

corrective actions being taken to achieve compliance.

If you have questions concerning this matter, please contact me. Thank you.

Sincerely,

R. Hayes Baber

cc: I. Wheeler

RECEIVED
JAN 27 1992

BIOMONITORING REPORT
ACUTE 24 HOUR TOXICITY TEST

PERMITTEE: ICI Americas
ADDRESS: 824 E. 12th & Cedar
North Little Rock, AR 72115
CONTACT: Hayes Baber

TEST FACILITY: ENTEK LABORATORIES, LITTLE ROCK, AR
ANALYST: PLD
LAB #: 91-8162
SAMPLE COLLECTED: 12/02/91 (0815)

OUTFALL: 001
NPDES #:

BEGIN: 1030 hrs 12/03/91
END: 1030 hrs 12/04/91

CONTROL WATER: Synthetic

TEST ORGANISM: Daphnia pulex
AGE - <24 hours old

Conc.	Rep.	# Live Organisms		# Dead Organisms		Mortality	Diss. Oxygen		pH		Alkalinity		Total Hardness	
%	#	0 hr.	24 hr.	0 hr.	24 hr.	Percent	0 hr.	24 hr.	0 hr.	24 hr.	0 hr.	24 hr.	0 hr.	24 hr.
0	1	10	10	0	0	0	9.0	8.6	7.99	8.25	70	70	98	100
	2	10	10	0	0	0								
100%	1	10	10	0	0	0	9.0	8.8	7.95	8.06	18	18	16	14
	2	10	10	0	0	0								

Report % MORTALITY to the COMMENTS SECTION of the DMR

Analyzed by: Pennye Derryberry
Biomonitoring Manager

RESULTS
The tested sample DOES NOT exhibit characteristics of toxicity.
LC - 50 for tested sample: N/A

QUALITY CONTROL
A standard reference toxicant was analyzed. Results were as follows:
LC-50 (True value) 6.5-20.5 ug/L
LC-50 (Analyzed value) 15.1 ug/L

All results meet acceptability criterion as established by the method.

Reviewed by: Ralph Vocque
Ralph Vocque
Laboratory Manager

METHOD OF ANALYSIS
EPA/600/4-85/013, March 1985, Methods for Measuring the Acute Toxicity of Effluents to freshwater and Marine Organisms, (Third Edition).

NO. LITTLE ROCK
DEC 13 1991
RECEIVED

RV/km

Entek Laboratory
11701 Interstate 30 • Bldg. 1 • Suite 108 • Little Rock, AR 72209 (501) 455-1316 P.O. Box 780 • Mabelvale, AR 72103

BIOMONITORING REPORT
ACUTE 24 HOUR TOXICITY TEST

PERMITTEE: ICI Americas
ADDRESS: 824 E. 12th & Cedar
North Little Rock, AR 72115
CONTACT: Hayes Baber

TEST FACILITY: ENTEK LABORATORIES, LITTLE ROCK, AR
ANALYST: PLD
LAB #: 91-8163
SAMPLE COLLECTED: 12/02/91 (0830)

OUTFALL: 002
NPDES #:

BEGIN: 1040 hrs 12/03/91
END: 1040 hrs 12/04/91

CONTROL WATER: Synthetic

TEST ORGANISM: Daphnia pulex
AGE - <24 hours old

Conc.	Rep.	# Live Organisms		# Dead Organisms		Mortality	Diss. Oxygen		pH		Alkalinity		Total Hardness	
%	#	0 hr.	24 hr.	0 hr.	24 hr.	Percent	0 hr.	24 hr.	0 hr.	24 hr.	0 hr.	24 hr.	0 hr.	24 hr.
0	1	10	10	0	0	0	9.0	8.6	7.99	8.25	70	70	98	100
	2	10	10	0	0	0								
100%	1	10	9	0	1	10	8.5	8.7	8.00	8.13	22	20	20	16
	2	10	10	0	0	0								

Report % MORTALITY to the COMMENTS SECTION of the DMR

Analyzed by: Pennye Derryberry
Biomonitoring Manager

RESULTS

The tested sample DOES NOT exhibit characteristics of toxicity.
LC - 50 for tested sample: N/A

QUALITY CONTROL

A standard reference toxicant was analyzed. Results were as follows:
LC-50 (True value) 6.5-20.5 ug/L
LC-50 (Analyzed value) 15.1 ug/L

All results meet acceptability criterion as established by the method.

Reviewed by: Ralph Vocque
Ralph Vocque
Laboratory Manager

METHOD OF ANALYSIS

EPA/600/4-85/013, March 1985, Methods for Measuring the Acute Toxicity of Effluents to freshwater and Marine Organisms, (Third Edition).

RV/km

BIOMONITORING REPORT
ACUTE 24 HOUR TOXICITY TEST

PERMITTEE: ICI Americas
ADDRESS: 824 E. 12th & Cedar
North Little Rock, AR 72115
CONTACT: Hayes Baber

TEST FACILITY: ENTEK LABORATORIES, LITTLE ROCK, AR
ANALYST: PLD
LAB #: 91-8164
SAMPLE COLLECTED: 12/02/91 (0845)

OUTFALL: 003
NPDES #:

BEGIN: 1050 Hrs 12/03/91
END: 1050 hrs 12/04/91

CONTROL WATER: Synthetic

TEST ORGANISM: Daphnia pulex
AGE - <24 hours old

Conc.	Rep.	# Live Organisms		# Dead Organisms		Mortality	Diss. Oxygen		pH		Alkalinity		Total Hardness	
%	#	0 hr.	24 hr.	0 hr.	24 hr.	Percent	0 hr.	24 hr.	0 hr.	24 hr.	0 hr.	24 hr.	0 hr.	24 hr.
0	1	10	10	0	0	0	9.0	8.6	7.99	8.25	70	70	98	100
	2	10	10	0	0	0								
100%	1	10	9	0	1	10	9.2	8.6	8.11	8.23	14	16	11	10
	2	10	10	0	0	0								

Report % MORTALITY to the COMMENTS SECTION of the DMR

Analyzed by: Pennye Derryberry
Biomonitoring Manager

RESULTS
The tested sample DOES NOT exhibit characteristics of toxicity.
LC - 50 for tested sample: N/A

QUALITY CONTROL
A standard reference toxicant was analyzed. Results were as follows:
LC-50 (True value) 6.5-20.5 ug/L
LC-50 (Analyzed value) 15.1 ug/L

All results meet acceptability criterion as established by the method.

Reviewed by: Ralph Vocque
Ralph Vocque
Laboratory Manager

METHOD OF ANALYSIS
EPA/600/4-85/013, March 1985, Methods for Measuring the Acute Toxicity of Effluents to freshwater and Marine Organisms, (Third Edition).

RV/km

AMERICAN INTERPLEX
CORPORATION
LABORATORIES

8600 Kanis Road
Little Rock, Arkansas 72204-2322
(501) 224-5060

NO. LITTLE ROCK
DEC 10 1991
RECEIVED

ICI Americas, Inc. (C-778)
Post Office Box 188
North Little Rock, AR 72115

December 9, 1991

ATTN: Mr. Hayes Baber

Control No. 5340

Description of Sample: Three (3) water samples received on 12/3/91
Re: ICP-NPDES

Results:

Parameter	Unit	120291-001 12/2/91 0815	120291-002 12/2/91 0830	120291-003 12/2/91 0845	Date/Time of Analysis	Analyst	Relative Percent Difference	% Recovery
COD	mg/l	23	23	34	12/4/91, 9:30 am	21	8.58	98.5
Total Suspended Solids	mg/l	2.5	~~70~~	4.8	12/5/91, 9:00 am	93	4.85/-5.41	-
Oil and Grease	mg/l	<1	<1	<1	12/5/91, 9:00 am	21	1.40	101/99.3
Total Phenolics	mg/l	<0.005	<0.005	<0.005	12/4/91, 8:45 am	127	-1.56	98.2
Total Recoverable Arsenic	mg/l	<0.001	0.0026	<0.001	12/3/91, 11:30 am	131	-4.13	78.3/81.6
Total Recoverable Zinc	mg/l	0.23	0.22	0.14	12/3/91, 11:00 am	61	-0.619	94.3

Method: EPA 420.1, 413.1, 160.2, 206.2, 200.7, HACH 8000 as approved in 40 CFR 136

AMERICAN INTERPLEX CORPORATION

CTG/td

By Charles T. Gosnell
Charles T. Gosnell
Laboratory Manager
Environmental Chemistry

Agricultural Products

RECEIVED
DEC 23 1991

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

CERTIFIED MAIL NO. P 880 768 428
RETURN RECEIPT REQUESTED

December 18, 1991

Ms. Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution Control & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Re: NPDES permit no. AR0042901

Dear Ms. Johnson:

This is a notification of a non-compliance with our NPDES permit limitation for zinc. The non-compliance event occurred in outfall 001 as follows:

Date	Parameter	Sample Value	Permit Limit
11-17-91	zinc	0.41 mg/l	0.30 mg/l

There is no zinc present in any of our finished products or raw materials. The zinc non-compliance has to be a result of stormwater contamination from the galvanized roofing and piping in the plant. We do not manufacture or use zinc in any plant process.

We plan to remove or paint all exposed galvanized surfaces before the end of the year. This is almost complete. This should eliminate zinc non-compliance events.

We are currently operating under a Consent Administrative Order (#91-074) that addresses past NPDES permit violations and corrective action being taken to achieve compliance.

If you have questions concerning this matter, please contact me. Thank you.

Sincerely,

R. Hayes Baber

cc: I. Wheeler

NPDES COMPLIANCE FILES
NPDES # 42901
___ DMR'S
✓ NCR
___ CORRESPONDENCE
___ CRAS

Agricultural Products

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

CERTIFIED MAIL NO. P 880 768 426
RETURN RECEIPT REQUESTED

RECEIVED 860 OCT 24 1991

October 21, 1991

Ms. Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution Control & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Re: NPDES permit no. AR0042901

Dear Ms. Johnson:

This is a notification of a non-compliance with our NPDES permit limitation for chemical oxygen demand (COD), oil and grease, and zinc. The non-compliance events occurred in outfall 001 as follows:

Date	Parameter	Value	Limit
9/4/91	oil and grease	44 mg/l	18 mg/l
9/11/91	COD	240 mg/l	75 mg/l
9/23/91	zinc	0.40 mg/l	0.30 mg/l
9/24/91	zinc	0.38 mg/l	0.30 mg/l

The oil and grease and the COD non-compliance events have been investigated. There is no apparent cause. We can only speculate that stormwater runoff contamination occurred during the piping changes being done as a part of our NPDES compliance project.

The zinc non-compliance has to be a result of stormwater contamination from the galvanized roofing and piping in the plant. We do not manufacture or use zinc in any plant process.

The engineering changes action step of our NPDES Compliance Project will be completed soon. We are taking every precaution to eliminate the possibility of stormwater runoff contamination during the piping changes. The last two samples collected during September were within our NPDES permit limits for all parameters.

NPDES COMPLIANCE FILES
NPDES # 42901
DMR'S
NCR
CORRESPONDENCE
CRAS

10

We plan to paint all exposed galvanized surfaces before the end of the year. This should eliminate zinc non-compliance events.

We are currently operating under a Consent Administrative Order (#91-074) that addresses past NPDES permit violations and corrective action being taken to achieve compliance.

If you have questions concerning this matter, please contact me. Thank you.

Sincerely,

R. Hayes Baber

cc: I. Wheeler
K. Herrold
L. Lapple
P. Whisenant

NPDES Section Copy RHB

Agricultural Products

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

CERTIFIED MAIL NO. P 880 768 426
RETURN RECEIPT REQUESTED

October 21, 1991

Ms. Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution Control & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

RECEIVED OCT 24 1991

Re: NPDES permit no. AR0042901

Dear Ms. Johnson:

This is a notification of a non-compliance with our NPDES permit limitation for chemical oxygen demand (COD), oil and grease, and zinc. The non-compliance events occurred in outfall 001 as follows:

Date	Parameter	Value	Limit
9/4/91	oil and grease	44 mg/l	18 mg/l
9/11/91	COD	240 mg/l	75 mg/l
9/23/91	zinc	0.40 mg/l	0.30 mg/l
9/24/91	zinc	0.38 mg/l	0.30 mg/l

The oil and grease and the COD non-compliance events have been investigated. There is no apparent cause. We can only speculate that stormwater runoff contamination occurred during the piping changes being done as a part of our NPDES compliance project.

The zinc non-compliance has to be a result of stormwater contamination from the galvanized roofing and piping in the plant. We do not manufacture or use zinc in any plant process.

The engineering changes action step of our NPDES Compliance Project will be completed soon. We are taking every precaution to eliminate the possibility of stormwater runoff contamination during the piping changes. The last two samples collected during September were within our NPDES permit limits for all parameters.

NPDES COMPLIANCE FILES
NPDES # 42901
..... DMR'S
✓ NCR
..... CORRESPONDENCE
CRAS

A business unit of ICI Americas Inc.

12

We plan to paint all exposed galvanized surfaces before the end of the year. This should eliminate zinc non-compliance events.

We are currently operating under a Consent Administrative Order (#91-074) that addresses past NPDES permit violations and corrective action being taken to achieve compliance.

If you have questions concerning this matter, please contact me. Thank you.

Sincerely,

R. Hayes Baber

cc: I. Wheeler
K. Herrold
L. Lapple
P. Whisenant

Agricultural Products

573
OCT 7 1991

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

CERTIFIED MAIL NO. P 880 768 424
RETURN RECEIPT REQUESTED

October 1, 1991

Ms. Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution Control & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Re: NPDES permit no. AR0042901

Dear Ms. Johnson:

This is a notification of a non-compliance with our NPDES permit limitation for COD. The sample in question was collected from outfall 001 on 9/11/91 and has an analytical value of 240 mg/l while the permit limitation is 75 mg/l.

Since that time, we have collected two more samples (9/23/91 & 9/24/91) and both were well within permit limits (both were 36 mg/l). Also, the sample collected just before the non-compliance event was well within permit limits (10 mg/l).

We have thoroughly investigated the probable causes of the non-compliance event. We suspect contamination from one of our raw materials. However, we are not certain how the contamination occurred nor what levels of contamination were involved. Our weekly inspection reports indicate that contamination sufficient to cause such a high COD level should not have occurred.

Our NPDES compliance project is well underway. The engineering changes in the project are being implemented and should be complete by November 30, 1991.

We are currently operating under a Consent Administrative Order (#91-074) that addresses past NPDES permit violations and corrective action being taken to achieve compliance.

If you have questions concerning this matter, please contact me. Thank you.

Sincerely,

R. Hayes Baber

R. Hayes Baber

NPDES # 42901
NCR
CRAS

A business unit of ICI Americas Inc.

14

cc: I. Wheeler
K. Herrold
L. Lapple
P. Whisenant

Agricultural Products

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

CERTIFIED MAIL NO. P 880 768 441
RETURN RECEIPT REQUESTED

September 18, 1991

Ms. Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution Control & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

RECEIVED
385
SEP 23 1991

Re: NPDES permit no. AR0042901

Dear Ms. Johnson:

This is a notification of an apparent non-compliance with our NPDES permit limitation for zinc. The sample in question has an analytical value of 0.34 mg/l while the permit limitation is 0.3 mg/l. It seems that this slightly greater value, only 0.04 above the permit limit, is negligible. Furthermore, a second sample taken on the same day (August 30, 1991) has an analytical value for zinc of 0.13 mg/l which is greatly below the permit limitation. The second sample was taken because the retention area filled up twice on August 30, 1991 as a result of heavy rainfall, thus requiring the discharge of accumulated stormwater on two separate occasions.

If these two "same day" sample values are averaged, the new value for zinc is 0.24 mg/l which is below the 0.3 mg/l permit limitation. As such, we feel that the stormwater discharge on August 30, 1991 was in compliance with the terms and conditions of the permit.

We are currently operating under a Consent Administrative Order (#91-074) that addresses past NPDES permit violations and corrective action being taken to achieve compliance.

If you have questions concerning this matter, please contact me. Thank you.

Sincerely,

R. Hayes Baber

R. Hayes Baber

COMPLIANCE ... # 42901
DWRS
CORRESPONDENCE
CRAS

A business unit of ICI Americas Inc.

16

Agricultural Products

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

RECEIVED JUL 25 1991

July 23, 1991

Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Dear Leda:

During the monitoring period from 06-01-91 through 06-30-91, we exceeded permit limits for outfall 001 for the following parameter:

PARAMETER	DATE	SAMPLE VALUE	LIMIT
Zinc	5-24-91	0.40 mg/l	0.3 mg/l

EXPLANATION: Exposed galvanized metal (siding and roof) used in recent construction are still contributing the zinc problem.

CORRECTIVE ACTION: We are in the process of painting all exposed galvanized surfaces. We are also in the process of replacing all galvanized piping with welded carbon steel and stainless steel piping. Both of these actions are included in our NPDES compliance project action plan.

We are continuing with our NPDES compliance project. I am sending a project status report to Mark Bradley with this mailing (copy attached).

Sincerely,

Irvin Wheeler
Plant Manager

NPDES COMPLIANCE FILES
NPDES # 42901
10
CORRESPONDENCE
FILE

A business unit of ICI Americas Inc.

17

Agricultural Products

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

RECEIVED JUN 26 1991

June 21, 1991

Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

42901

CRAS

Dear Leda:

During the monitoring period from 05-01-91 through 05-31-91, we exceeded permit limits for outfall 001 for the following parameters:

PARAMETER	DATE	SAMPLE VALUE	LIMIT
Zinc	5-24-91	0.35 mg/l	0.3 mg/l
Total Susp. Solids	5-29-91	65 mg/l	50 mg/l

EXPLANATION: During February, 1991, construction of a new liquid production and storage area was underway. Large amounts of galvanized sheet metal were used in the construction. We feel that this is still contributing to the zinc levels being above our permit limit.

The total suspended solids excursion can be attributed to the muddy condition of the open ditch where the sample is collected.

CORRECTIVE ACTION: Samples have been collected from all tank farm areas discharging to outfall 001 to determine the source of the zinc contamination. We have identified the areas of high zinc contamination. We are investigating methods to reduce zinc "bleed" from the galvanized sheet metal into stormwater runoff.

The turbidity problems in outfall 001 are difficult to control. The sample collection site is in an open earthen ditch which is often muddy and full of vegetative debris during a heavy rainfall. We are investigating ways to minimize turbidity in all three outfalls. One alternative being discussed is the construction of a concrete drainage channel to eliminate mud and vegetative debris as a source of turbidity.

We are continuing with our NPDES compliance project. A status

report of this project will be issued to Mark Bradley during July. I will send you a copy of the report.

Sincerely

Irvin Wheeler

Irvin Wheeler
Plant Manager

Agricultural Products

RECEIVED MAY 28 1991

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

May 17, 1991

Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Dear Leda:

During the monitoring period from 04-01-91 through 04-30-91, we exceeded permit limits for outfall 001 for the following parameters:

PARAMETER	DATE	SAMPLE VALUE	LIMIT
Zinc	4-4-91	0.38 mg/l	0.3 mg/l
Total Susp. Solids	4-12-91	80 mg/l	50 mg/l

EXPLANATION: During February, 1991, construction of a new liquid production and storage area was underway. Large amounts of galvanized sheet metal were used in the construction. We feel that this is the major source of our Zinc contamination throughout the month of March and April. The high zinc value of 0.38 mg/l occurred early in the month of April. The five samples collected after that were all under the permit limit.

The total suspended solids excursion can be attributed to the muddy condition of the open ditch where the sample is collected.

CORRECTIVE ACTION: We our investigating the exact source of the Zinc contamination. This source id study will be included in our NPDES compliance project. Samples were collected in various areas discharging stormwater runoff into outfall 001. So far, analytical results indicate that the more highly contaminated samples come from tank farms directly adjacent to the newly constructed galvanized steel structures. We are studying ways to reduce zinc contamination in these areas.

The turbidity problems in outfall 001 are difficult to control. The sample collection site is in an open earthen ditch which is often muddy and full of vegetative debris during a heavy rainfall. We are investigating ways to minimize turbidity in all three outfalls.

On November 1, 1990, we initiated a major NPDES compliance project

composed of several stages. On March 5, 1991, we met with Mark Bradley, Inspection Engineer II, and Joe Williford, Supervisor, NPDES Enforcement Section, ADPC&E, to discuss enforcement actions to be taken against our plant. We presented a copy of our NPDES compliance project plan and discussed each action step stated in the plan.

During March, I signed the written Consent Administrative Order (NPDES permit AR0042901) from ADPC&E outlining the enforcement action to be taken against our plant.

On April 8, 1991, Hayes Baber, plant Quality Control Supervisor, met with Mark Bradley to clarify the terms of the consent order in reference to further enforcement action during the implementation of our NPDES compliance project. The ICI Americas North Little Rock site NPDES compliance project plan objective is to achieve 100% NPDES permit compliance within the 1991 calendar year.

Sincerely,

Irvin Wheeler
Plant Manager

Agricultural Products

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
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RECEIVED APR 25 1991

April 22, 1991

Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

NPDES COMPLIANCE FILES
NOTES # 42901
DATE
NSB
CORRESPONDENCE
CRAS

Dear Leda:

During the monitoring period from 03-01-91 through 03-31-91, we exceeded permit limits for outfalls 001 for the following parameters:

PARAMETER	DATE	SAMPLE VALUE	LIMIT
Zinc	3-1-91	0.66 mg/l	0.3 mg/l
Zinc	3-19-91	0.40 mg/l	0.3 mg/l
Zinc	3-27-91	0.61 mg/l	0.3 mg/l
Total Phenols	3-1-91	0.66 mg/l	0.50 mg/l
Total Susp. Solids	3-19-91	58 mg/l	50 mg/l

EXPLANATION: During February, 1991, construction of a new liquid production and storage area has been underway. Large amounts of galvanized sheet metal were used in this construction. We feel that this is the major source of our Zinc contamination throughout the month of March.

We could not determine the source of phenol contamination.

The total suspended solids excursion can be attributed to the muddy condition of the open ditch where the sample is collected.

CORRECTIVE ACTION: We our investigating the exact source of the Zinc contamination. This source id study will be included in our NPDES compliance project. Samples were collected in various areas discharging stormwater runoff into outfall 001. So far, analytical results indicate that the more highly contaminated samples come from tank farms directly adjacent to the newly constructed galvanized steel structures. We are studying ways to reduce zinc contamination in these areas.

The turbidity problems in outfall 001 are difficult to control.

The sample collection site is in an open earthen ditch which is often muddy and full of vegetative debris during a heavy rainfall. We are investigating ways to minimize turbidity in all three outfalls.

Trace amounts of phenols are found in some of the emulsifiers stored in tank farms discharging to outfall 001. We have initiated a study to determine the source of this contamination. So far, analytical results from samples collected in tank farms discharging into outfall 001 indicate total phenol level well below NPDES permit maximum levels. We are still collecting source id samples.

On November 1, 1990, we initiated a major NPDES compliance project composed of several stages. On March 5, 1991, we met with Mark Bradley, Inspection Engineer II, and Joe Williford, Supervisor, NPDES Enforcement Section, ADPC&E, to discuss enforcement actions to be taken against our plant. We presented a copy of our NPDES compliance project plan and discussed each action step stated in the plan.

I attached a copy of this plan last month.

During March, I signed the written Consent Administrative Order (NPDES permit AR0042901) from ADPC&E outlining the enforcement action to be taken against our plant.

On April 8, 1991, Hayes Baber, plant Quality Control Supervisor, met with Mark Bradley to clarify the terms of the consent order in reference to further enforcement action during the implementation of our NPDES compliance project. The ICI Americas North Little Rock site NPDES compliance project plan objective is to achieve 100% NPDES permit compliance within the 1991 calendar year.

Sincerely

Irvin Wheeler

Irvin Wheeler
Plant Manager

Agricultural Products

NPDES COMPLIANCE FILE
NPDES # 42901
DMR'S
NCR
CORRESPONDENCE
CRAS

RECEIVED
MAR 25 1991

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

March 22, 1991

Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Dear Leda:

During the monitoring period from 02-01-91 through 02-28-91, we exceeded permit limits for outfalls 001 for the following parameters:

PARAMETER	DATE	SAMPLE VALUE	LIMIT
Zinc	2-5-91	0.75 mg/l	0.3 mg/l
Zinc	2-19-91	0.36 mg/l	0.3 mg/l
Zinc	2-22-91	0.61 mg/l	0.3 mg/l
Total Susp. Solids	2-22-91	140 mg/l	50 mg/l

EXPLANATION: During February, 1991, construction of a new liquid production and storage area has been underway. Large amounts of galvanized sheet metal were used in this construction. We feel that this is the major source of our Zinc contamination.

The total suspended solids excursion can be attributed to the muddy condition of the open ditch where the sample is collected.

CORRECTIVE ACTION: We our investigating the exact source of the Zinc contamination. This source id study will be included in our NPDES compliance project.

The turbidity problems in outfall 001 are difficult to control. The sample collection site is in an open earthen ditch which is often muddy and full of vegetative debris during a heavy rainfall. We are investigating ways to minimize turbidity in all three outfalls.

On November 1, 1990, we initiated a major NPDES compliance project composed of several stages. On March 5, 1991, we met with Mark Bradley, Inspection Engineer II, and Joe Williford, Supervisor, NPDES Enforcement Section, ADPC&E, to discuss enforcement actions to be taken against our plant. We presented a copy of our NPDES compliance project plan and discussed each action step stated in the plan.

A copy of the plan is attached.

Sincerely

Irvin Wheeler

Irvin Wheeler
Plant Manager

Agricultural Products

RECEIVED
FEB 26 1991

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

February 22, 1991

Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Dear Leda:

During the monitoring periods from 01-01-91 through 01-31-91, we exceeded permit limits for outfalls 001 for the following parameters:

PARAMETER	DATE	SAMPLE VALUE	LIMIT
Zinc	1-3-91	0.52 mg/l	0.3 mg/l
COD	1-15-91	89 mg/l	75 mg/l
Total Susp. Solids	1-15-91	84 mg/l	50 mg/l

EXPLANATION: Much of our piping is galvanized steel. We feel that this is the primary source of zinc contamination. There is nothing else in our plant that would account for high zinc values.

The COD excursion was caused by contamination from a leaking pump seal. The leak was found during a routine maintenance inspection.

The total suspended solids excursion can be attributed to the muddy condition of the open ditch where the sample is collected.

CORRECTIVE ACTION: Galvanized piping is slowly being replaced with stainless steel piping. This is included in our NPDES compliance project. Stainless steel piping is expensive and the change out process will take some time.

We have repaired the faulty pump seal that was responsible for the contamination.

The turbidity problems in outfall 001 are difficult to control. The sample collection site is in an open earthen ditch which is often muddy and full of vegetative debris during a heavy rainfall.

On November 1, 1990, we initiated a major NPDES compliance project

composed of several stages. On March 5, 1991, we are to meet with Mark Bradley, Enforcement Engineer, NPDES Enforcement Section, ADPC&E, to discuss possible enforcement actions to be taken against our plant. We will present the details of our compliance project to Mr. Bradley at that time.

Sincerely

Irvin Wheeler

Irvin Wheeler
Plant Manager

Agricultural Products

JAN 25 1991

ICI Agricultural Products Group
North Little Rock Plant
824 E. 12th Street
P.O. Box 188
North Little Rock, AR 72115
Telephone (501) 374-7445
Fax (501) 374-2919

January , 1991

Leda F. Johnson
NPDES Enforcement Section
Arkansas Dept. of Pollution & Ecology
8001 National Drive, P.O. Box 8913
Little Rock, AR 72219-8913

Dear Leda:

During the monitoring periods from 10-01-90 through 12-31-90 and from 12-01-90 through 12-31-90, we exceeded permit limits for outfalls 001, 002, and 003 for the following parameters:

PARAMETER	DATE/OUTFALL	SAMPLE VALUE	LIMIT
Zinc	11-9-90/002	.58 mg/l	.3 mg/l
Zinc	11-9-90/003	.58 mg/l	.3 mg/l
Zinc	12-17-90/001	.44 mg/l	.3 mg/l
Zinc	12-18-90/001	.78 mg/l	.3 mg/l
Zinc	12-21-90/001	.41 mg/l	.3 mg/l

EXPLANATION: Much of our piping is galvanized steel. We feel that this is the primary source of zinc contamination. There is nothing else in our plant that would account for high zinc values.

CORRECTIVE ACTION: Galvanized piping is slowly being replaced with stainless steel piping. This is included in our NPDES compliance project. Stainless steel piping is expensive and the change out process will take some time.

We continue to work toward total compliance with our NPDES permit.

Sincerely

Irvin Wheeler

NPDES COMPLIANCE FILES
NPDES # 42901
DMR'S
NCR
CORRESPONDENCE
CRAS

REFERENCE 22

STATE OF ARKANSAS

Arkansas Geological Survey

GEORGE C. BRANNER

State Geologist

BULLETIN 3

Geology of the Arkansas Paleozoic Area

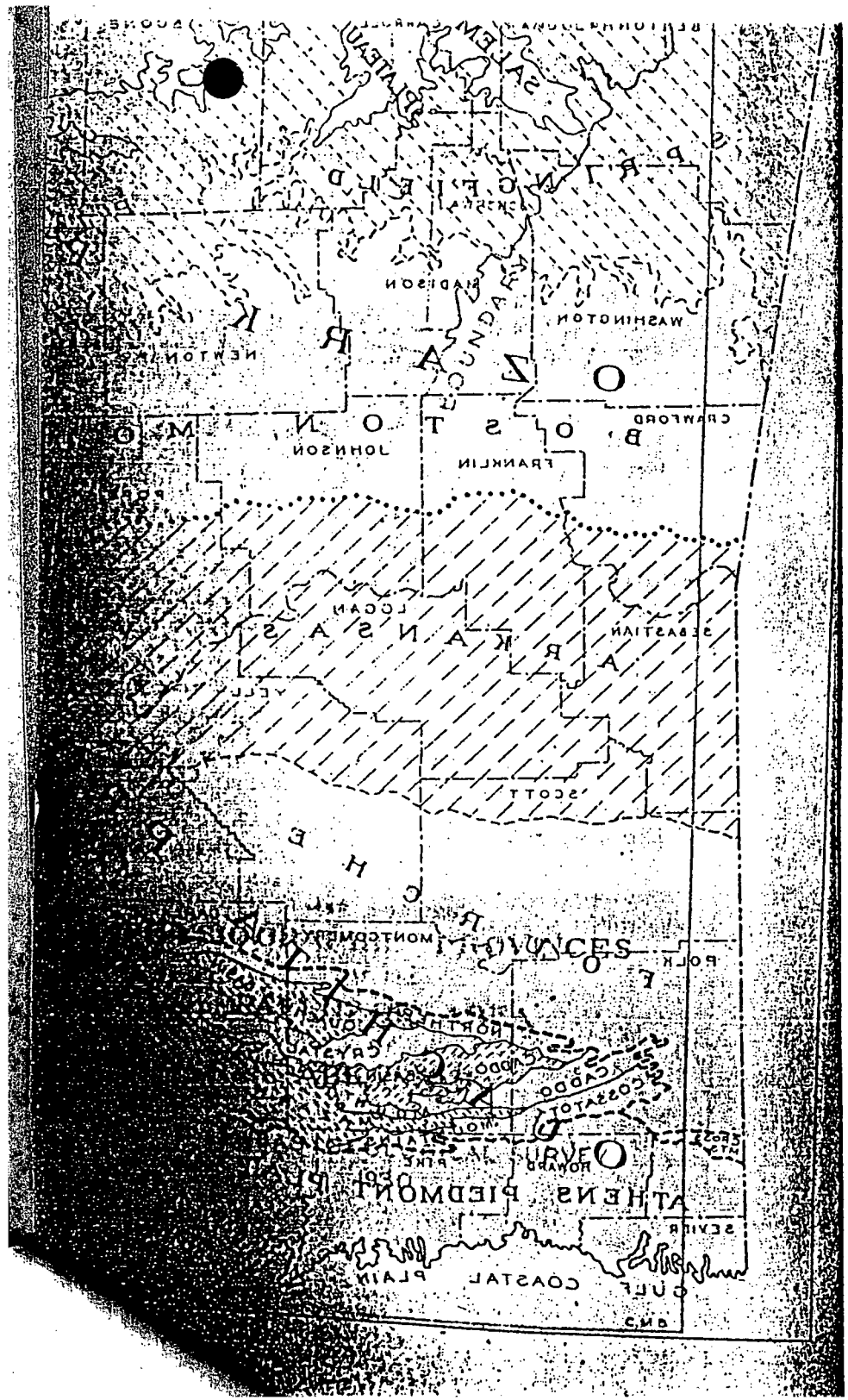
With Especial Reference to Oil and Gas Possibilities

By

CAREY CRONEIS

LITTLE ROCK

1930



PHYSIOGRAPHY OF THE PALEOZOIC AREA OF ARKANSAS

SUBDIVISIONS

Arkansas lies within two great physiographic provinces, whose boundary divides the State into nearly equal parts. The Interior Highland province includes that part of Arkansas which lies northwest of a line passing from a point on the Missouri boundary near the northeast corner of Randolph County southwestward through Little Rock to a point near Arkadelphia and thence nearly due west to the Oklahoma border. The Coastal Plain province includes that part of the State which lies southeast of the line described. The following table shows the subdivisions of the major provinces that have been recognized in Arkansas.

A. Coastal Plain:
  I. *Mississippi Alluvial Plain.*
  II. *West Gulf Coastal Plain.*
B. Interior Highlands:
  I. *Ozark Plateaus:*
    A. Salem Plateau.
    B. Springfield Plateau.
    C. Boston Mountains.
  II. *Ouachita Province:*
    A. Arkansas Valley.
    B. Ouachita Mountains.
      1. Fourche Mountains.
      2. Novaculite Uplift.
        a. Caddo Mountains
        b. Cossatot Mountains.
        c. Cross Mountains.
        d. Crystal Mountains.
        e. Northern Mountains.
        f. Trap Mountains.
        g. Zigzag Mountains.
        h. Caddo Basin.
        i. Mazarn Basin.
        j. Ouachita Basin.
        k. Saline Basin.
      3. Athens Piedmont Plateau.

As the Paleozoic area of Arkansas is coincident with its Interior Highland province, it is necessary only to mention the major features of the Coastal Plain of Arkansas in this report.

COASTAL PLAIN

The Coastal Plain of Arkansas, which occupies about 27,370 square miles, or about 52 per cent of the total area of the State, ranges in elevation from 100 to 700 feet above sea level. It is a southward-sloping plain whose western part is a rolling, slightly hilly country, most of whose surface stands at elevations of from 200 to 400 feet

above sea level. The eastern and northern parts of the Coastal Plain in Arkansas are somewhat more gently undulating than the rest of the plain and stand at heights of 100 to 300 feet. Crowley's Ridge, however, the most prominent topographic feature in northeastern Arkansas, rises above this plain. This ridge extends northward from Helena into Missouri and varies in width from 1 to 12 miles. Its crest reaches an elevation of about 400 feet near its southern end, but it rises gradually toward the north and is 500 feet above sea level in Clay County.

A narrow belt along the Mississippi River, which has the topographic features of old age, such as oxbow lakes, meandering streams, natural levees, and low relief, is called the Mississippi Alluvial Plain. The rest of the Coastal Plain of Arkansas is classed as the West Gulf Coastal Plain. Practically all the rocks of the Coastal Plain are of sedimentary origin, but a small body of igneous rocks lies near Benton, in Saline County; another crops out near Murfreesboro, in Pike County; and a third lies south of Little Rock, in Pulaski County. The sedimentary rocks of the Mississippi Alluvial Plain are all fine-grained clastic sediments of Quaternary age. Most of those of the West Gulf Coastal Plain are composed of clay, sandstone, marl, chalk, conglomerate, and lignite, and range in age from early Cretaceous to Quaternary. Most of the rocks of the Coastal Plain are poorly cemented, and none of the beds has been greatly deformed.

INTERIOR HIGHLAND

The Interior Highland province of Arkansas occupies about 25,155 square miles, or 48 per cent of the total area of the State. All the rocks exposed in this province except a few small mid-Cretaceous intrusions are of Paleozoic age, and they represent all the geologic systems from the Cambrian to the Carboniferous, inclusive. At some places these rocks have undergone great deformation; at others they still lie in essentially the attitude in which they were deposited. Some of these rocks, such as dolomite and novaculite, are very hard; others, such as shale and shaly sandstone, are readily weathered by erosion. As a consequence of these differences in structure and lithology in different parts of the Interior Highland, a number of diverse topographic features have been developed in the Paleozoic area. These various surface forms are the bases for the subdivisions of the Highland area that are shwn in outline on the accompanying map (Pl. III), and briefly described in the following pages.

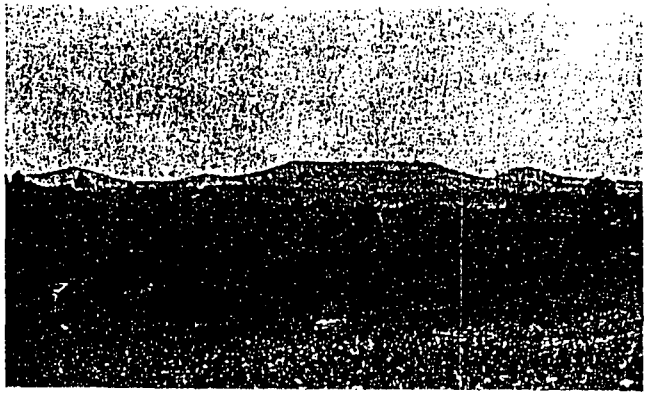
OZARK PLATEAUS

EXTENT AND SUBDIVISIONS

The Ozark area in northwestern and north-central Arkansas occupies a belt averaging 65 miles in width and extending from the Okla-

A. VIEW ACROSS WHITE RIVER BOTTOMS NEAR MONTE NE

The hills in the background are a part of the Eureka Springs escarpment. Their even-crested surface represents the level of the Springfield plateau. The Salem Plateau is here represented by the valley flats in the foreground.



B. THE BOAT MOUNTAIN GROUP SEEN LOOKING WEST FROM THE VICINITY OF WESTERN GROVE AT A DISTANCE OF ABOUT 6 MILES

These mountains stand as monadnocks on the undulating surface of the Springfield Plateau, seen in the foreground.

REFERENCE 23

Water Resources of *Pulaski and Saline Counties, Arkansas

By RAYMOND O. PLEBUCH *and* MARION S. HINES

CONTRIBUTIONS TO THE HYDROLOGY OF THE UNITED STATES

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1839-B

Prepared in cooperation with the Arkansas Geological Commission

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1967

UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

William T. Pecora, *Director*

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

CONTENTS

	Page
Abstract	B1
Introduction	1
Water resources	3
Water-supply possibilities in the Interior Highlands	6
Surface water and its quality	6
Ground water and its quality	10
Water-supply possibilities in the Coastal Plain	11
Surface water and its quality	11
Ground water and its quality	11
Conclusions	14
Selected references	15
Basic data	17

ILLUSTRATIONS

	Page
PLATE 1. Geohydrologic map of Pulaski and Saline Counties	In pocket
FIGURE 1. Index map of Arkansas showing area of report	B2
2. Diagrammatic sketch showing relationship of the rocks of the Coastal Plain to those of the Interior Highlands	5

TABLES

	Page
TABLE 1. Lithologic and water-bearing characteristics of the rocks in Pulaski and Saline Counties	B4
2. Frequency of low flows and duration of daily flows	6
3. Water-supply characteristics of tributary streams	8
4. Significance of dissolved mineral constituents and physical properties of natural waters	18
5. Chemical analyses of water from selected wells in Pulaski and Saline Counties	21

WATER RESOURCES OF PULASKI AND SALINE COUNTIES, ARKANSAS

By Raymond O. Plebuch and Marion S. Hines

ABSTRACT

Pulaski and Saline Counties constitute an area of 1,506 square miles in the geographic center of Arkansas. The area is divided into a hilly western part, known as the Interior Highlands, and a relatively flat eastern part, known as the Coastal Plain.

In the Interior Highlands, surface water offers greater possibilities than ground water for water supplies. Alum Fork, Middle Fork, and North Fork of the Saline River offer excellent impoundment possibilities and will yield water of good quality. In addition, with storage, many of the smaller streams are suitable for development of small supplies.

In contrast, in the Coastal Plain it is easier to develop ground water than surface water in relatively large quantities. Two aquifers, units 3 and 9, yield as much as 350 and 2,000 gallons per minute of water, respectively. A third aquifer, unit 7, is as yet relatively undeveloped in the project area, but yields 860 gallons per minute to a well south of the project area. These aquifers yield water that, with treatment, is suitable for most uses.

INTRODUCTION

This report is an appraisal of the water resources of Pulaski and Saline Counties, Ark. It provides information on the occurrence, availability, and chemical quality of surface and ground water in sufficient detail to identify, locate, and describe the best potential sources of water. The need for a study was made apparent by the increased number of requests for water information. The number of requests in Pulaski County was particularly great. This county, containing 13.6 percent of the State's inhabitants, is the most populous in Arkansas. The area is becoming highly industrialized, and water use is increasing rapidly. Average water use in the Little Rock metropolitan area increased from 23 to 29 million gallons per day between 1962 and 1965.

This study, which began in July 1962, was made by the Water Resources Division of the U.S. Geological Survey in cooperation with the Arkansas Geological Commission. The report is based not only on information obtained specifically for this investigation, but also

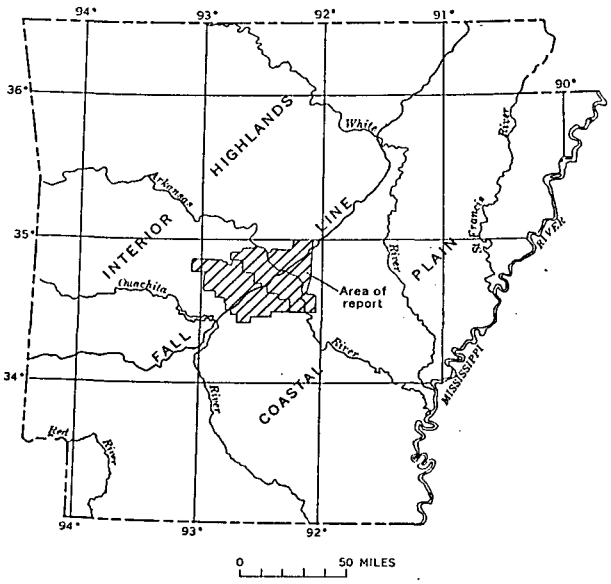


FIGURE 1.—Location of report area.

on data collected previously as part of the continuing program of water-resources studies in Arkansas. Previous geologic and hydrologic studies in the project area include a number of reports. (See list of references.)

Pulaski and Saline Counties, constituting an area of 1,506 square miles, lie in the geographic center of Arkansas (fig. 1). The project area is bordered on the north by Perry and Faulkner Counties, on the east by Lonoke County, on the south by Jefferson and Grant Counties, and on the west by Garland County. The area is drained primarily by the Arkansas and Saline Rivers and their tributaries. A few square miles in northeastern Pulaski County is drained by tributaries of the White River. This two-county area is divided physiographically into a hilly western part, known as the Interior Highlands, and a relatively flat eastern part, known as the Coastal Plain. About two-thirds of the area is in the Interior Highlands. Altitudes are lowest—less than 250 feet—in the Coastal Plain and highest—more than 1,000 feet—in the Interior Highlands.

The two physiographic divisions of the Pulaski-Saline County area are topographically distinct primarily because of geologic conditions. The Interior Highlands are underlain by consolidated rocks. In contrast, the Coastal Plain is underlain by a thick sequence of unconsolidated sediments, which dip gently to the southeast. In this report 10 geologic units have been differentiated—1 in the highlands and 9 in the Coastal Plain. The lithologic and water-bearing characteristics of these units and their vertical relationships are summarized in table 1 and figure 2. The distribution of the units is shown on the geohydrologic map (pl. 1). Persons interested in a more detailed discussion of the geology are referred to the list of references at the back of the report.

The most significant chemical constituents and physical properties of surface and ground water are discussed in the body of the report. More complete analyses of water from wells are listed in table 5. Wells listed in table 5 can be found on the geohydrologic map (pl. 1) by means of the well-location diagram on p. B20.

Quality-of-water requirements vary according to the user, particularly among industrial users. Comparison of data in the text and in table 5 with table 4, "Significance of dissolved mineral constituents and physical properties of natural waters," will be sufficient for some users. Those requiring more detailed information should refer to a publication by the California State Water Pollution Control Board (1952) entitled, "Water Quality Criteria."

WATER RESOURCES

The contrasting geologic conditions of the two topographically distinct divisions of the Pulaski-Saline County area have a definite effect on the water resources of the area. The consolidated rocks in the Interior Highlands have relatively low permeabilities, which limit the amount of ground water available and hinder its movement. The rocks are highly dissected, and the streams have steep gradients. Surface runoff, which averages 18 inches per year, is rapid and the streams crest and recede quickly, inhibiting flow of water from the streams to the ground-water reservoir. During high flow, water probably is held only temporarily in bank storage and released quickly to the streams at low stage. Perennial base flow occurs at only a few locations, and most of the tributaries cease to flow during periods of drought.

In contrast to the rocks of the Interior Highlands, the higher permeabilities of some of the Coastal Plain sediments favor the transmission of water, and greater amounts of ground water are available.

Relief in the Coastal Plain is slight, and streams are sluggish. There are many swampy areas in the eastern part of Pulaski County along the Arkansas River. Tributary streams are not sufficiently incised to in-

TABLE 1.—*Lithologic and water-bearing characteristics of the rocks in Pulaski and Saline Counties, Ark.*

Age	Lithologic unit	Thickness (feet)	Lithologic and water-bearing characteristics
Quaternary	9	0–120	Clay and silt grading downward into sand and gravel; in places bordered or underlain by terrace deposits consisting of dark-red clay and white sand. The basal sand and gravel unit yields from 300 to 2,000 gpm of water to wells.
Tertiary (includes Jackson?, Claiborne, Wilcox and Midway Groups)	8	350+	Gray, green, bluish, cream, and ocher silty clay interbedded with brown carbonaceous clay, thin lignite beds, and medium to coarse sand. Yields small quantities of water to domestic wells.
	7	207–412	Continental homogeneous tan or gray fine to medium sand containing layers and lenses of gray silty clay; locally contains a bed of dark-brown woody lignite at the base. Utilized only for domestic supplies in the report area. Well yields up to 860 gpm reported 12 miles south of Saline-Grant County line.
	6	0–450	Dark-chocolate-brown silty to sandy carbonaceous clay interlaminated with white micaceous sand and containing scattered lignite and siderite layers; grades upward into dark-brown medium to coarse sand. A large deposit of gravel and coarse sand in the lower part fringes the highlands. Well yields are unpredictable, and test drilling is advisable.
	5	0–347	Greenish- to bluish-gray silty clay and grayish-green fine sand alternate with lignite, black lignitic and brown carbonaceous clay, and hard layers of siderite. Bauxite deposits fringe the syenite hills. Not a good source of water because of lack of coarse materials.
	4A	?	Nature of materials unknown, but apparently too fine grained to yield more than 1 or 2 gpm to wells in Jacksonville area and south of Benton.
	4	0–450	Dark-bluish-gray to black silty clay containing layers of siderite. Varicolored clay occurs at the top in places. Does not yield water to wells.
	3	0–185	Greenish-gray and dark-gray clay, sandy in places, interbedded with marl, sandy glauconitic limestone, and calcareous sandstone. Well yields up to 350 gpm are obtainable from the limestone and sandstone.
Cretaceous	2		Light-gray or bluish igneous rocks containing pendants of altered older rocks. Does not yield water to wells.
Pennsylvanian to Ordovician	1	?	Sandstones, shales novaculite, and chert. Well yields normally are 10 gpm or less, although the highly shattered cherts have yielded up to 200 gpm in Garland County. Well yields are dependent on local conditions, and dry holes are common. Well depths normally are less than 150 feet.

tersect the water table, and therefore most streams that originate in the Coastal Plain cease to flow during extended dry periods.

The major sources of surface-water supplies in Pulaski and Saline Counties are the Arkansas and Saline Rivers. The average water-year flow of the Arkansas River at Little Rock (site 3, pl. 1) for the period 1927–63 was 41,550 cfs (cubic feet per second). The daily average flow exceeded this amount about one-third of the time but varied widely throughout the years and from year to year. The average annual flow reached a high of 84,780 cfs in 1945 and a low of 10,820 cfs in 1940. Peak flow of 536,000 cfs was recorded on May 27, 1943, and a minimum flow of 850 cfs was reached on Aug. 23, 1934. All aspects of water supply on the Arkansas River at Little Rock will

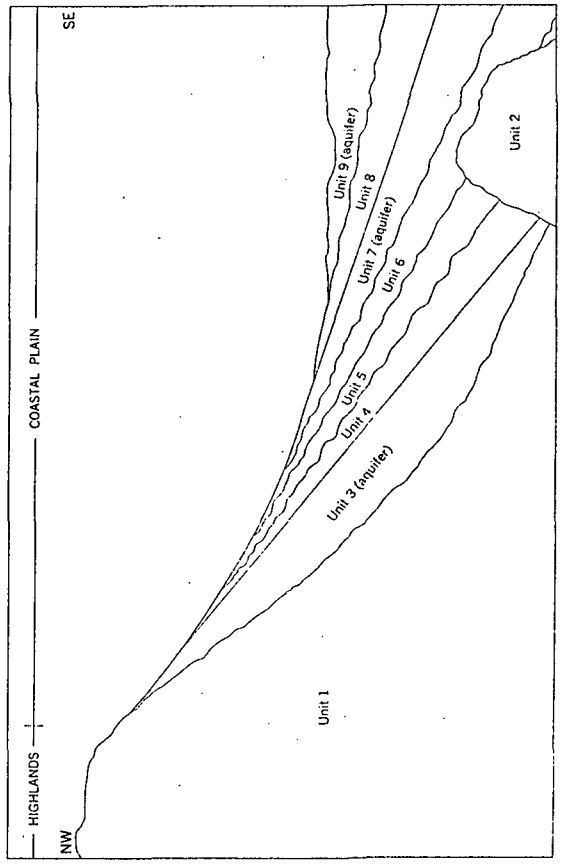


FIGURE 2.—Relationship of the rocks of the Coastal Plain to those of the Interior Highlands.

be improved as a result of the construction program now in progress (1965).

Streamflow in the Saline River at Benton (site 13, pl. 1) averaged 752 cfs for the period 1950–63. The daily average flow exceeded this amount about one-fourth the time. Peak flow reached 49,500 cfs on Dec. 4, 1952, and the stream ceased to flow for several days in 1954 and on Sept. 3, 1963, when the flow of the stream was diverted into the Benton water system. The highest average water-year flow was 1,212 cfs in 1957, and the lowest was 282 cfs in 1963.

WATER-SUPPLY POSSIBILITIES IN THE INTERIOR HIGHLANDS

SURFACE WATER AND ITS QUALITY

The water-supply potential of a stream is determined by the frequency with which streamflow recedes to minimal amounts (frequency distribution of annual low flows) and the length of time given flows are available (duration of daily flows). Minimum flows vary from time to time, from stream to stream, and between different points on the same stream. Statistical analyses of flow data are necessary to determine the dependable amount of water available. These statistical analyses of the magnitude and frequency of annual low flows and the duration of daily flows are presented for the Arkansas and Saline Rivers in table 2.

TABLE 2.—*Frequency of low flows and duration of daily flows*

Stream	Annual low flow (cfs), for indicated recurrence interval (years)					
	Period (days)	1.2	2	5	10	20
Arkansas River at Little Rock, Ark.	7	9,000	4,100	1,780	1,160	850
	15	9,700	4,350	1,880	1,210	920
	30	11,800	5,240	2,250	1,470	1,060
	60	16,700	7,000	2,800	1,820	1,380
	120	24,800	11,000	4,950	2,960	1,970
Saline River at Benton, Ark.	7	28	12	5.3	2.7	1.4
	15	34	15	6.8	3.6	1.9
	30	48	20	9.0	5.0	2.7
	60	75	28	11	6.9	4.5
	120	194	65	26	18	12

Stream	Daily flow (cfs), which was equaled or exceeded for indicated percentage of time								
	99	95	90	80	60	40	20	5	1
Arkansas River at Little Rock, Ark.	1,410	2,850	4,540	7,450	15,000	28,000	62,000	155,000	280,000
Saline River at Benton, Ark.	2.3	12	23	44	118	328	890	3,500	11,400

The minimum average flow for 7 consecutive days that is expected to occur once each 2 years (2-year recurrence interval) is considered to be a good index of the stream's low-flow character, and thus it is a measure of the stream's ability to meet a required water need.

This streamflow statistic is referred to as the 7-day, 2-year low flow. On the streams investigated in Pulaski and Saline Counties, the 7-day, 2-year low flow is available 90–95 percent of the time. For example, the 7-day, 2-year low flow of the Arkansas River at Little Rock is 4,100 cfs (table 2), and it will be equaled or exceeded more than 90 percent of the time.

Some water-supply studies are concerned with minimum average flows for several different periods of time and recurrence intervals. In addition, the complete range of daily-flow duration is useful for comparison of physical differences between streams. Therefore, average flows for arbitrary periods from 7 to 120 days with recurrence intervals from 1.2 to 20 years and selected flow-duration values from 1 to 95 percent are shown in table 2.

Upstream reservoirs that are proposed or under construction (1965) on the Arkansas River will affect the flow at Little Rock to the extent that minimum flows will be increased about 50 percent, and maximum flows will be reduced. At present (1965), the average annual flow in the Saline River at Benton is reduced about 30—35 cfs by diversion from Lake Winona to the Little Rock water system, and about 2.0 cfs by diversion from the stream to the Benton water system. Lake Winona, supplied by runoff from 43.5 sq. mi. of the Alum Fork watershed, and Lake Norrell, supplied by runoff from about 5 sq. mi. of the North Fork watershed, have only minor effects on maximum and minimum flow of the Saline River at Benton. However, water released from Lake Norrell increases the flow at Benton considerably during dry periods.

Low-flow-frequency and flow-duration information, based on discharge measurements, has been estimated for nine tributary streams in the interior Highlands and is summarized in table 3. The data for these sites show the variation in low flow between streams and direct attention to areas where streams are suitable for water supply. Table 3 shows that the average flow of Middle Fork at Crows is about 150 cfs, the 7-day, 2-year low flow is 3.6 cfs, and 90 percent of the time the flow will be at least 6.4 cfs.

Although many of the Interior Highland streams have dependable water supplies without storage, the amount of water available could be increased considerably by the construction of reservoirs. The topography in the highlands is suitable for reservoir construction as shown by Lakes Norell, Winona, and Maumelle, which have total capacities of 6,600, 43,000, and 208,000 acre-feet, respectively. The U.S. Army Corps of Engineers has recommended a multipurpose reservoir at Benton to provide flood control, water supply, and recreation, with basic facilities for future power installation. The proposed reservoir would have a capacity of 979,900 acre-feet at the flood-control pool altitude of 385.0 feet above mean sea level. The

TABLE 3.—*Water-supply characteristics of tributary streams*

Map No.	Station name	Tributary to—	Drainage area (sq mi)	Estimated Flow (cfs)			Remarks
				Average	7-day, 2-year	90-percent duration	
	Arkansas River basin						
1	Nowlin Creek near Pinnacle.	Little Maumelle River	[1] 13	15	0.01	0.03	Drains Pulaski County game refuge. Without storage is useful for as much as 0.02 cfs.
2	Little Maumelle River at Maumelle.	Arkansas River	[1] 80	110	1.2	3.3	Flow of spring-fed upper tributaries consumed by evapotranspiration and seepage during dry periods.
4	Brodie Creek at Little Rock.	Fourche Creek	[1] 9	10	0	0	Do.
5	Fourche Creek at Little Rock.	Arkansas River	162	229	.2	.8	Flow affected by urban development. Not suitable for most water supplies.
6	Kellogg Creek near Jacksonville.	Bayou Meto	[1] 18	25	0	0	Ground-water inflow sufficient for evapotranspiration. Irrigation and livestock supplies available from large pools.
	Saline River basin						
7	Alum Fork at Crows	Saline River	123	[2] 100	[3] 1.2	[3] 2.5	Based on yield of Lake Winona. 55–65 cfs available at Crows with storage of 80,000 acre-ft.
8	Middle Fork at Crows	Alum Fork	109	150	3.6	6.4	Based on yield of Lake Winona. 75–90 cfs available at Crows with storage of 110,000 acre-ft.
10	South Fork near Nance	do	[1] 115	150	1.3	2.1	Spring-fed by tributaries in Garland County. Minimum flow at least 1.3 cfs since 1957.
11	North Fork at Paron	Saline River	[1] 23	30	0	0	Frequently recedes to no flow.
12	North Fork near Benton	do	132	[3] 170	[3] .7	[3] 1.8	Based on yield of proposed reservoir at Benton, 110 cfs available with storage of about 158,000 acre-ft.
14	Hurricane Creek near Sardis	do	66.1	90	[4] 1.0	[4] 1.8	Perennial flow is effluent from alumina processing. Poor-quality water.

[1] Estimated
[2] Affected by regulation at Lake Winona.
[3] Affected by regulation at Lake Norrell.
[4] Regulated.

NOTE.—1 cfs for 1 day = 646,317 gallons.

portion of storage allocated to water supply by the Corps of Engineers is sufficient to yield 300 mgd (million gallons per day), which has been estimated to be the ultimate need for municipal and industrial uses and stream-quality maintenance in the vicinity of Benton.

The following discussion of the chemical quality of surface water, although categorized under "Interior Highlands," applies equally to the Coastal Plain. The water samples were taken at or near the boundary between the highlands and the plains, and no significant change in water quality is expected to occur with the debouchment of the streams onto the plain.

Quality of water, Arkansas River.—Because the quality of the Arkansas River water varies considerably with time, only the extremes of certain selected constituents and properties are discussed. Daily samples of the river water at Little Rock have been taken since October 1945 to determine conductance and chloride content. These samples are composited for a period of 1–30 days, according to the conductance, and partial or complete analyses are then made on the composites. These analyses are found in the U.S. Geological Survey Water-Supply Papers dealing with quality of surface waters, given in the list of references.

Extremes at Little Rock between 1945 and 1964 were as follows:

Dissolved solids: Maximum, 2,400 ppm (parts per million) Nov. 28–29, 1953; minimum, 105 ppm Mar. 3, 1957.

Hardness: Maximum, 556 ppm Nov. 28–29, 1953; minimum, 46 ppm Feb. 2–4, 9, 12–18, 1957, and Mar. 9–26, 1964.

Specific conductance: Maximum, 5,050 micromhos Apr. 8, 1954; minimum, 173 micromhos Feb. 4, 1957, and Nov. 20, 1958.

Water temperature: Maximum, 98°F Aug. 16, 1954, and July 5, 1956; minimum, the freezing point on several days during December, January, and February of some years.

Arkansas River water is predominantly of the sodium chloride type (sodium and chloride are the dominant dissolved chemical constituents), and is characterized by wide variations of dissolved-solids and sediment content, in both time and place. The current multipurpose project, by the U.S. Army Corps of Engineers, for improvement of the Arkansas River and its tributaries in Arkansas and Oklahoma should reduce considerably the day-to-day fluctuations in dissolved-solids and sediment content.

Quality of water, Saline River.—Chemical analyses of Saline River water near Benton are available for the period October 1949–September 1953. They are tabulated in U.S. Geological Survey Water-Supply Papers 1188, 1199, 1252, and 1292.

Saline River water is of the calcium bicarbonate type. Extremes between October 1949 and September 1953 were as follows:

Dissolved solids: Maximum, 96 ppm Nov. 1–10, 1950; minimum, 29 ppm Mar. 12–14, 1950.

Hardness: Maximum, 74 ppm Oct. 21–31, 1950; minimum, 22 ppm, Mar. 12–14, 1950.
Specific conductance: Maximum, 204 micromhos Apr. 11, 1953; minimum 31.9 micromhos Feb. 13, 1950.
Water temperatures: Maximum, 91°F July 2–3, 1952: minimum, freezing point Dec. 16, 1949, Jan. 5, 1950, Jan. 30–31, Feb. 4, 1951.

GROUND WATER AND ITS QUALITY

Ground water in the Interior Highlands is obtained from a thick sequence of sandstone, shale, slate, chert, and novaculite (unit 1, pl. 1). The type of opening in which water occurs varies according to whether the opening is in the zone of alternate wetting and drying or in the zone of saturation. The lowest level of the water table separates these zones. Weathering has altered the rock above the water table to soil and "rotten rock," which together attain a maximum thickness of about 20 feet. The materials in the weathered zone are more porous and permeable than the original unweathered rock, and water occurs between the individual soil particles. Weathering has not affected the rock below the water table, and ground water occurs in secondary openings such as joints, fractures, and solution channels.

Ground water moves in the direction of slope of the water table. In the weathered zone this slope generally follows the topography. In the unweathered zone the slope of the water table is controlled mainly by geologic structure, and ground water generally moves toward the synclinal axes and away from the anticlinal axes.

Permeabilities are relatively low in the rocks of unit 1. Wells drilled into these rocks seldom yield more than 5–10 gpm (gallons per minute). However, wells in the highly shattered cherts have yielded as much as 200 gpm at some locations in adjoining Garland County. Generally, wells in the rocks of unit 1 are less than 150 feet deep. Water levels in the wells range from at or near land surface to about 85 feet below land surface. Maximum water-level fluctuations normally do not exceed 10–20 feet during a given year, although the levels in certain wells may fluctuate as much as 80 feet in a 6-month period.

Several factors control the depth to water in unit 1. Precipitation has a direct effect, in that periods of heavy rainfall are accompanied by corresponding decreases in depth to water. Conversely, dry periods are coincident with increases in depth to water. Depth to water is generally directly related to the topography of the area. Depth to water is greater in wells on the crests or slopes of ridges than in those in the nearby valleys.

Water from wells in the rocks of unit 1 may vary from a bicarbonate to a sulfate type. In 13 samples iron concentrations ranged from 0.01 to 0.74 ppm, dissolved solids from 72 to 414 ppm, and hardness from 12 to 330 ppm.

WATER-SUPPLY POSSIBILITIES IN THE COASTAL PLAIN

SURFACE WATER AND ITS QUALITY

The water-supply potential of streams flowing out of the Interior Highlands does not improve as the streams traverse the Coastal Plain. Tributary stream channels in the Coastal Plain are not sufficiently incised to intersect the ground-water table, precluding the possibility of a ground-water contribution to low flows. Minimum flows of the Arkansas and Saline Rivers, however, are increased slightly by ground-water inflow in the Coastal Plain, but the increase is assumed to be a small percentage of the total flow and therefore does not significantly change water quality or flow characteristics.

Low-flow-frequency and flow-duration information for the Arkansas and Saline Rivers, shown in table 2, is applicable to those parts of the streams in the Coastal Plain of Pulaski and Saline Counties. Estimates of water-supply characteristics for two tributary streams (sites 5 and 14, pl. 1) in the Coastal Plain are shown in table 3. This table shows that the average flow of Hurricane Creek at Sardis is 90 cfs, the 7-day, 2-year low flow is 1.0 cfs, and 90 percent of the time the flow will be at least 1.8 cfs. However, minimum flows in Hurricane Creek at Sardis represent effluent from an alumina processing plant, which is supplied with water from Hurricane Lake. The data are useful as an indicator of the water supply available when storage is provided.

Without storage facilities, most Pulaski and Saline County streams that originate in the Coastal Plain are without dependable water supplies and cease to flow during dry periods. Storage on most tributary streams in the Coastal Plain is limited to inchannel facilities. The flat topography is unsuitable for large reservoirs except for the main stem of the Saline River, which follows a pronounced depression about 2 miles wide and about 50 feet lower than the adjacent terraces.

GROUND WATER AND ITS QUALITY

Although nine geologic units are exposed in the Coastal Plain part of the report area (pl. 1, table 1), only three—units 3, 7, and 9—are of major importance as sources of water. Unit 2, which consists of granitic-type igneous rocks, does not yield water to wells. Unit 4, a dark-bluish-gray to black clay, also does not yield water to wells. Units 4A, 5, and 8 consist of materials that are too fine grained to be good sources of water. Wells in units 4A, 5, and 8 will yield only very small quantities of water at best. Unit 6 varies considerably in lithology, both horizontally and vertically. Although the upper sand yields water to shallow wells, drillers report difficulty in obtaining even domestic supplies in those areas where the dark-chocolate-brown clays in unit 6 are close to the surface.

One note of caution is advocated. Some of the analyses of water from wells in unit 6 (table 5) show a rather high concentration of nitrate (over 45 ppm). Seepage into the wells from the surface probably causes the high nitrate content. Water with nitrate concentrations greater than about 45 ppm may be harmful to infants, because it could result in methemoglobinemia, the so-called "blue-baby" disease. Proper curbing and well sealing near the surface would prevent contamination by seepage from the surface.

Unit 3, one of the three major aquifers, consists mainly of intergrading and interfingering beds of claystone, calcareous sandstone, sandy limestone, marl, and conglomerate—in that order of abundance—and includes minor beds of arkose, kaolin, and lignite (Gordon and others, 1958, p. 14). Where this unit is exposed at the surface, its measured thickness ranges from 7½ to nearly 60 feet. At depth the unit is thin or locally absent along the flanks of buried hills of igneous rock (pl. 1). The unit thickens rapidly eastward and attains a maximum known thickness of 185 feet. Very little is known about unit 3 in extreme eastern Pulaski County (pl. 1). However, it should not be overlooked as a possible source of supply in this area if suitable water is not obtained at shallower depths.

The sandstone and sandy limestone of unit 3 offer good prospects for water. Well yields as great as 350 gpm have been reported. A 40-gpm well near Mabelvale, T. 1 S., R. 13 W., had a reported drawdown of 6–7 feet, giving a specific capacity of approximately 6 gpm per foot of drawdown. A number of wells have been developed in the Mabelvale-Vimy Ridge-Bauxite area. Water levels in these wells range from 11 to 86 feet below land surface.

Wells developed in the arkose and conglomerate beds of unit 3 sometimes flow. One domestic well flowed 10 gpm when drilled. These beds are best developed near the upslope lip of the unit, particularly along the slopes of buried hills of igneous rock.

Wells in unit 3 yield a sodium bicarbonate water in some areas, and a calcium bicarbonate water in others, with no predictable pattern of occurrence. In six samples iron concentrations ranged from 0 to 0.3 ppm, dissolved solids from 178 to 426 ppm, and hardness from 57 to 154 ppm.

Unit 7, the second of the three major aquifers, consists of a homogeneous tan or gray fine to medium, loosely packed sand, containing some interbedded gray clay lenses. A conspicuous lignite bed is present locally at the base. The thickness of this unit ranges from 207 to 412 feet and averages 320 feet (Gordon and others, 1958, p. 56).

Hydrologic data are lacking for unit 7. The outcrop area is sparsely populated, and the aquifer is tapped by only a few shallow domestic wells in the Sardis area. These wells are designed to yield

no more than 8–10 gpm, and little information as to the potential yield of the aquifer can be obtained from them. However, two wells at Sheridan, about 12 miles south of the Saline-Grant County line, yield 600 and 860 gpm, respectively, from this unit. The yields of these wells suggest that the unit should be capable of yielding large quantities of water in the outcrop area and in the subsurface to the southeast (pl. 1).

Yields in the project area are highest from wells drilled in unit 9. This unit consists of terrace deposits and alluvium. The terrace deposits consist of a maximum thickness of about 60 feet of dark-brick- to salmon-red clay, containing a variable amount of fine silt that grades locally into sand. The sand is common toward the top of the unit. Although not differentiated in plate 1, the terrace deposits border the highlands north of the Arkansas River. South and west of the Arkansas River, the eastern limit of these deposits extends south from College Station and approximately coincides with U.S. Highway 65. The western limit is the contact with units 6 and 8. South and west of the river, wells in the terrace deposits yield little water.

The alluvium consists of a relatively thick sequence of fluvial deposits which cover the eastern part of the project area, exclusive of the terrace deposits. The alluvium was deposited by the Arkansas and Mississippi Rivers, and it blankets much of the eastern half of Arkansas and adjacent States. It also includes the flood-plain deposits of the Saline River, Fourche Creek, and the Arkansas River northwest of Little Rock (pl. 1).

The predominant characteristic of the alluvium is the change from gravel or coarse sand at the base, to fine material at the top. The alluvium may generally be divided into two parts: a lower part consisting of gravel and sand with minor amounts of silt and clay, and an upper part consisting of silt and clay with minor amounts of sand. The alluvium attains a maximum thickness of 120 feet in eastern Pulaski County but is much thinner along the Saline River, Fourche Creek, and the Arkansas River northwest of Little Rock.

Well yields as high as 1,000 gpm have been reported from the basal sands and gravels of unit 9 in the Coastal Plain part of the project area, and wells may yield 2,000 gpm in some areas. However, such high yields are not available from the alluvium of Fourche Creek and of the Saline River because those deposits are too thin (generally less than 30 ft.) and too fine grained.

Northwest of Little Rock, well yields ranging from 300 to 700 gpm are obtainable from the alluvium deposited by the Arkansas River (Bedinger and others, 1963, p. L27).

Depths to water in wells in the alluvium deposited by the Arkansas River range from 5 to 35 feet below land surface northwest of Little

Rock. Annual fluctuations of water levels rarely exceed 20 feet. The water levels generally respond to changes in river stage, rising and falling with the river. However, the effect of changes in river stage on ground-water levels diminishes with increasing distance from the river (Bedinger and others, 1963, p. L13).

In eastern Pulaski County and in a small area in southeastern Saline County, depths to water in the alluvium range from 10 to 40 feet. Annual fluctuations of levels seldom exceed 10 feet and are caused by seasonal changes in pumpage and by variations in the rates of recharge from precipitation and discharge by evapotranspiration. Water levels normally begin to decline in late spring, reach their lowest point in the late summer or early fall, and rise to their highest point in the spring.

Wells in unit 9 yield a calcium bicarbonate-type water whose dissolved-mineral constituents and physical properties vary greatly. Iron concentrations in 90 samples ranged from 0.1 to 52 ppm, dissolved solids in 3 samples from 242 to 327 ppm, and hardness in 76 samples from 6 to 505 ppm.

CONCLUSIONS

Alum Fork, Middle Fork, and North Fork of the Saline River offer excellent impoundment possibilities. Alum Fork at Crows will yield 55–65 cfs with storage of 80,000 acre-feet; Middle Fork at Crows will yield 75–90 cfs with storage of 110,000 acre-feet; and North Fork at Benton will yield 110 cfs with storage of 158,000 acre-feet. However, the ultimate development of the Saline River is the proposed dam at Benton, which would yield 465 cfs for water-supply purposes. Most of the smaller streams in the Interior Highlands part of the study area generally go dry in midsummer, but with storage they would be suitable for development of small surface-water supplies. The Arkansas River with a 7-day, 2-year flow of 4,100 cfs, or more than 2.5 billion gallons per day, is sufficient for any foreseeable development in areas accessible to the river.

Ground-water yields in the project area vary considerably. The consolidated rocks of the Interior Highlands generally yield less than 10 gpm of water to wells, although larger amounts may be obtained locally. In the Coastal Plain part of the area, the limestone and sandstone of unit 3, the sand of unit 7, and the basal sand and gravel of unit 9 offer the best possibilities for water. Wells in unit 3 yield as much as 350 gpm, and unit 7 could probably yield large amounts of water. Maximum yields of unit 7 in the project area are unknown, although yields of as much as 860 gpm are reported 12 miles south of the area. Yields from wells in unit 9 range from 300 to 700 gpm in the Arkansas River valley northwest of Little Rock to 2,000 gpm in eastern Pulaski County. Prospects of obtaining water from the alluvium deposited by the Saline River and Fourche Creek are poor.

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BASIC DATA

TABLE 4.—*Significance of dissolved mineral constituents and physical properties of natural waters*

Constituent or physical property	Source or cause	Significance
Silica (SiO_2)	Dissolved from almost all rocks and soils, generally in small amounts from 1 to 30 ppm. High concentrations, as much as 100 ppm, generally occur in highly alkaline waters.	Forms hard scale in pipes and boilers. Carried in steam of high pressure boilers to form deposits on blades of steam turbines. Inhibits deterioration of zeolite-type water softeners.
Iron (Fe)	Dissolved from almost all rocks and soils. May also be derived from iron pipes, pumps, and other equipment. More than 1 or 2 ppm of soluble iron in surface waters generally indicates acid wastes from mine drainage or other sources.	On exposure to air, iron in ground water oxidizes to reddish-brown sediment. More than about 0.3 ppm stains laundry and utensils reddish brown. Objectionable for food processing, beverages, dyeing, bleaching, ice manufacture, brewing, and other processes. U.S. Public Health Service drinking water standards recommend that iron should not exceed 0.3 ppm. Larger quantities cause unpleasant taste and favor growth of iron bacteria.
Manganese (Mn)	Dissolved from some rocks and soils. Not as common as iron. Large quantities commonly associated with high iron content and with acid waters.	Same objectionable features as iron. Causes dark-brown or black stain. U.S. Public Health Service drinking water standards recommend that manganese should not exceed 0.05 ppm.
Calcium (Ca) and magnesium (Mg).	Dissolved from almost all soils and rocks but especially from limestone, dolomite, and gypsum. Calcium and magnesium are found in large quantities in some brines. Magnesium is present in large quantities in sea water.	Causes most of the hardness and scale-forming properties of water; soap consuming (see hardness). Waters low in calcium and magnesium are desired in electroplating, tanning, dyeing, and in textile manufacturing.
Sodium (Na) and potassium (K).	Dissolved from almost all rocks and soils. Found also in ancient brines, sea water, some industrial brines, and sewage.	Large amounts, in combination with chloride, give a salty taste. High sodium content commonly limits use of water for irrigation. Sodium salts may cause foaming in steam boilers.
Bicarbonate (HCO_3) and carbonate (CO_3).	Action of carbon dioxide in water on carbonate rocks such as limestone and dolomite.	Bicarbonate and carbonate produce alkalinity. Bicarbonates of calcium and magnesium decompose in steam boilers and hot-water facilities to form scale and release corrosive carbon dioxide gas. In combination with calcium and magnesium cause carbonate hardness.
Sulfate (SO_4)	Dissolved from rocks and soils containing gypsum, iron sulfides, and other sulfur compounds. Commonly present in mine waters and in some industrial wastes.	Large amounts have a laxative effect on some people and, in combination with other ions, give a bitter taste. Sulfate in water containing calcium forms a hard scale in steam boilers. U.S. Public Health Service drinking water standards recommend that the sulfate content should not exceed 250 ppm.
Chloride (Cl)	Dissolved from rocks and soils. Present in sewage and found in large amounts in ancient brines, sea water, and industrial brines.	Large quantities increase the corrosiveness of water and, in combination with sodium, give salty taste. U.S. Public Health Service drinking water standards recommend that the chloride content should not exceed 250 ppm.

TABLE 4.—*Significance of dissolved mineral constituents and physical properties of natural waters*—Continued

Constituent or physical property	Source or cause	Significance
Fluoride (F)	Dissolved in small to minute quantities from most rocks and soils.	Fluoride in drinking water reduces the incidence of tooth decay when the water is consumed during the period of enamel calcification. However, it may cause mottling of the teeth depending on the concentration of fluoride, the age of the child, the amount of drinking water consumed, and the susceptibility of the individual. The maximum concentration of fluoride recommended by the U.S. Public Health Service for Arkansas is about 1.2 ppm; 0.9 ppm is considered to be the optimum concentration.
Nitrate (NO_3)	Decaying organic matter, legume plants, sewage, nitrate fertilizers, and nitrates in soil.	Nitrate encourages growth of algae and other organisms that produce undesirable tastes and odors. Concentrations much greater than the local average may suggest pollution. U.S. Public Health Service drinking water standards recommend that nitrate content should not exceed 45 ppm, as there is evidence that higher concentrations may cause methemoglobinemia in infants, the so-called "blue-baby" disease, that sometimes is fatal. Nitrate has shown to be helpful in reducing intercrystalline cracking of boiler steel.
Dissolved solids	Chiefly mineral constituents dissolved from rocks and soils. Includes any organic matter and some water of crystallization.	U.S. Public Health Service drinking water standards recommend that the dissolved solids should not exceed 500 ppm. Waters containing more than 1,000 ppm of dissolved solids are unsuitable for many purposes.
Hardness as $CaCO_3$	In most waters nearly all the hardness is due to calcium and magnesium. All the metallic cations other than the alkali metals also cause hardness.	Consumes soap before a lather will form, and deposits soap curd on bathtubs. Hard water forms scale in boilers, water heaters, and pipes. Hardness equivalent to the bicarbonate and carbonate is called carbonate hardness. Any hardness in excess of this is called noncarbonate hardness. In general, waters of hardness up to 60 ppm are considered soft; 61 to 120 ppm, moderately hard; 121 to 180 ppm, hard; more than 180 ppm very hard.
Percent sodium and sodium-adsorption-ratio.	See sodium	Values for these properties are used with specific conductance values to determine the suitability of water for irrigation use.
Specific conductance (micromhos at 25°C).	Mineral content of the water.	Specific conductance is a measure of the capacity of water to conduct an electric current. This property varies with concentration and degree of ionization of the constituents, and with temperature (therefore reported at 25°C).
Hydrogen-ion concentration (pH).	Acids, acid-generating salts, and free carbon dioxide lower the pH. Carbonates, bicarbonates, hydroxides, phosphates, silicates, and borates raise the pH.	A pH of 7.0 indicates neutrality of a solution. Higher values denote increasing alkalinity; lower values, increasing acidity. pH is a measure of the activity of the hydrogen ions. Corrosiveness of water generally increases with decreasing pH. However, excessively alkaline waters may also attack metals.
Temperature		Affects usefulness of water for many purposes. Most users desire water of uniformly low temperature. In general, temperature of shallow ground water shows some seasonal fluctuation, whereas temperature of ground water from moderate depths remains near the mean annual air temperature of the area. In very deep wells, water temperature generally increases about 1°F for each 60-ft increment of depth.

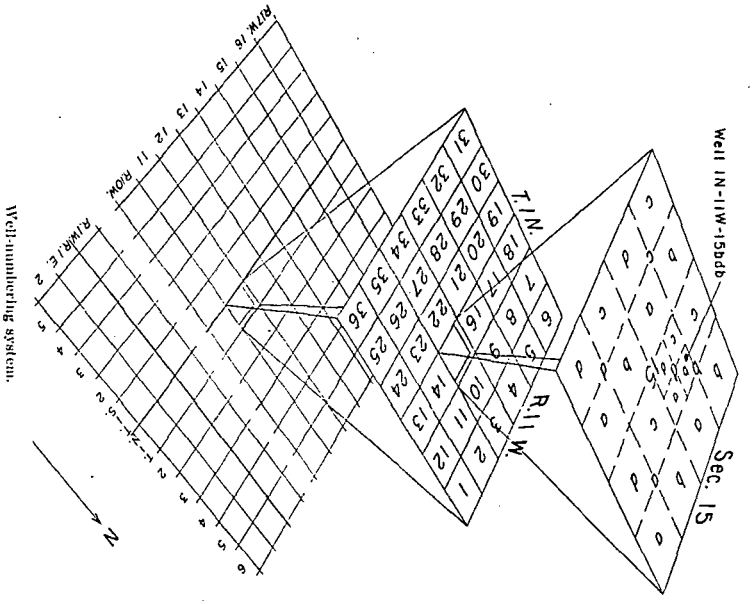


TABLE 5.—*Chemical analyses of water from selected wells in Pulaski and Saline Counties, Ark.*

[Chemical constituents in parts per million except as indicated]

Well	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption-ratio	Specific conductance (micromhos at 25° C)	pH
Unit 1																						
1N-13W- 9baa	1-17-63	------	5.6	0.08	0	2.3	9.7	8	0.3	39	0	11	15	0.2	0.3	72	45	14	28	1.2	134	6.9
1N-15W-36cbb	10-22-62	------	------	.10	0.0	6.0	3.7	16	6.4	31	0.0	15	14	.2	18	95	30	4	48	1.3	165	7.2
1N-16W-35bcd	8-25-64	60.5	11	.37	0	56	6.9	3	.1	180	0	22	10	.4	.9	201	176	28	------	------	323	7.9
1N-17W-13ddd	1-14-63	------	7.8	.11	.1	11	27	18	1.1	63	0	97	15	.6	.3	209	138	87	22	.7	332	8.5
2N-17W-22acb	8-25-64	------	8.4	.44	.4	6.4	5.8	82	2	244	0	5.8	4.6	.4	.8	237	40	0	------	------	392	8.1
3N-15W-35aac	1-14-63	------	5.9	.08	0	14	29	17	.9	202	0	5.8	14	.1	1.2	187	154	0	19	.6	321	8.0
1S-13W- 9aab	1- 7-54	------	------	.74	------	120	7.2	9.8	------	283	------	88	15	------	0	414	330	98	------	------	------	7.5
1S-14W-14aaa2	3-31-59	66	------	.44	------	61	13	8.6	2.5	244	0	15	10	.5	.4	259	206	6	8	------	421	7.3
15bda [1]	9- 5-61	------	------	.62	------	89	12	4.2	------	264	------	74	8.5	.08	.09	341	322	106	------	------	------	6.6
24daa [1]	9-28-56	------	------	2.10	------	45	1.3	15	------	178	------	2	24	.3	0	229	164	18	------	------	------	7.2
2S-15W-29ddd	3-14-63	64	8.9	.16	.05	17	4.9	71	3.7	220	0	1.2	31	.6	.1	247	62	0	------	------	426	7.7
3S-15W-18dua	3-28-63	69	10	.01	.04	4.7	.7	123	1.8	312	0	1.6	20	1.3	.1	317	14	0	------	------	523	7.9
29aba	4-19-63	70.5	10	.11	0	3.7	.8	140	1.2	262	1	0	68	.8	.4	355	12	0	------	------	615	8.3
Unit 3																						
1S-13W-22baa	4-17-63	66.5	12	0.30	0	40	13	7.4	3.1	188	0	8.6	7.4	.2	0.1	184	154	0	------	------	318	8.1
1S-14W-34bda	4-12-63	64	7.8	0	0	40	12	34	8.8	254	0	11	7	.5	0	246	150	0	------	------	396	7.6
34bdd	5-22-63	64	16	.01	0	19	13	35	9	188	6	7.6	12	.4	2.6	213	101	0	------	------	352	8.5
2S-14W-10abd	6-25-63	64	16	.03	0	23	11	126	8	254	2	14	97	4.7	0	426	103	0	------	------	782	8.4
2S-15W-32dca	3-14-63	------	8.9	.07	.05	16	4.1	70	3.6	218	0	1.2	29	.5	.1	241	57	0	------	------	415	7.8
3S-15W- 5cba	4-24-63	62	9.1	.14	0	27	9	26	4.2	179	4	0	9.6	.4	.2	178	105	0	------	------	304	8.4

See footnote at end of table.

TABLE 5.—*Chemical analyses of water from selected wells in Pulaski and Saline Counties, Ark.*—Continued

Well	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption-ratio	Specific conductance (micromhos at 25° C)	pH
Unit 6																						
1N-11W-35C	3- 9-64	62	------	1.4	------	92	24	27	1.7	410	0	15	13	------	0.4	395	328	0	------	------	698	6.9
1S-12W-15bcd	4-22-63	65	------	.78	------	3	1.2	2.7	1.4	15	0	4.8	4.4	------	0	42	12	0	------	------	53	7.0
1S-14W-34acc	11-20-53	64	------	.95	------	------	------	------	------	10	0	18	58	------	2.5	------	21	13	------	------	224	6.9
34cad	11-20-53	63	------	.29	------	------	------	------	------	6	0	14	7.2	------	3.4	------	4	0	------	------	63	6.7
34dcb	11-20-53	61	------	1.1	------	------	------	------	------	2	0	16	63	------	72	------	64	62	------	------	387	5.0
35bcc	11-20-53	61	------	.67	------	------	------	------	------	65	0	15	4.2	------	2.6	------	62	9	------	------	155	7.8
35bdb	11-20-53	------	------	9.3	------	------	------	------	------	0	0	1	30	------	90	------	48	48	------	------	298	4.3
2S-12W-18abb	6-26-63	62.5	------	.12	------	1.2	.8	1	.6	5	0	0	2	0	3.4	21	6	2	------	------	26	5.4
2S-13W- 7bbc	3-29-54	------	------	.21	------	------	------	------	------	9	0	4	4.5	------	1.4	------	7	0	------	------	39	6.2
7bdd	3-29-54	------	------	.06	------	------	------	------	------	72	0	9	5	------	6.4	------	63	4	------	------	168	7.8
17acc	3-29-54	------	------	.05	------	------	------	------	------	16	0	1	10	------	12	------	27	14	------	------	89	7.2
17bda	3-30-54	------	------	.14	------	------	------	------	------	24	0	2	3.5	------	1.8	------	21	1	------	------	59	7.3
18ada	3-30-54	------	------	.06	------	------	------	------	------	5	0	2	3.2	------	5.2	------	7	3	------	------	34	6.3
19dda	3-30-54	------	------	.10	------	------	------	------	------	3	0	5	4	------	3	------	6	4	------	------	43	5.0
20ada	3-29-54	------	------	.25	------	------	------	------	------	76	0	9	44	------	38	------	82	20	------	------	392	7.8
20daa	3-29-54	------	------	.43	------	------	------	------	------	75	0	52	8	------	11	------	113	51	------	------	285	7.5
20dad	3-29-54	------	------	.24	------	------	------	------	------	69	0	5	36	------	17	------	68	11	------	------	280	7.3
2S-14W- 1cdd	3-29-54	------	------	4.2	------	------	------	------	------	18	0	2	9	------	1.9	------	12	0	------	------	69	7.0
3aba	11-20-53	62	------	.12	------	------	------	------	------	3	0	15	32	------	6.8	------	21	19	------	------	174	6.2
10dac	11-20-53	62	------	.13	------	------	------	------	------	6	0	3	5	------	6.2	------	4	0	------	------	48	6.5
11dad	3-29-54	------	------	.05	------	------	------	------	------	0	0	12	76	------	5.5	------	60	60	------	------	325	4.5
11dbd	3-29-54	------	------	.21	------	------	------	------	------	98	0	74	40	------	2.9	------	114	34	------	------	450	7.8
12aac	3-29-54	63	------	.18	------	------	------	------	------	14	0	2	3.5	------	3.3	------	12	1	------	------	38	6.4
12aca	3-29-54	------	------	12	------	------	------	------	------	40	0	6	3	------	7	------	24	0	------	------	------	------
13bab	3-30-54	------	------	.03	------	------	------	------	------	9	0	6	38	------	10	------	20	13	------	------	183	6.0
13bad	3-30-54	------	------	1.20	------	------	------	------	------	0	0	100	14	------	.8	------	28	28	------	------	386	3.4
13cbd	3-30-54	------	------	3.50	------	------	------	------	------	14	0	10	42	------	50	------	50	4	------	------	281	5.9
13cdb	3-30-54	------	------	.01	------	------	------	------	------	24	0	6	14	------	14	------	29	9	------	------	145	6.8
24bba2	3-30-54	------	------	.09	------	------	------	------	------	62	0	22	36	------	48	------	94	43	------	------	350	6.8
24bba3	3-30-54	------	------	.01	------	------	------	------	------	2	0	1	59	------	34	------	19	17	------	------	279	4.8
24bca	3-30-54	------	------	.30	------	------	------	------	------	45	0	4	8.5	------	8.9	------	42	5	------	------	126	7.0
24bdc	3-30-54	------	------	.03	------	------	------	------	------	49	0	40	48	------	27	------	86	46	------	------	366	6.5
24cbd	3-30-54	------	------	.56	------	------	------	------	------	37	0	2	25	------	5.5	------	39	9	------	------	159	7.0
Unit 9																						
1N-10W- 4abc	6-11-51	64	------	9.1	------	------	------	------	------	85	0	17	5.5	------	0.5	------	70	0	------	------	174	7.4
21bcb	6-13-51	64	------	13	------	------	------	------	------	420	0	4	4.5	------	.6	------	351	7	------	------	630	7.6
1N-11W- 1ddc	7-14-59	63	------	5.3	------	------	------	24	0	152	0	42	31	------	------	------	176	0	------	------	410	7.5
4bbb	6-12-51	64	------	9.9	------	------	------	------	------	177	0	14	8.2	------	.9	------	146	1	------	------	311	7.8
4dbd	6-12-51	64	------	18	------	------	------	------	------	219	0	16	14	------	.5	------	181	1	------	------	381	6.9
15bdb	7-14-59	66	------	19	------	------	------	30	3.9	604	0	30	24	------	------	------	505	------	------	------	921	7.3
16dde	7- 7-51	64	------	------	------	------	------	------	------	442	38	31	25	------	.3	------	6	0	------	------	533	8.9
27bda	7- 9-51	64	------	.59	------	------	------	------	------	140	7	6	6	------	15	------	135	9	------	------	294	8.2
28daa	7-14-59	------	------	------	------	------	------	16	0	60	0	19	9	------	------	------	68	------	------	------	189	7.6
30bdc	7-16-59	------	------	15	------	------	------	15	0	176	0	0	21	------	------	------	152	------	------	------	335	7.3
31acb	7-16-59	------	------	23	------	------	------	18	.6	208	0	0	18	------	------	------	161	------	------	------	366	7.0
32bca	7-16-59	------	------	2	------	------	------	6.8	0	164	0	8.6	7	------	------	------	137	------	------	------	266	7.8
32cdc	7-16-59	------	------	.04	------	------	------	8.3	0	88	0	15	5	------	------	------	79	------	------	------	180	6.8
34aba	7-14-59	------	------	3.5	------	------	------	16	.7	408	0	48	24	------	------	------	396	------	------	------	701	8.1
34cda	7- 9-51	64	------	.1	------	------	------	------	------	312	6	38	10	------	21	------	317	51	------	------	571	8.4
34cdd	2-27-59	------	------	25	------	------	------	9.4	.7	212	0	22	8	------	------	------	188	------	------	------	349	8.2
1N-12W- 1ccd	6-14-51	64	------	.5	------	------	------	------	------	211	0	92	112	------	6.2	------	309	136	------	------	876	7.6
1dbc	6-14-51	64	------	9.8	------	------	------	------	------	347	0	72	88	------	.5	------	394	110	------	------	917	7.7
2bbd	9-14-51	65	------	8.7	------	------	------	------	------	218	0	88	113	------	2	------	274	95	------	------	789	7.9
12bdd	6-14-51	------	------	.18	------	------	------	------	------	193	0	59	34	------	3.8	------	210	52	------	------	540	7.2
2N-10W- 5bcc	6-11-51	64	------	2.5	------	------	------	------	------	415	0	4	28	------	.5	------	334	0	------	------	703	7.7
16bcd	8- 2-51	64	------	10	------	------	------	------	------	311	0	2	14	------	1.5	------	248	0	------	------	602	7.5
16bde	7-14-59	64	------	5.3	------	------	------	15	.3	268	0	0	17	------	------	------	215	------	------	------	421	8.2
31cac	6-13-51	64	------	12	------	------	------	------	------	132	0	2	.2	------	.3	------	93	0	------	------	211	7.5
2N-11W-31ddb	6-13-51	------	------	21	------	------	------	------	------	206	0	7	18	------	.2	------	182	14	------	------	377	7.4
32bbc	6-13-51	------	------	13	------	------	------	------	------	145	0	18	17	------	.2	------	152	33	------	------	339	7.4
33cdb	6-12-51	64	------	25	------	------	------	------	------	370	0	6	34	------	.9	------	310	7	------	------	648	7.7
2N-12W-36dca	6-14-51	64	------	35	------	------	------	------	------	154	0	137	51	------	2.3	------	290	164	------	------	662	7.0
2N-13W- 7ddc	1-26-59	------	------	.15	------	------	------	------	------	------	------	------	102	------	------	------	------	------	------	------	1020	6.9
8cdd	1-26-59	------	------	9.2	------	------	------	------	------	------	------	------	6.5	------	------	------	------	------	------	------	425	6.7
16bab	7-20-51	64	------	2.9	------	------	------	------	------	316	10	28	19	------	6.1	------	294	18	------	------	604	------
16bac1	1-26-59	------	------	1.6	------	------	------	------	------	------	------	------	20	------	------	------	------	------	------	------	616	6.6

See footnote at end of table.

TABLE 5.—*Chemical analyses of water from selected wells in Pulaski and Saline Counties, Ark.*—Continued

Well	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption-ratio	Specific conductance (micromhos at 25° C)	pH
Unit 9—Continued																						
2N-13W-16bbb	11-19-58	------	------	3.7	------	52	13	13	6	204	0	27	11	------	1.5	242	183	16	13	0.4	396	------
16bbb	10-27-54	------	------	4.2	------	44	14	18	------	195	0	24	11	------	1.9	265	167	8	19	.6	392	------
3N-10W-31dcd	3- 7-56	64	10	1.5	------	78	14	23	2	294	0	7.8	32	------	1.2	327	252	11	16	------	563	------
32ccd	6-11-51	64	------	.17	------	------	------	------	------	400	0	3	14	------	.3	------	312	0	------	------	646	------
3N-13W-30bbc	1-29-59	------	------	6.6	------	------	------	------	------	------	------	------	11	------	------	------	------	------	------	------	657	6.7
3N-14W- 2cbb	1-27-59	------	------	2.9	------	------	------	------	------	------	------	------	7	------	------	------	------	------	------	------	494	6.7
3dbb	1-27-59	------	------	2.9	------	------	------	------	------	------	------	------	130	------	------	------	------	------	------	------	957	6.6
3ddd	1-27-59	------	------	.18	------	------	------	------	------	------	------	------	4	------	------	------	------	------	------	------	453	6.7
10abs	1-26-59	------	------	11	------	------	------	------	------	------	------	------	32	------	------	------	------	------	------	------	499	6.8
10ace	10-27-50	------	------	.97	------	------	------	------	------	106	0	13	7.5	------	21	------	127	40	------	------	255	------
10dcd	10-27-50	------	------	30	------	------	------	------	------	360	0	2	31	------	2	------	308	13	------	------	608	------
11bcc	10-27-50	------	------	5.9	------	------	------	------	------	382	0	10	21	------	.8	------	349	36	------	------	624	------
11cdb	1-27-59	------	------	8.6	------	------	------	------	------	------	------	------	19	------	------	------	------	------	------	------	586	6.6
14bbb	10-27-50	------	------	1.6	------	------	------	------	------	352	0	25	10	------	1.6	------	327	38	------	------	593	------
14cab	1-27-59	------	------	------	------	------	------	------	------	------	------	------	5.5	------	------	------	------	------	------	------	456	6.6
14cab	1-27-50	64	------	------	------	------	------	------	------	------	------	25	4.8	------	------	------	------	------	------	------	460	------
14cba	10-27-50	------	------	1.7	------	------	------	------	------	140	0	24	19	------	7.2	------	180	65	------	------	340	------
15adc	10-27-50	------	------	7.6	------	------	------	------	------	206	0	22	19	------	5.3	------	218	49	------	------	393	------
15bbd	1-27-59	------	------	1.4	------	------	------	------	------	------	------	------	43	------	------	------	------	------	------	------	581	6.6
15bdb	10-27-50	------	------	25	------	------	------	------	------	331	0	23	14	------	.4	------	312	41	------	------	564	------
15daa	10-27-50	------	------	1.9	------	------	------	------	------	240	0	34	21	------	27	------	270	73	------	------	513	------
15dbc	1-27-59	------	------	9.2	------	------	------	------	------	------	------	------	10	------	------	------	------	------	------	------	621	7.0
15dbc	10-23-59	65	------	------	------	------	------	------	------	------	------	25	7.2	------	------	------	------	------	------	------	589	------
15dda	10-27-50	------	------	26	------	------	------	------	------	334	0	8	5	------	.6	------	300	10	------	------	535	------
16dcd	1-26-59	------	------	7	------	------	------	------	------	------	------	------	8	------	------	------	------	------	------	------	356	6.9
16dcd	10-23-59	64	------	------	------	------	------	------	------	------	------	1.8	3.8	------	------	------	------	------	------	------	210	------
22aaa	10-27-50	------	------	11	------	------	------	------	------	183	0	10	4.5	------	7.8	------	167	17	------	------	322	------
22aad	1-27-59	------	------	.16	------	------	------	------	------	------	------	------	3	------	------	------	------	------	------	------	406	6.6
22abc	1-27-59	------	------	7.2	------	------	------	------	------	------	------	------	19	------	------	------	------	------	------	------	625	6.9
23add	1-27-59	------	------	5.1	------	------	------	------	------	------	------	------	16	------	------	------	------	------	------	------	619	7.0
23bab	1-27-59	------	------	7.4	------	------	------	------	------	------	------	------	7	------	------	------	------	------	------	------	529	6.7
26ccd	1-26-59	------	------	.11	------	------	------	------	------	------	------	------	22	------	------	------	------	------	------	------	978	7.2
1S-10W-17caa	6-13-51	66	------	14	------	------	------	------	------	496	0	8	6.5	------	1.1	------	304	0	------	------	654	8.1
17ccd	6-13-51	64	------	.60	------	------	------	------	------	485	0	7	7	------	2.9	------	418	20	------	------	741	7.5
23ccb	7-14-59	64	------	13	------	------	------	12	.7	152	0	11	8	------	------	------	106	------	------	------	261	7.1
25bad	8-14-59	64	------	8.7	------	------	------	12	.5	145	0	12	13	------	------	------	122	------	------	------	271	8.1
25ddb	7-16-51	64	------	16	------	------	------	------	------	157	14	11	20	------	.5	------	166	10	------	------	372	8.4
26baa	7- 7-51	66	------	.48	------	------	------	------	------	26	10	9	13	------	15	------	60	22	------	------	162	8.7
29aba	7- 7-51	66	------	12	------	------	------	------	------	258	20	13	24	------	.6	------	262	0	------	------	542	8.5
29bba	7- 7-51	66	------	2.90	------	------	------	------	------	323	11	8	3.2	------	1	------	290	5	------	------	503	8.3
1S-11W-6caa	10-22-59	67	------	4.5	------	------	------	160	6.2	430	16	21	165	------	4.3	------	269	------	------	------	1,200	8.5
6caa	2- 8-60	67	------	------	------	------	------	------	------	------	------	------	12	------	------	------	------	------	------	------	385	------
8bdc	7-16-59	------	------	13	------	------	------	15	.4	261	0	8.2	8	------	------	------	209	------	------	------	412	7.3
9caa	7-14-59	63	------	3.4	------	------	------	7	.3	84	0	6.6	5	------	------	------	74	------	------	------	161	6.8
9cbb	7-16-59	64.5	------	.96	------	------	------	9.7	.3	316	0	11	5	------	------	------	269	------	------	------	457	8.2
10acd	7-14-59	------	------	7.7	------	------	------	8.8	.1	288	0	19	6	------	------	------	256	------	------	------	457	7.9
16cbb	7-16-59	------	------	9.8	------	------	------	8.1	.0	134	0	14	6	------	------	------	123	------	------	------	239	8.2
25ddb	7-14-59	64	------	16	------	------	------	12	1.1	492	0	1	8	------	------	------	406	------	------	------	708	7.4
27bcc	6-11-51	64	------	9	------	------	------	------	------	304	0	36	66	------	.8	------	334	85	------	------	700	7.5
28cbb	7-17-59	------	------	14	------	------	------	29	1.2	374	0	9.8	11	------	------	------	289	------	------	------	553	8.2
1S-12W-15daa1	6-12-51	------	------	.63	------	------	------	------	------	2	0	2	21	------	34	------	32	30	------	------	154	4.9
15daa2	6-12-51	------	------	.22	------	------	------	------	------	146	0	10	16	------	15	------	129	9	------	------	325	7.0
27aac	6-12-51	------	------	1.3	------	------	------	------	------	39	0	4	6	------	3.3	------	25	0	------	------	85	6.7
2S-10W-14ddb	9-22-53	63	------	.32	------	36	8.6	------	------	236	0	32	13	------	.1	------	126	0	------	------	449	6.8
21bbb1	7-13-59	65	------	8.7	------	------	------	26	1.1	260	0	23	45	------	------	------	258	0	------	------	582	6.9
21bbb2	7-16-51	65	------	6.9	------	------	------	------	------	314	6	36	10	------	.6	------	264	0	------	------	550	8.2
23bba	7-16-51	------	------	43	------	------	------	------	------	391	7	69	141	------	.3	------	408	76	------	------	1,120	8.1
27dbd	7-16-51	64	------	31	------	------	------	------	------	296	0	7	57	------	.5	------	275	32	------	------	615	7.6
32daa	7-16-51	65	------	------	------	------	------	------	------	452	0	28	9.5	------	40	------	409	30	------	------	802	7.9
35ccc	7-31-59	64	------	25	------	------	------	79	4.5	192	0	72	128	------	------	------	244	------	------	------	854	8.0
35ccd	8- 2-51	64	------	49	------	------	------	------	------	290	0	50	116	------	1.4	------	310	72	------	------	876	7.0
35dcb1	8- 2-51	64	------	52	------	------	------	------	------	294	0	29	60	------	1.5	------	284	43	------	------	667	6.8
35ddd	8- 2-51	64	------	47	------	------	------	------	------	308	0	12	79	------	1.1	------	309	56	------	------	724	7.0
2S-11W-5acd	6-11-51	------	------	.38	------	------	------	------	------	18	0	67	68	------	1	------	50	35	------	------	412	6.7
9dcc	7-17-59	------	------	21	------	------	------	39	2.8	276	0	17	38	------	------	------	220	------	------	------	547	7.2
20bdd	10-22-59	65	------	1.1	------	------	------	18	4.4	14	0	12	27	------	------	------	16	------	------	------	142	6.7

[1] Arkansas State Board of Health analysis.

U. S. GOVERNMENT PRINTING OFFICE: 1962

REFERENCE 24

Table 2.--Use of water in Arkansas counties, 1980

[In million gallons per day[1]]

County	Public supply			Self-supplied industry			Rural use				Irrigation						Fish and minnow farms			Wildlife impoundments			Electric energy[2]			County total			Rank according to quantity of water used	County
							Domestic (ground water)	Livestock			Rice			Other crops																
	Ground water	Surface water	Total	Ground water	Surface water	Total		Ground water	Surface water	Total	Ground water	Surface water	Total	Ground water	Surface water	Total	Ground water	Surface water	Total	Ground water	Surface water	Total	Ground water	Surface water	Total	Ground water	Surface water	Total		
Arkansas	4.02	-----	4.02	0.09	-----	0.09	0.34	0.08	0.12	0.64	209.63	139.76	349.38	20.26	13.68	33.80	12.05	13.87	26.92	----	16.63	16.63	----	--------	--------	246.46	182.92	429.38	8	Arkansas
Ashley	2.27	-----	2.27	10.03	36.40	46.43	.46	0.08	.14	.68	74.08	3.08	77.16	16.10	2.84	17.94	8.53	5.08	13.61	----	-----	-----	----	--------	--------	110.63	47.26	157.82	30	Ashley
Baxter	.65	2.13	2.68	.14	-----	.14	1.06	.07	.37	1.50	------	------	------	-----	.10	.10	-----	26.97	26.97	----	-----	-----	----	2,709.00	2,709.00	1.82	2,737.66	2,739.37	4	Baxter
Benton	.43	6.98	6.41	.16	.06	.21	2.32	2.10	3.15	7.57	------	------	------	-----	.92	.92	.61	.04	.66	----	-----	-----	----	4.67	4.67	6.61	14.02	20.43	48	Benton
Boone	1.98	.03	2.01	.06	-----	.06	.93	.16	.90	1.99	------	------	------	-----	.11	.11	.11	.09	.20	----	-----	-----	----	--------	--------	3.23	1.13	4.36	69	Boone
Bradley	.98	-----	.98	.45	-----	.45	.20	.13	.19	.52	------	------	------	.40	1.43	1.83	.07	.64	.71	----	-----	-----	----	--------	--------	2.23	2.26	4.49	58	Bradley
Calhoun	.31	-----	.31	.61	.04	.65	.22	.04	.06	.32	------	------	------	-----	.03	.03	-----	.02	.02	----	-----	-----	----	--------	--------	1.08	.15	1.23	74	Calhoun
Carroll	1.46	.92	2.38	.01	-----	.01	.60	.20	1.13	1.93	------	------	------	-----	.12	.12	-----	.12	.12	----	-----	-----	----	366.00	366.00	2.27	368.29	340.56	11	Carroll
Chicot	1.76	-----	1.76	.03	-----	.03	.44	.12	.18	.74	87.43	64.76	122.19	4.46	2.23	6.71	4.34	2.32	6.66	----	-----	-----	----	--------	--------	70.60	69.49	140.09	27	Chicot
Clark	.48	1.59	2.07	.18	1.39	1.57	.50	.17	.26	.93	------	7.71	7.71	.79	.53	1.32	1.34	.29	1.63	----	-----	-----	----	384.00	384.00	3.46	365.77	369.23	10	Clark
Clay	1.42	-----	1.42	.70	-----	.70	.76	.12	.12	1.02	151.56	11.44	163.00	16.60	-----	16.60	1.37	.08	1.45	----	5.95	5.95	----	--------	--------	162.65	17.59	170.14	24	Clay
Cleburne	.12	1.73	1.85	.13	.01	.14	.22	.66	.84	1.67	------	------	------	-----	.33	.33	-----	14.06	14.06	----	-----	-----	----	648.00	648.00	1.03	664.97	666.00	7	Cleburne
Cleveland	.41	-----	.41	.01	-----	.01	.43	.16	.23	.81	------	------	------	-----	.18	.18	-----	.15	.15	----	-----	-----	----	--------	--------	1.00	.66	1.66	72	Cleveland
Columbia	2.66	-----	2.66	2.87	-----	2.87	.75	.31	.46	1.52	------	------	------	-----	.07	.07	.14	1.10	1.48	----	-----	-----	----	--------	--------	7.76	.81	8.67	61	Columbia
Conway	1.39	-----	1.39	.06	5.45	5.51	.69	.54	.81	2.04	2.17	1.22	3.39	1.33	.09	1.42	-----	.63	.63	----	-----	-----	----	--------	--------	6.18	8.10	14.28	47	Conway
Craighead	7.44	-----	7.44	.46	-----	.46	.42	.12	.08	.62	186.23	16.32	203.56	29.94	1.04	30.98	.16	.34	.49	----	-----	-----	0.05	--------	.05	223.83	19.78	243.59	16	Craighead
Crawford	-----	6.05	6.06	.03	.18	.21	1.07	.46	.69	2.22	------	------	------	1.06	1.16	5.06	.03	.47	.45	----	-----	-----	----	--------	--------	6.46	7.67	13.03	49	Crawford
Crittenden	5.79	-----	5.79	.17	-----	.17	.68	.06	.02	.76	38.58	------	38.58	39.33	-----	39.33	4.13	.76	4.89	----	-----	-----	----	--------	--------	88.74	.78	89.52	34	Crittenden
Cross	2.20	-----	2.20	.30	-----	.30	.46	.13	.03	.62	189.05	------	189.05	31.30	-----	31.30	3.43	1.37	4.80	----	-----	-----	----	--------	--------	226.87	1.40	228.27	17	Cross
Dallas	.76	-----	.76	.14	-----	.14	.35	.04	.07	.46	------	.72	.72	.22	-----	.22	.14	.05	.19	----	-----	-----	----	--------	--------	1.66	.84	2.49	67	Dallas
Desha	1.35	-----	1.35	.97	11.62	12.59	.48	.07	.10	.65	100.30	33.43	133.73	31.12	11.40	42.52	14.15	1.84	15.99	----	-----	-----	----	--------	--------	148.44	58.39	206.83	19	Desha
Drew	2.82	-----	2.82	.01	-----	.01	.38	.11	.16	.65	33.51	8.38	41.89	10.50	1.16	11.66	1.11	.66	1.77	----	8.93	8.93	----	--------	--------	48.44	19.29	67.73	36	Drew
Faulkner	.84	3.61	4.45	.03	.12	.16	1.69	.31	.47	2.47	.43	8.15	8.58	-----	1.32	1.32	-----	.85	.85	----	10.71	10.71	----	--------	--------	3.30	25.23	28.53	39	Faulkner
Franklin	-----	1.22	1.22	.19	.03	.22	.58	.26	.37	1.20	1.13	------	1.13	-----	1.84	1.84	-----	.09	.09	----	-----	-----	----	8,901.82	8,904.82	2.15	8,906.07	8,910.22	2	Franklin
Fulton	.38	-----	.38	.02	-----	.02	.47	.11	.60	1.18	------	------	------	-----	.09	.09	-----	.91	.91	----	-----	-----	----	--------	--------	.98	1.60	2.58	66	Fulton
Garland	.13	10.26	10.39	.61	2.66	3.17	1.17	.08	.12	1.32	------	------	------	-----	.06	.06	-----	1.01	1.01	----	-----	-----	----	1,316.00	1,316.00	1.84	1,330.10	1,331.94	6	Garland
Grant	1.30	.04	1.34	.07	.03	.10	.25	.09	.14	.48	------	------	------	-----	.08	.08	.17	.29	.46	----	-----	-----	----	--------	--------	1.88	.55	2.43	69	Grant
Greene	2.99	-----	2.99	.17	-----	.17	.88	.27	.48	1.43	126.98	------	126.98	4.02	2.23	7.16	7.92	.81	8.73	----	6.96	6.96	----	--------	--------	144.23	9.17	153.40	26	Greene
Hempstead	2.64	-----	2.64	.01	-----	.01	1.08	.77	1.16	3.00	------	------	------	.74	.81	1.26	.02	.66	.68	----	1.61	1.61	----	--------	--------	6.16	3.83	8.07	60	Hempstead
Hot Spring	.06	1.48	1.56	.22	3.56	3.78	.31	.11	.17	.59	------	1.94	1.94	.87	.16	.43	-----	2.39	2.39	----	-----	-----	----	1,355.83	1,355.83	1.35	1,366.33	1,366.78	5	Hot Spring
Howard	.12	.71	.83	.49	.23	.72	.66	.81	1.37	2.84	------	------	------	.09	.03	.12	-----	.80	.80	----	-----	-----	----	--------	--------	2.17	3.14	5.31	46	Howard
Independence	1.17	2.76	3.92	.09	.05	.14	.92	.21	.49	1.62	13.94	------	13.94	3.40	.05	3.45	.10	.36	.46	----	-----	-----	----	--------	--------	19.83	3.69	23.52	42	Independence
Izard	1.22	-----	1.22	.01	1.06	1.07	.41	.13	.88	1.21	------	------	------	.04	.11	.15	.05	-----	.05	----	-----	-----	----	--------	--------	1.83	1.95	3.70	62	Izard
Jackson	1.32	-----	1.32	.79	-----	.79	.36	.14	.10	.60	178.94	6.54	184.62	27.90	-----	27.90	3.40	.76	4.16	----	-----	-----	----	--------	--------	212.89	6.39	219.28	18	Jackson
Jefferson	11.63	-----	11.63	46.46	.23	46.68	.48	.12	.17	.77	132.64	21.69	154.23	14.98	-----	14.98	7.24	2.04	9.28	----	16.63	16.63	----	--------	--------	212.64	39.66	252.20	16	Jefferson
Johnson	-----	1.96	1.96	.10	-----	.10	.84	.34	.50	1.68	.84	------	.84	1.72	.45	2.17	.03	.92	.95	----	-----	-----	----	--------	--------	3.87	3.83	7.70	53	Johnson
Lafayette	.80	-----	.80	.19	.23	.42	.36	.31	.47	1.13	16.27	------	16.27	3.77	1.69	5.46	.85	.81	1.16	----	-----	-----	1.68	--------	1.68	23.02	2.80	25.82	41	Lafayette
Lawrence	1.28	.05	1.33	.01	.23	.24	.62	.04	.33	1.01	136.16	------	136.16	14.48	-----	14.48	1.30	.21	1.51	----	13.39	13.39	----	--------	--------	154.11	14.21	168.32	23	Lawrence
Lee	1.40	-----	1.40	.01	-----	.01	.71	.12	.08	.91	84.29	32.83	-----	32.83	-----	32.83	.23	2.43	2.70	----	-----	-----	----	--------	--------	119.43	2.51	121.14	28	Lee
Lincoln	.88	-----	.88	.40	-----	.40	.16	.16	.24	.56	78.34	17.20	95.54	9.01	1.61	10.62	1.22	2.56	3.78	----	-----	-----	----	--------	--------	90.16	21.61	111.77	31	Lincoln
Little River	0.89	-----	0.89	0.47	69.64	70.11	0.68	0.24	0.36	1.28	0.77	2.71	3.48	2.88	0.44	3.32	-----	0.21	0.21	----	-----	-----	----	--------	--------	6.63	73.56	79.19	35	Little River
Logan	.10	1.50	1.60	.04	.01	.05	.87	.65	.98	2.50	.47	-----	.47	.46	-----	.46	-----	.17	.17	----	-----	-----	----	--------	--------	2.59	2.49	5.08	57	Logan
Lonoke	2.54	-----	2.54	1.28	-----	1.28	1.42	.30	.46	2.18	206.33	45.29	251.62	40.52	2.79	43.31	123.04	1.92	124.96	----	-----	-----	----	--------	--------	376.43	50.46	426.89	9	Lonoke
Madison	.02	.65	.67	.01	-----	.01	.76	.37	2.10	3.23	------	------	------	-----	.16	.16	-----	.16	.16	----	-----	-----	----	--------	--------	1.16	2.97	4.13	60	Madison
Marion	.66	-----	.66	.22	.06	.28	.54	.09	.60	1.13	------	------	------	-----	.01	.01	3.97	.05	4.02	----	-----	-----	----	--------	--------	6.38	.62	6.00	64	Marion
Miller	.20	2.60	2.80	.23	.23	.46	.93	.48	.72	2.13	3.42	6.36	8.77	.47	2.18	2.65	.40	-----	.40	----	8.83	8.83	----	--------	--------	6.13	16.61	22.74	43	Miller
Mississippi	7.09	-----	7.09	3.80	-----	3.80	.79	.07	.02	.88	16.88	19.40	35.28	14.06	2.23	16.26	2.50	.01	2.51	----	25.00	25.00	----	--------	--------	44.18	45.66	90.84	33	Mississippi
Monroe	1.25	-----	1.25	.02	-----	.02	.24	.02	.03	.29	95.63	14.28	109.95	29.98	-----	29.98	39.80	.66	40.46	----	-----	-----	----	--------	--------	156.68	14.97	171.65	22	Monroe
Montgomery	-----	.16	.16	.10	.04	.14	.64	.29	.43	1.36	------	------	------	-----	.14	.14	-----	.14	.14	----	-----	-----	----	--------	--------	.93	.91	1.84	71	Montgomery
Nevada	.63	-----	.63	.04	-----	.04	.66	.36	.62	1.42	------	------	------	.26	.01	.27	-----	-----	-----	----	-----	-----	----	--------	--------	1.83	.57	2.40	70	Nevada
Newton	.10	-----	.10	.17	-----	.17	.50	.06	.32	.88	------	------	------	-----	.08	.08	-----	-----	-----	----	-----	-----	----	--------	--------	.83	.37	1.20	76	Newton
Ouachita	.98	2.10	3.08	2.64	7.84	10.48	.27	.14	.21	.62	------	------	------	.02	-----	.02	.04	.04	.08	----	-----	-----	----	43.27	43.27	4.09	63.46	67.55	37	Ouachita
Perry	.10	.20	.30	.02	-----	.02	.40	.19	.29	.88	------	4.26	4.26	.01	.47	.48	-----	.24	.24	----	2.14	2.14	----	--------	--------	.72	7.59	8.31	62	Perry
Phillips	3.41	-----	3.41	2.44	-----	2.44	.62	.11	.16	.79	34.45	.35	34.80	42.83	-----	42.83	.04	.09	.13	----	-----	-----	0.06	226.18	226.23	83.86	226.78	310.63	13	Phillips
Pike	.06	.90	.96	.27	.33	.60	.66	.40	.60	1.66	.68	-----	.68	-----	.60	.60	-----	-----	-----	----	-----	-----	----	202.00	202.00	1.87	204.43	206.30	20	Pike
Poinsett	2.83	-----	2.83	.43	-----	.43	.32	.12	.08	.52	278.34	-----	278.34	23.86	-----	23.86	3.24	4.08	7.32	6.36	-----	6.36	----	--------	--------	318.50	4.16	319.66	12	Poinsett
Polk	.22	.62	.34	.03	.06	.09	.85	.30	1.04	2.63	------	------	------	-----	.20	.20	-----	.14	.14	----	-----	-----	----	--------	--------	1.54	2.06	3.90	61	Polk
Pope	-----	8.06	8.06	.47	-----	.47	1.68	.60	.91	3.09	1.23	-----	1.23	1.34	.10	1.44	-----	.11	.11	----	.84	.84	----	8,773.24	8,773.24	3.22	8,779.96	8,783.18	3	Pope
Prairie	.87	-----	.87	-----	-----	-----	.10	.06	.12	.30	136.76	33.94	169.70	21.64	6.98	28.62	29.30	22.09	51.39	----	-----	-----	----	--------	--------	187.67	63.13	250.80	14	Prairie
Pulaski	3.38	52.30	55.68	.71	1.44	2.15	6.80	.11	.16	6.07	13.86	2.87	16.63	9.75	1.13	10.88	1.26	1.59	2.85	----	-----	-----	1.03	--------	1.03	36.58	59.60	96.17	32	Pulaski
Randolph	.16	.58	.74	.01	-----	.01	.73	.06	.32	1.11	38.63	2.46	40.89	3.36	-----	3.36	.44	.25	.69	----	6.96	6.96	----	--------	--------	45.28	9.66	52.84	38	Randolph
St. Francis	2.93	-----	2.93	.31	-----	.31	.48	.16	.04	.68	104.46	8.09	113.55	32.82	-----	32.82	.45	1.62	2.07	----	-----	-----	.03	.88	.91	141.64	11.63	153.27	25	St. Francis
Saline	.76	3.68	4.43	.27	1.98	2.25	1.64	.09	.13	2.06	.06	.06	.12	.01	.06	.06	.10	.17	.27	----	-----	-----	----	--------	--------	3.14	6.07	9.19	46	Saline
Scott	-----	.84	.84	.01	-----	.01	.62	.43	.64	1.69	------	------	------	-----	.01	.01	-----	.06	.06	----	-----	-----	----	--------	--------	1.06	1.54	2.60	65	Scott
Searcy	.25	-----	.25	.01	-----	.01	.66	.10	.56	1.22	------	------	------	-----	.01	.01	-----	-----	-----	----	-----	-----	----	--------	--------	.92	.57	1.49	73	Searcy
Sebastian	.08	18.88	18.96	.05	.23	.28	.89	.34	.51	1.74	------	------	------	.61	.02	.63	-----	.88	.88	----	-----	-----	----	--------	--------	1.98	20.53	22.51	44	Sebastian
Sevier	.20	2.06	2.26	.12	.04	.16	.63	.64	.95	2.22	------	------	------	-----	.93	.93	-----	-----	-----	----	-----	-----	----	--------	--------	1.59	3.98	5.57	55	Sevier
Sharp	1.42	.14	1.56	.01	-----	.01	.39	.07	.42	.88	------	------	------	-----	.06	.06	-----	.66	.66	----	-----	-----	----	--------	--------	1.89	1.18	3.07	63	Sharp
Stone	.02	.46	.48	.05	-----	.05	.67	.19	1.10	1.86	------	.08	.08	-----	.34	.34	.02	.04	.06	----	-----	-----	----	--------	--------	.80	2.02	2.82	64	Stone
Union	7.88	-----	7.88	8.20	.29	8.49	.36	.21	.32	.88	------	------	------	-----	.11	.11	.10	.02	.12	----	-----	-----	----	--------	--------	16.74	.74	17.48	46	Union
Van Buren	.04	.76	.80	.01	-----	.01	.52	.14	.81	1.47	------	------	------	.02	.07	.09	-----	.12	.12	----	-----	-----	----	--------	--------	.73	1.76	2.49	68	Van Buren
Washington	.02	14.98	15.00	.03	.07	.10	2.20	2.62	1.76	6.60	------	------	------	.80	.80	1.07	.14	4.11	-----	----	-----	-----	----	--------	--------	8.74	19.77	28.51	40	Washington
White	.55	4.37	4.92	.04	-----	.04	1.22	.43	.65	2.30	36.36	36.36	72.72	13.00	6.86	19.86	.86	3.46	4.30	----	13.39	13.39	----	--------	--------	62.46	66.08	117.53	29	White
Woodruff	.80	-----	.80	.02	-----	.02	.30	.06	.07	.42	128.72	-----	128.72	36.96	-----	36.96	.66	3.86	4.60	----	-----	-----	.22	29.78	30.00	167.72	33.70	201.42	21	Woodruff
Yell	.53	.21	1.74	1.26	.23	1.49	.72	.89	1.33	2.94	.89	3.60	4.49	1.38	.03	1.38	-----	.47	.47	----	3.67	3.67	----	10,635.00	10,635.00	6.14	10,644.94	10,651.08	1	Yell
Total	109.96	162.85	262.81	90.04	146.07	236.11	56.57	22.00	38.38	117.95	2,687.02	623.32	3,410.34	597.47	74.40	671.87	284.98	130.14	415.12	8.36	133.92	139.28	3.06	35,458.17	35,461.23	4,066.46	36,857.80	40,714.26		

[1]To convert million gallons per day to acre-feet per year, multiply by 1,120.
[2]Includes thermoelectric- and hydroelectric-energy generation.

REFERENCE 25

TELECON NOTE
AR DEPT. OF POLLUTION CONTROL & ECOLOGY

SITE ID. NUMBER:	DATE:	TIME:
ARD983285255	November 20, 1992	0851 Hours

DISTRIBUTION: ICI Burial Pit
12th and Cedar Street
North Little Rock, AR 72114

BETWEEN:	OF:	PHONE:
Fred Glover, Manager	NLR Waterworks	1-(501)-758-4445

AND: Tammie J. Hynum, Inspector, ADPC&E

DISCUSSION:

Requested information regarding where drinking water is obtained.

NLR Waterworks purchases surface water from Little Rock Waterworks. Little Rock Waterworks obtains surface water from Lake Maumelle and Lake Winona. The surface water NLR Waterworks purchases from Little Rock Waterworks comes from Lake Winona.

NLR Waterworks has a 17 million gallon holding tank in which the water is stored. They have 6 lines that run throughout the area to serve the water to the community. NLR Waterworks serves a total population of 116,610 (102,000 being within NLR city limits and 14,610 consecutive population). No post treatment is conducted at the NLR water plant. NLR Waterworks has pump stations located at Montgomery, Park Hill, and Crystal Hill.

Informed Mr. Glover as to the location of ICI. Mr. Glover confirmed that NLR Waterworks would supply drinking water to this site.

ACTION ITEMS:

REFERENCE 26

TELECON NOTE
AR DEPT. OF POLLUTION CONTROL & ECOLOGY

SITE ID. NUMBER:	DATE:	TIME:
ARD983285255	December 17, 1992	1440 Hours

DISTRIBUTION: ICI Burial Pit
12th and Cedar Street
North Little Rock, AR 72114

BETWEEN:	OF:	PHONE:
Tamara Almand, Sanitarian	NLR Health Dept.	1-(501)-758-1540

AND: Tammie J. Hynum
Tammie J. Hynum, Inspector, ADPC&E

DISCUSSION:

Requested information regarding whether there were any private drinking water wells located within a 4-mile radius of ICI, which is located in Range 12 West, Township 2 North, Section 35.

There are no private wells located within a 4-mile radius of this site. All residents living within this radius obtain drinking water from NLR Waterworks. NLR Waterworks purchases surface water from Little Rock Waterworks. Little Rock Waterworks obtains surface water from Lake Maumelle and Lake Winona. The surface water NLR Waterworks purchases from Little Rock Waterworks comes from Lake Winona.

ACTION ITEMS:

REFERENCE 27

ARKANSAS

COMMUNITY PUBLIC WATER SYSTEM LIST

JULY 15, 1991

ARKANSAS DEPARTMENT OF HEALTH

DIVISION OF ENGINEERING

TREATMENT AND CHEMICAL CODES

AERATION

0	No Aeration
1	Cascade/Tray
2	Induced Draft
3	Forced Draft
4	Pressure Aeration
5	Destratification
9	Other

COAGULATION/FLOCCULATION

0	No Coagulation/Flocculation
1	Hydraulic
5	Mechanical
9	Other

SEDIMENTATION

0	No Sedimentation
1	Standard
2	Standard w/ Tube Settlers
3	Upflow
4	Upflow w/ Tube Settlers
5	Reaction Basin / Contact Chamber
6	Upflow w/ Suspended Media
9	Other

FILTRATION

0	No Filtration
1	Gravity - Surface
2	Gravity - Fe/Mn
3	Gravity - Softening
4	Pressure
5	Pressure - Fe/Mn
9	Other

DISINFECTION

0	No Disinfection
1	Prechlorination
2	Postchlorination
3	Pre & Postchlorination
4	Booster / Rechlorination
9	Other

FLUORIDATION

0	None (< 0.7 mg/l)
1	Natural (> 0.7 mg/l)
2	Saturator
3	Solution Feeder
4	Volumetric Dry Feeder
5	Gravimetric Feeder
8	Buys Fluoridated Water
9	Other

LIMITING FACTORS

0	Unknown
1	Source - Quantity
2	Raw Water Pumpinty
3	Aeration
4	Coagulation/Sedimentation
5	Filtration
6	High Service Pumping
7	Chemical Feed
8	Purchase Contract
9	Source - Hydraulic Capacity

CHEMICALS

001	Gas Chlorine
002	Calcium Hypochlorite
003	Sodium Hypochlorite
004	Potassium Permanganate
005	Copper Sulfate

CHEMICALS

006	Ferric Chloride
007	Lime
008	Alum
009	Soda Ash
010	Caustic Soda
011	Sodium Aluminate
012	Carbon Dioxide
013	Ammonia
014	Hydorfluosilicic Acid
015	Sodium Fluoride
016	Sodium Silicofluoride
017	Powdered Activated Carbon
018	Sodium Hexametaphosphate
019	Bentonite Clay
020	Sodium Chloride
021	Zinc Polyphosphate
022	Chlorine Dioxide
023	Dow Polymer NP-10P
024	Celanese HRL100
025	Mogul Polymer 8043N
026	Westo Formula 9326
027	Percol LT20
028	Westo Formula 8314
029	Nalco Naclear 7766
030	Aquadene
031	Westo Formula 950P
032	Polyaluminum Chloride
033	Aquamag
034	Westo Formula 2220
035	Westo Formula 9348
036	Westo Formula 9363
037	Westo Floc 84
038	Zinc Chloride
039	Tetrapotassium Pyrophosphate
040	Calgon 233
041	Nalcolite 8100
042	Westo Formula 9411
043	Zinc Orthophosphate
044	Westo Formula 9412
045	
046	

NOTE:
This publication is produced as a public service for informational purposes only. The Arkansas Department of Health makes no guarantees as to the accuracy of the contents of this document.

WATER SYSTEM NAME ADDRESS PWS ID # CITY, STATE & ZIP CODE	OPERATOR'S NAME COUNTY (OF OFFICE) PURCHASES FROM PWS #	SOURCE TYPE TREATMENT CODES CHEMICAL CODES	OFFICE TELEPHONE PLANT TELEPHONE	POPULATION SERVED CONSECUTIVE POPULATION TOTAL POPULATION
LINCOLN WATERWORKS 572 LINCOLN, AR 72744-0000	BILL KEEN WASHINGTON COUNTY	SURFACE A0 C5 S3 F1 D3 FL0 SF0 LF5 001 007 008 017 004	501-824-3453 501-824-3453	3,000 0 3,000
LISBON WATER ASSOCIATION 101 WOTAPI 716 EL DORADO AR 71730-0000	ROBERT MCKINNON UNION COUNTY 550	GROUND PURCHASED A0 C0 S0 F0 D4 FL0 SF0 LF6 002	501-863-3989	413 0 413
LITTLE CREEK WATER ASSOCIATION P. O. BOX 598 214 SHERIDAN, AR 72150-0000	LEVON BROWN, MGR GRANT COUNTY 215	GROUND PURCHASED A0 C0 S0 F0 D0 FL8 SF0 LF8	501-942-5812	1,600 0 1,600
LITTLE RIVER CO RDA P.O. BOX 527 787 FOREMAN, AR 71836-0000	BUDDY BELL LITTLE RIVER COUNTY	SURFACE A0 C5 S1 F1 D3 FL4 SF0 LF5 001 007 008 017	501-000-0000 501-000-0000	0 0 0
LITTLE RIVER COUNTRY CLUB STAR ROUTE BOX 95 467 WINTHROP, AR 71866-0000	ROGER MCGOUGH LITTLE RIVER COUNTY	GROUND A0 C0 S0 F0 D2 FL0 SF0 LF2 001	501-381-7408	200 0 200
LITTLE RIVER WATER ASSOCIATION P. O. BOX 119 371 ETOWAH, AR 72428-0000	MERL D. STOKES, SUPT MISSISSIPPI COUNTY	GROUND A4 C0 S0 F5 D1 FL0 SF0 LF2 001	501-531-2158	1,200 0 1,200
→ LITTLE ROCK MUN. WATER WORKS N MARTIN & HILL ST. 465 LITTLE ROCK, AR 72205-0000	JIM HARVEY, ASST MGR PULASKI COUNTY	SURFACE A0 C5 S1 F1 D3 FL6 SF0 LF1 001 016 007 008 017 014 021	501-377-1200 501-377-1240	194,629 150,856 345,485
LOCKESBURG WATERWORKS P. O. BOX 14 517 LOCKESBURG, AR 71846-0000	WILLIAM SURBER SEVIER COUNTY	GROUND A0 C0 S0 F0 D2 FL0 SF0 LF2 001	501-289-3261	613 0 613
LOCUST BAYOU WATER ASSOCIATION ROUTE 4, BOX 246 H 102 CAMDEN, AR 71701-0000	DUANE DICKEY OUACHITA COUNTY 407	GROUND PURCHASED A0 C0 S0 F0 D0 FL0 SF0 LF9	501-836-2241 501-574-0634	983 0 983
LONDON WATERWORKS P. O. BOX 130 443 LONDON, AR 72847-0000	MAYOR DIXON POPE COUNTY 446	SURFACE PURCHASED A0 C0 S0 F0 D0 FL8 SF0 LF8 002	501-293-4513	540 0 540
LONG LAKE WATER ASSOCIATION 702 CHERRY ST. 274 HELENA, AR 72342-0000	DENNIS SULLIVAN PHILLIPS COUNTY 419	GROUND PURCHASED A0 C0 S0 F0 D4 FL8 SF0 LF8 001 001	501-338-7438 501-338-8401	500 0 500
LONOKE WATERWORKS 203 WEST FRONT ST 343 LONOKE, AR 72086-0000	MELVIN MURPHY, MGR LONOKE COUNTY	GROUND A3 C0 S5 F5 D1 FL3 SF0 LF5 001 004 007 029 014	501-676-6658 501-676-2688	4,650 0 4,650

WATER SYSTEM NAME ADDRESS PWS ID # CITY, STATE & ZIP CODE	OPERATOR'S NAME COUNTY (OF OFFICE) PURCHASES FROM PWS #	SOURCE TYPE TREATMENT CODES CHEMICAL CODES	OFFICE TELEPHONE PLANT TELEPHONE	POPULATION SERVED CONSECUTIVE POPULATION TOTAL POPULATION
NORTH CARBON CITY WATER ASS'N ROUTE 2, BOX 251 331 PARIS, AR 72855-0000	ALAN LOONEY, PRES. LOGAN COUNTY 328	SURFACE PURCHASED A0 C0 S0 F0 D0 FL0 SF0 LF9	501-963-3113	120 0 120
NORTH CROSSETT WATERWORKS P. O. BOX 576 022 CROSSETT, AR 71635-0000	HARRY WALKER ASHLEY COUNTY	GROUND A0 C0 S0 F0 D1 FL0 SF0 LF0 001	501-364-2188 501-364-2188	3,175 200 3,375
NORTH EAST CROSSETT WATER ASSN P. O. BOX 576 023 CROSSETT, AR 71635-0000	HARRY WALKER ASHLEY COUNTY 022	GROUND PURCHASED A0 C0 S0 F0 D0 FL0 SF0 LF1	501-364-2188 501-364-2188	200 0 200
NORTH EAST WATER ASS'N ROUTE 2, BOX 226X 007 DE WITT, AR 72042-0000	W. R. DOLLAR ARKANSAS COUNTY 008	GROUND PURCHASED A0 C0 S0 F0 D0 FL0 SF0 LF8	501-946-1638	507 0 507
NORTH EAST WATER ASSOCIATION P. O. DRAWER J 033 MOUNTAIN HOME, AR 72653-0000	DOYNE G. RIGGS BAXTER COUNTY 025	SURFACE PURCHASED A0 C0 S0 F0 D4 FL8 SF0 LF8 001	501-492-6332 501-492-5628	3,750 0 3,750
NORTH JACKSON CO. WATER ASSN. DRAWER K 767 TUCKERMAN, AR 72473-0000	JAMES TODD COLE JACKSON COUNTY 266	GROUND PURCHASED A0 C0 S0 F0 D0 FL0 SF0 LF9	501-349-2338 501-349-5645	350 0 350
NORTH LA GRUE WATER ASS'N ROUTE 2, BOX 226X 012 DE WITT, AR 72042-0000	W. R. DOLLAR ARKANSAS COUNTY 008	GROUND PURCHASED A0 C0 S0 F0 D0 FL0 SF0 LF1	501-946-1638	349 0 349
→ NORTH LITTLE ROCK WATERWORKS P. O. BOX 796 453 NO. LITTLE ROCK, AR 72115-	FRED GLOVER, MGR. PULASKI COUNTY 465	SURFACE PURCHASED A0 C0 S0 F0 D0 FL8 SF0 LF9	501-758-4445 501-835-6741	102,000 14,610 116,610
NORTH PULASKI CO. WATER ASS'N 1010 S REDMOND ROAD 725 JACKSONVILLE, AR 72076-0000	PAUL PAYNE PULASKI COUNTY 724	SURFACE PURCHASED A0 C0 S0 F0 D0 FL8 SF0 LF8	501-982-0734 501-000-0000	2,559 0 2,559
NORTH WHITE CO. WATER ASS'N ROUTE 1, BOX 327B 583 JUDSONIA, AR 72081-0000	LYNN BREWER WHITE COUNTY 590	SURFACE PURCHASED A0 C0 S0 F0 D0 FL8 SF0 LF2	501-729-5224	2,211 0 2,211
NORTHERN HILLS MHP WATERWORKS ROUTE 2, BOX 368B 659 LOWELL, AR 72745-0000	BILL LAWRENCE WASHINGTON COUNTY 575	SURFACE PURCHASED A0 C0 S0 F0 D1 FL8 SF0 LF8	501-756-6945	300 0 300
NORTHERN MALVERN WATER ASSN. P. O. BOX 1078 763 MALVERN, AR 72104-0000	RAYMOND HARRIS HOT SPRING COUNTY 237	SURFACE PURCHASED A0 C0 S0 F0 D3 FL8 SF0 LF0 001	501-337-1548 501-332-2758	780 0 780

REFERENCE 28

U.S. Department of Commerce
Economics and Statistics Administration
BUREAU OF THE CENSUS

JUN 0 2 1992

1990 CPH-1-5

CENSUS '90

1990 Census of Population and Housing

Summary Population and Housing Characteristics

Arkansas

OFFICE COPY
Source: Population Estimates Branch
Bureau of the Census

S/N 003-024-07304-8
(324 pp.)
$16.00

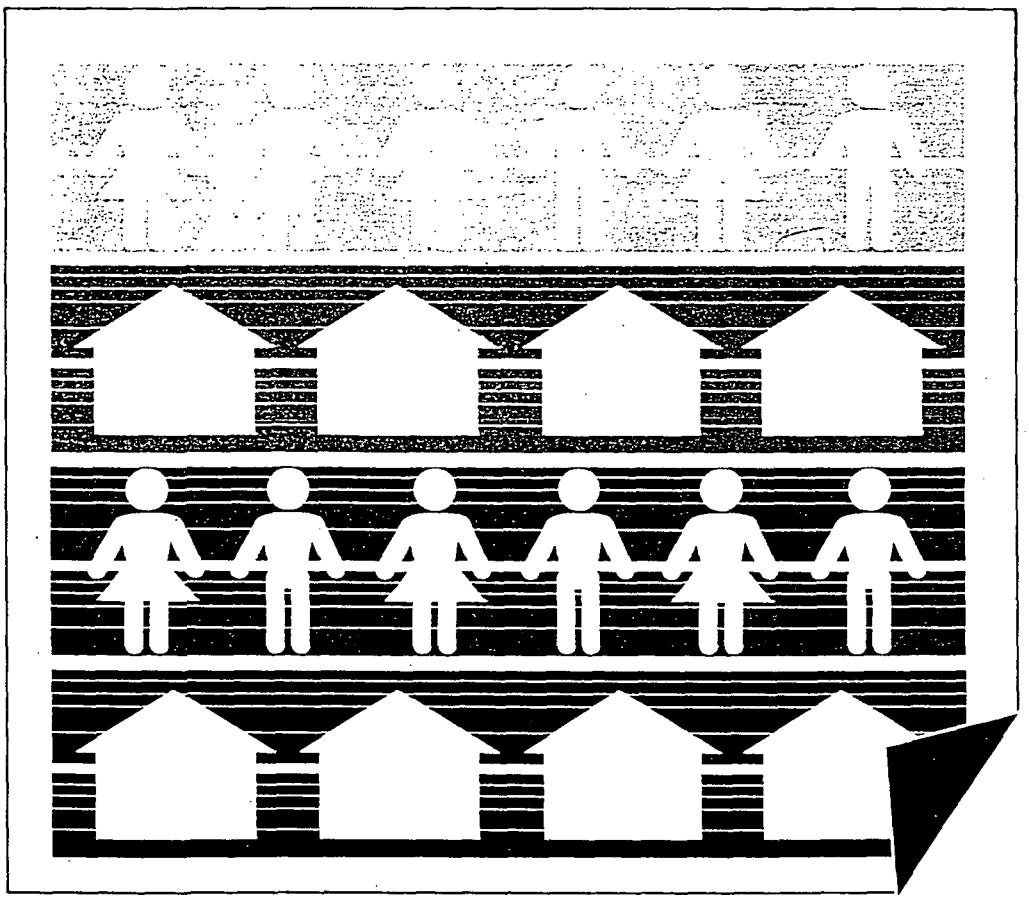
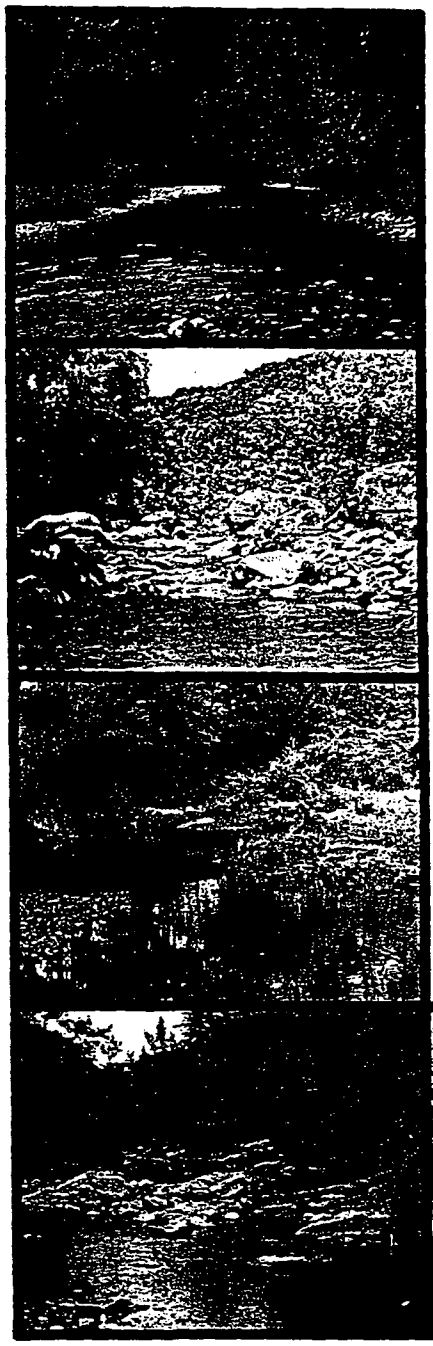


Table 6. Household, Family, and Group Quarters Characteristics: 1990—Con.

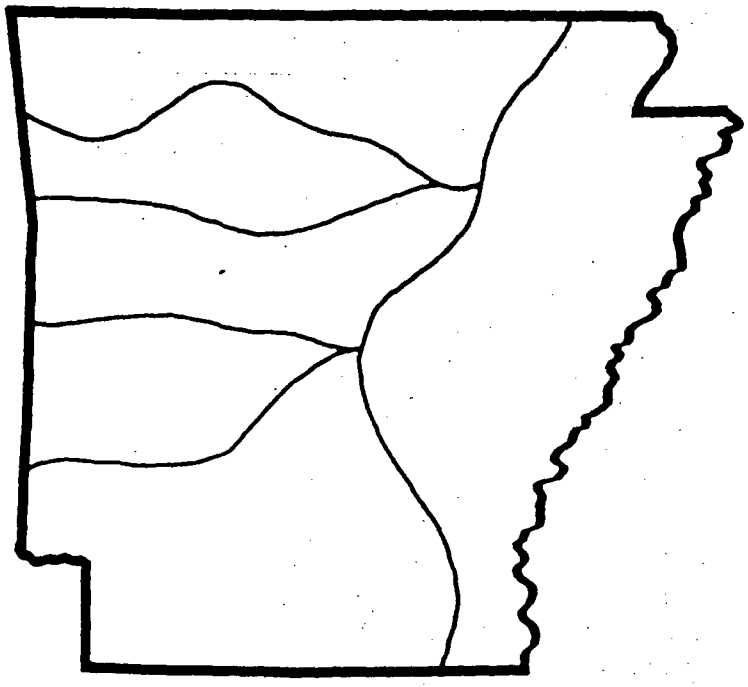
[For definitions of terms and meanings of symbols, see text]

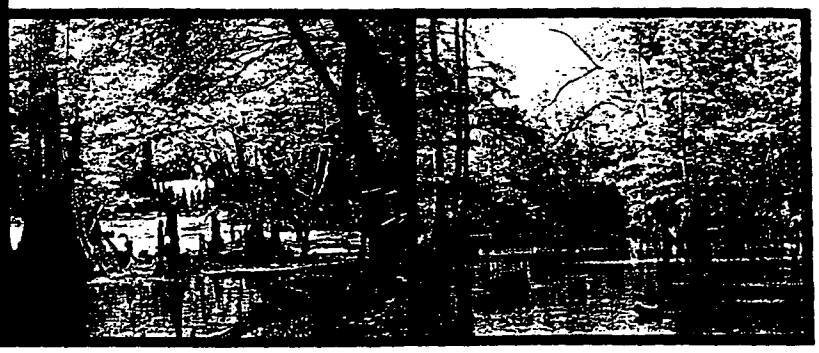
State County Place and [In Selected States] County Subdivision	Persons in households	All households	Family households: Total	Family households: Married-couple family	Family households: Female householder, no husband present	Nonfamily households: Total	Nonfamily households: Householder living alone: Total	Nonfamily households: Householder living alone: 65 years and over: Total	Nonfamily households: Householder living alone: 65 years and over: Female	Persons per— Household	Persons per— Family	Persons in group quarters: Total	Persons in group quarters: Institutionalized persons	Persons in group quarters: Other persons in group quarters
PLACE AND COUNTY SUBDIVISION—Con.														
Lavaca city, Sebastian County	1 253	451	372	319	44	79	75	38	30	2.78	3.12	-	-	-
Leachville city, Mississippi County	1 743	743	509	424	65	234	220	149	124	2.35	2.90	-	-	-
Lead Hill town, Boone County	283	123	89	77	9	34	34	27	17	2.30	2.79	-	-	-
Leola town, Grant County	476	172	142	119	17	30	26	12	9	2.77	3.07	-	-	-
Leporto city, Poinsett County	2 033	810	581	458	106	229	221	152	120	2.51	3.06	-	-	-
Leslie city, Searcy County	446	199	123	98	15	76	74	60	45	2.24	2.94	-	-	-
Letona town, White County	218	88	68	63	3	20	19	15	8	2.48	2.87	-	-	-
Lewisville city, Lafayette County	1 407	544	379	264	96	165	160	100	85	2.59	3.22	17	17	-
Lexa city, Phillips County	295	117	84	67	11	33	32	17	12	2.52	3.10	-	-	-
Lincoln city, Washington County	1 460	610	418	329	72	192	184	130	117	2.39	2.96	-	-	-
Little Rock city, Benton County	944	338	285	267	12	53	44	16	13	2.79	3.07	-	-	-
Little Rock city, Pulaski County	171 916	72 573	45 484	32 978	10 493	27 089	23 283	7 337	6 018	2.37	3.04	3 879	2 562	1 317
Lockesburg town, Sevier County	608	252	181	146	28	71	64	47	41	2.41	2.90	-	-	-
London city, Pope County	811	312	234	195	33	78	69	32	24	2.60	3.05	14	-	14
Lonoke city, Lonoke County	3 836	1 491	1 078	841	201	413	386	226	197	2.57	3.11	186	179	7
Lonsdale town, Garland County	127	39	33	30	2	6	5	2	1	3.26	3.61	-	-	-
Louann town, Ouachita County	158	60	42	33	7	18	16	9	9	2.63	3.17	-	-	-
Lowell city, Benton County	1 224	477	360	309	33	117	98	45	34	2.57	2.96	-	-	-
Luxora town, Mississippi County	1 338	462	343	196	132	119	112	67	44	2.90	3.47	-	-	-
Lynn town, Lawrence County	299	128	91	82	8	37	34	24	18	2.34	2.82	-	-	-
McCaskill city, Hempstead County	75	31	22	18	3	9	9	5	5	2.42	2.95	-	-	-
McCrory city, Woodruff County	1 853	744	524	394	107	220	208	141	118	2.49	3.06	118	118	-
McDougal town, Clay County	208	96	68	63	5	28	27	17	14	2.17	2.63	-	-	-
McGehee city, Desha County	4 876	1 845	1 326	925	343	519	472	269	208	2.64	3.19	121	121	-
McNab town, Hempstead County	95	30	22	17	4	8	6	5	3	3.17	3.68	-	-	-
McNeil city, Columbia County	686	250	174	116	49	76	74	39	28	2.74	3.45	-	-	-
McRae city, White County	669	273	186	150	24	87	82	50	41	2.45	3.05	-	-	-
Madison city, St. Francis County	1 263	402	302	161	120	100	95	57	45	3.14	3.78	-	-	-
Magazine city, Logan County	799	300	230	190	31	70	64	40	35	2.66	3.13	-	-	-
Magness town, Independence County	157	69	46	39	3	23	22	17	15	2.28	2.85	1	-	1
Magnolia city, Columbia County	10 257	4 282	2 816	2 059	637	1 466	1 344	722	595	2.40	3.04	894	244	650
Malvern city, Hot Spring County	9 032	3 836	2 574	1 901	558	1 262	1 205	730	599	2.35	2.96	224	178	46
Mammoth Spring city, Fulton County	1 097	482	317	273	39	165	164	112	79	2.28	2.91	-	-	-
Manila city, Mississippi County	2 584	1 063	747	613	106	316	291	174	148	2.43	2.97	51	51	-
Mansfield city	1 018	412	303	259	32	109	106	62	46	2.47	2.98	-	-	-
Scott County	416	162	121	101	14	41	39	20	13	2.57	3.08	-	-	-
Sebastian County	602	250	182	158	18	68	67	42	33	2.41	2.91	-	-	-
Marianna city, Lee County	5 783	2 068	1 440	807	571	628	583	341	264	2.80	3.49	127	107	20
Marie town, Mississippi County	129	37	29	21	5	8	7	3	1	3.49	3.90	-	-	-
Marion city, Crittenden County	4 204	1 477	1 226	1 020	169	251	223	59	44	2.85	3.16	187	170	17
Marked Tree city, Poinsett County	2 986	1 158	801	540	228	357	341	191	150	2.58	3.22	114	114	-
Marmaduke city, Greene County	1 131	472	338	278	55	134	126	84	78	2.40	2.90	33	33	-
Marshall city, Searcy County	1 241	555	368	312	41	187	176	127	110	2.24	2.80	77	77	-
Marvell city, Phillips County	1 457	582	387	250	122	195	187	121	99	2.50	3.20	88	88	-
Maumelle city, Pulaski County	6 714	2 540	1 965	1 705	216	575	502	178	159	2.64	3.06	-	-	-
Mayflower city, Faulkner County	1 415	594	450	389	45	144	126	56	43	2.38	2.76	-	-	-
Maynard town, Randolph County	354	152	104	92	8	48	47	34	28	2.33	2.92	-	-	-
Melbourne city, Izard County	1 501	654	439	352	72	215	210	144	120	2.30	2.89	61	61	-
Mena city, Polk County	5 292	2 360	1 555	1 259	244	805	761	502	420	2.24	2.82	183	183	-
Menifee city, Conway County	355	126	86	56	27	40	40	20	9	2.82	3.62	-	-	-
Midland town, Sebastian County	220	84	70	63	5	14	14	9	5	2.62	2.94	-	-	-
Mineral Springs city, Howard County	1 004	388	288	230	46	100	97	65	48	2.59	3.06	-	-	-
Minturn town, Lawrence County	124	51	36	29	6	15	14	5	2	2.43	3.00	-	-	-
Mitchellville city, Desha County	513	167	116	56	52	51	49	29	19	3.07	3.91	-	-	-
Monette city, Craighead County	1 115	506	323	256	54	183	173	122	107	2.20	2.80	-	-	-
Monticello city, Drew County	7 424	2 942	2 071	1 462	515	871	788	381	316	2.52	3.06	692	196	496
Montrose city, Ashley County	528	186	128	82	40	58	51	38	34	2.84	3.52	-	-	-
Moorefield town, Independence County	160	62	49	39	9	13	12	4	4	2.58	2.98	-	-	-
Moro town, Lee County	287	112	90	76	10	22	21	11	9	2.56	2.93	-	-	-
Morrilton city, Conway County	6 240	2 601	1 766	1 319	379	835	785	471	410	2.40	2.98	311	299	12
Morrison Bluff town, Logan County	84	30	19	15	2	11	11	6	5	2.80	3.79	-	-	-
Mountainburg city, Crawford County	488	208	138	111	23	70	62	41	32	2.35	2.94	-	-	-
Mountain Home city, Baxter County	8 742	4 253	2 868	2 493	312	1 385	1 319	950	770	2.06	2.52	285	262	23
Mountain Pine city, Garland County	866	303	239	173	53	64	56	22	18	2.86	3.26	-	-	-
Mountain View city, Stone County	2 327	1 043	679	567	93	364	342	196	160	2.23	2.83	112	102	10
Mount Ida city, Montgomery County	713	310	206	163	33	104	102	73	59	2.30	2.92	62	62	-
Mount Pleasant town, Izard County	422	168	121	102	15	47	46	32	22	2.51	3.07	-	-	-
Mount Vernon town, Faulkner County	192	67	49	43	4	18	17	11	10	2.87	3.47	-	-	-
Mulberry city, Crawford County	1 428	603	445	369	66	158	153	102	89	2.37	2.83	20	20	-
Murfreesboro city, Pike County	1 452	589	419	354	52	170	163	116	102	2.47	3.03	90	87	3
Nashville city, Howard County	4 235	1 703	1 143	814	280	560	520	298	243	2.49	3.12	404	324	80
Newark city, Independence County	1 159	449	337	274	47	112	102	63	53	2.58	3.04	-	-	-
Newport city, Jackson County	7 201	2 949	1 996	1 435	487	953	887	505	419	2.44	3.04	258	258	-
Nimmons town, Clay County	96	43	27	22	3	16	15	5	4	2.23	2.89	-	-	-
Norfork city, Baxter County	394	160	122	108	12	38	35	25	19	2.46	2.87	-	-	-
Norman town, Montgomery County	382	175	115	89	18	60	56	35	26	2.18	2.73	-	-	-
Norphlet city, Union County	706	295	203	177	22	92	87	54	40	2.39	3.00	-	-	-
North Crossett CDP, Ashley County	3 358	1 267	991	851	106	276	248	116	100	2.65	3.05	-	-	-
North Little Rock city, Pulaski County	60 532	24 987	16 766	12 248	3 793	8 221	7 251	3 150	2 581	2.42	3.00	1 209	978	231
Oak Grove town, Carroll County	231	88	66	55	7	22	21	15	13	2.63	3.14	-	-	-
Oak Grove Heights town, Greene County	513	175	147	136	6	28	24	9	8	2.93	3.24	-	-	-
Oakhaven city, Hempstead County	35	9	9	9	-	-	-	-	-	3.89	3.89	-	-	-
Oden town, Montgomery County	126	53	37	30	3	16	16	12	10	2.38	2.95	-	-	-
Ogden town, Little River County	264	100	79	62	11	21	21	13	10	2.64	3.08	-	-	-
Oil Trough city, Independence County	208	87	63	52	8	24	24	18	15	2.39	2.90	-	-	-
O'Kean town, Randolph County	250	90	67	54	10	23	23	13	9	2.78	3.34	-	-	-
Okolona town, Clark County	113	58	32	24	7	26	26	15	7	1.95	2.63	-	-	-
Ola city, Yell County	1 016	434	278	213	48	156	146	78	58	2.34	3.02	74	74	-

REFERENCE 29



Physical, Chemical, and Biological Characteristics of Least-Disturbed Reference Streams in Arkansas' Ecoregions





Volume II: Data Analysis

1987

State of Arkansas
Department of Pollution Control and Ecology

community structure to the degree that only certain species adapt and thrive in this type of stream habitat. As gradient and stream velocities decline the aquatic community composition tends to reflect these changes. Instream dissolved oxygen is also influenced by stream velocity and turbulence which is a function of gradient and flow.

Although major physical features such as geologic formations serve to establish the different ecoregions, many other physical characteristics are unique to the streams within each ecoregion. These characteristics and their influence on the aquatic communities will be evaluated on a regional basis.

Delta Ecoregion

There are several physical features that are unique to Delta streams (Table P-1). The most obvious feature is the very low gradient. The average slope of all the streams surveyed was only 0.65 feet per mile drop in elevation. Many reaches of these streams have ill-defined streams channels, as evidenced by measured channel widths of almost one quarter mile wide. The substrates of these streams are composed predominantly of mud and silt, yet aquatic habitat is present in the form of brush, logs, debris and inundated vegetation. The land use in this ecoregion is 77% agricultural activities with the primary type being grain and fiber crop production. Irrigation practices in this type of agriculture have a definite impact on the stream flow in the late summer period. The smallest stream studied - Boat Gunwale Slash - with a watershed size of 23 mi^2 had almost a 3 cfs flow on August 2, 1983. The stream with the largest watershed - Bayou DeView - had a flow of 191 cfs on July 30, 1985. Both streams according to U.S.G.S. flow data, have a Q_{7-10} flow of 0 cfs. The influence of irrigation drainage is readily apparent in these and the other Delta streams surveyed. In the Delta streams influenced by these agricultural practices, the critical flow period and the critical temperature period do not generally coincide. The low flow months usually occur in the fall of the year after crop irrigation has ceased. By this time, the stream temperatures have usually declined by a few degrees. Despite the dominance of agricultural activities in the Delta, the stream canopy in the reference streams averaged 75%, which is the second highest value recorded in the ecoregion surveys. This is an atypically high value because least-disturbed streams were surveyed. Most of the drainage in the Delta has very limited wooded areas adjacent to the streams.

Gulf Coastal Ecoregion

The major streams in this region originate in the Ouachita Mountains Ecoregion. Another significant feature of this ecoregion is that some areas have perennially flowing streams of various watershed sizes while in other areas, streams with the largest watersheds have only intermittent flow during the summer and early fall months of the year. Table P-2 provides a summary of the physical characteristics evaluated during the

stream surveys of this ecoregion.

Two of the reference streams in the Gulf Coastal Ecoregion, East Fork Tulip Creek and Cypress Creek, represent a unique group of streams in that they have a continuous year-round flow. Numerous springs in the headwaters of these streams produced flows of 5.2 and 10.8 cfs, respectively, during the summer surveys. This is a substantial flow for the 46 mi^2 watershed of East Fork Tulip and the 73 mi^2 watershed of Cypress Creek. The more typical Gulf Coastal Ecoregion streams are represented by the other seven reference streams. Of these streams, which range in watershed size from 23 to 451 mi^2, the dominant characteristic is the absence of flow during the summer and early fall months. Another unique feature of this region is the low stream gradients in an area containing rolling hills. These streams meander back and forth through the broad sandy flats between these hills, with the stream channels being established by the high flows of winter and spring.

Land use in this region is dominated by forestry activities. Approximately 88% forestry cover existed in the watersheds of the streams surveyed while 12% was used for agricultural purposes - primarily pastureland. The forestry cover contributes to the high stream canopy which averaged 84% in the streams surveyed. The generally forested watersheds also contribute to instream cover by deposition of logs, brush and debris into the stream through the natural growth and death processes and through streambank erosion and the subsequent falling of trees. The 40% composition of brush, logs, and debris as instream cover was one of the highest values encountered during the survey. Another unique feature of the Gulf Coastal region is the predominance of sand in the stream substrates. Three of the nine streams surveyed had substrates of 100% sand while the average sand content of all reference streams substrates was 62%. The permeability and porosity of the soils in this ecoregion may be a pertinent factor in the lack of summer flow in the more typical streams.

The high stream canopy plays an important role in regulation of water temperatures. In only one stream did the stream temperature reach 30°C during the surveys of this region. That stream had the least canopy cover of all streams survey. Most of the streams showed little or no diurnal variation in water temperature because of the large amount of stream canopy.

Arkansas River Valley

The Arkansas River Valley Ecoregion contains streams with characteristics similar to those of the Boston Mountains to the north and the Ouachita Mountains to the south. The general topography of this ecoregion reflects its transitional nature by being relatively flat in some areas while showing some of the greatest elevations in the state in other areas. Table P-3 summarizes the physical characteristics of the streams surveyed.

→ Gulf Coastal Ecoregion

The relative abundance value of all species collected in this ecoregion, by sample site, is given in Table F-3. A total of 66 species, including 12 sensitive species, were collected. This represents the second highest species richness of the six ecoregions. With the exception of East Fork Tulip Creek and Cypress Creek, there is a general progression of increased species richness as watershed sizes increase (Figure F-4). A notably larger number of total and sensitive species occur in the relatively small watershed sites on East Fork Tulip and Cypress Creeks. These streams have substantial springwater influenced flows and higher water quality than typical Gulf Coastal Ecoregion reference streams. The most diverse fish population of all reference streams sampled is found in Moro Creek. This stream has a 7_{Q-10} flow of zero and probably has zero flow during the critical season of each year. However, the size of the watershed above the sample station is the largest of all sites sampled within this ecoregion.

→ Fish populations within the Gulf Coastal Ecoregion are characteristically dominated by Centrarchids (Figure F-5). Percidae is the next dominant fish family. This is influenced by the relatively large number of Percid species in the two springwater-influenced streams and in the Moro Creek sample. Cyprinidae is the third dominant family.

As in all ecoregions, macroinvertebrate feeding fishes distinctly dominate these populations (Figure F-6). Primary feeders make up a very small part of the populations and no primary feeders were found in Whitewater Creek or Freeo Bayou. A relatively large part of the fish populations in the springwater-influenced streams and in the three largest watersheds is composed of carnivorous fishes.

Springtime sampling in these reference streams was severely hampered by very high flows during one spring and very low flows during another spring. All successful springtime sampling was done with trammel nets; however, only one additional species was collected from Cypress Creek, Big Creek, Whitewater Creek and Moro Creek.

→ Because of the two substantially different types of streams within this ecoregion, two lists of dominant key species and indicator species are given in Table F-4. The springwater-influenced streams have a significantly different fishery from the typical Gulf Coastal streams. These differences are primarily a result of the critical season flow difference, although dissolved oxygen and other water quality differences are also apparent. The springwater-influenced streams can be further differentiated by their greater abundance of sensitive species, a higher percentage of Ictaluridae, which are primarily madtoms, and a slightly lower composition of Centrarchids, which are normally dominated by longear instead of bluegill and warmouth as in the typical Gulf Coastal streams.

TABLE F-3. FISHES OF GULF COASTAL ECOREGION REFERENCE STREAMS

FISH SPECIES		TULIP	CYPRS	W.WTR	BIG	DERSX	FREED	HOONS	L'AGL	MORD	SUM
(Aphredoderus sayanus)	Pirate perch	9.0	10.5	10.0	12.0	9.0	12.0	12.0	9.0	10.5	94.0
(Lepomis gulosus)	Warmouth	6.5	9.0	12.0	7.0	12.0	7.0	10.0	10.5	10.0	84.0
(Lepomis megalotis)	Longear	12.0	12.0	9.0	5.5	10.5	10.0	6.0	6.0	6.5	77.5
(Fundulus olivaceus)	Blackspotted topminnow	7.5	9.0	7.5	6.0	9.0	10.5	11.0	9.0	8.0	77.5
(Centrarchus macropterus)	Flier	4.5	9.0	12.0	10.0	12.0	6.0	8.0	10.5	5.0	77.0
(Esox americanus)	Grass pickerel	9.0	9.0	9.0	9.0	9.0	9.0	3.0	12.0	7.0	76.0
(Minytrema melanops)	Spotted sucker	2.0	7.0	9.0	1.0	11.0	3.0	12.0	12.0	12.0	69.0
(Ictalurus natalis)	Yellow bullhead	6.0	12.0	1.0	2.0	12.0	6.0	8.0	12.0	9.0	68.0
(Gambusia affinis)	Mosquitofish	4.5	4.5	9.0	9.0	6.5	7.5	9.0	9.0	7.5	66.5
(Etheostoma gracile)	Slough darter	7.5	4.5	9.0	9.0	10.0	2.0	12.0	7.0	4.0	65.0
(Notropis umbratilis)	Redfin shiner	12.0	12.0	6.0	6.0	9.0	10.5	6.5		2.0	64.0
(Lepomis macrochirus)	Bluegill	4.5		4.0	5.5	7.5	3.0	9.0	12.0	9.0	54.5
(Lepomis cyanellus)	Green sunfish	6.5	9.0	6.0	6.5	5.0	4.0	4.0	6.0	4.0	51.0
(Etheostoma whipplei)	Redfin darter	6.0	9.0	4.0	2.0	6.0	7.0	3.0	6.0	7.5	50.5
(Elassoma zonatum)	Banded pygmy sunfish	9.0	6.0	9.0	9.0	4.0	4.0	2.0	1.0	4.0	48.0
*(Etheostoma collettei)	Creole darter	9.0	7.5	1.0	S	1.0	9.0	2.0	7.0	11.0	47.5
(Lepomis punctatus)	Spotted sunfish	5.0	6.0	5.0		5.0	9.0	3.0	9.0	4.5	46.5
*(Percina maculata)	Blackside darter	6.0	6.0		7.0	5.5	8.0	5.5		5.0	43.0
(Etheostoma chlorosomum)	Bluntnose darter		1.0	1.0	2.0	6.0	6.0	12.0	4.5	9.0	41.5
(Micropterus salmoides)	Largemouth bass	7.5	2.0	1.0		4.0	2.0	9.0	7.5	7.0	40.0
*(Percina sciera)	Dusky darter	6.5	8.0		1.0	4.0	7.0		1.0	9.0	36.5
(Fundulus notatus)	Blackstripe topminnow	9.0	7.5	4.0				4.0	6.0	6.0	36.5
(Amia calva)	Bowfin	3.0	7.0	3.0		6.0	1.0	7.0	2.5	6.5	36.0
(Esox niger)	Chain pickerel		10.5	S		4.0		4.5	10.0	6.0	35.0
(Notropis chrysocephalus)	Striped shiner	9.0	7.5		6.0	2.0	1.0	4.0		5.0	34.5
(Notropis emiliae)	Pugnose minnow	6.0	6.0		1.0	3.0	2.0	6.0	2.0	7.0	33.0
(Hybognathus nuchalus)	Silvery minnow	1.5			2.0	7.0		12.0		9.0	31.5
(Erimyzon oblongus)	Creek chubsucker	2.0		6.0	8.0	5.0	5.0	1.0	2.0	2.5	31.5
*(Moxostoma poecilurum)	Blacktail redhorse	12.0	7.5			7.0	2.0	S		2.0	30.5
(Hybognathus hayi)	Cypress minnow					6.0		9.0	4.0	9.0	28.0
(Notropis fumeus)	Ribbon shiner					6.0		2.0	6.0	12.0	26.0
(Noturus nocturnus)	Freckled madtom	10.5	12.0							3.0	25.5
(Etheostoma proeliare)	Cypress darter		1.0	9.0			6.0		4.5	4.0	24.5
(Noturus gyrinus)	Tadpole madtom		6.0			4.0	9.0	2.0	1.0	2.0	24.0
(Notemigonus crysoleucas)	Golden shiner		1.0		9.0	8.0			2.0	4.0	24.0
(Notropis texanus)	Weed shiner					4.0			2.0	12.0	18.0
(Micropterus punctulatus)	Spotted bass	6.0	7.5					2.0			15.5
(Moxostoma erythrurum)	Golden redhorse	6.5	6.0							1.0	13.5
(Pomoxis nigromaculatus)	Black crappie		1.0			1.0		2.0	2.0	7.0	13.0
*(Ammocrypta vivax)	Scaly sand darter	9.0	1.0							2.0	12.0
(Noturus miurus)	Brindled madtom	10.5									10.5
(Percina caprodes)	Logperch							1.0		9.0	10.0
(Labidesthes sicculus)	Brook silversides		1.5			2.0	1.0		1.0	4.0	9.5
(Notropis atherinoides)	Emerald shiner						4.5		4.0		8.5
(Pimephales notatus)	Bluntnose minnow	7.5									7.5
(Aplodinotus grunniens)	Freshwater drum									5.0	5.0
(Pimephales vigilax)	Bullhead minnow									4.0	4.0
(Ichthyomyzon gagei)	Southern brook lamprey	3.0	1.0								4.0
(Campostoma anomalum)	Stoneroller	1.0	3.0								4.0
(Lepomis symmetricus)	Bantam sunfish			3.0							3.0
(Lepomis hybrid)	Hybrid sunfish					1.0	1.0	1.0			3.0
(Anguilla rostrata)	American eel		3.0								3.0
*(Percina ouachitae)	Saddleback darter									2.5	2.5
*(Etheostoma stigmaeum)	Speckled darter	1.5	1.0								2.5
*(Etheostoma parvipinne)	Goldstripe darter		1.0				1.0				2.0
(Percina shumardi)	River darter									2.0	2.0
(Cyprinus carpio)	Carp									2.0	2.0
*(Notropis annis)	Pallid shiner									1.0	1.0
*(Hypentelium nigricans)	Northern hogsucker		1.0								1.0
*(Fundulus catenatus)	Northern studfish		1.0								1.0
*(Ammocrypta asprella)	Crystal darter									1.0	1.0
(Notropis venustus)	Blacktail shiner									1.0	1.0
(Lepomis microlophus)	Redear							1.0			1.0
(Lepisosteus oculatus)	Spotted gar							1.0			1.0
(Pomoxis annularis)	White crappie									S	0.0
(Ichthyomyzon castaneus)	Chestnut lamprey		S								0.0
	NUMBER OF SPECIES=	36	43	25	24	36	32	37	33	50	66.0

* - SENSITIVE SPECIES
S - SPRING COLLECTION ONLY

Table F-4. Dominant Key Species and Indicator Species of the Gulf Coastal Ecoregion Fish Populations

Typical Streams	Springwater Influenced
Key Species	
Redfin shiner	Redfin shiner
Spotted sucker	Blacktail redhorse
Yellow bullhead	Freckled madtom
Flier	Longear
Slough darter	Creole darter
Grass pickerel	Grass pickerel
Indicator Species	
Pirate perch	Pirate perch
Warmouth	Golden redhorse
Spotted sunfish	Spotted bass
Dusky darter	Scaly sand darter
Creek chubsucker	Striped shiner
Banded pygmy sunfish	Banded pygmy sunfish

Arkansas River Valley Ecoregion

Rotenone was used to sample the fish population at all sites within the Arkansas River Valley Ecoregion during the summer period. The 75 species collected from this ecoregion are listed in Table F-5 with their relative abundance value at each site.

The average number of species collected per site was 36 and the range was 27 to 44. The species richness of all samples was very similar, although the Dutch Creek site had a distinctly greater number of species (Figure F-7). Arkansas River Valley Ecoregion produced the largest number of species of all regions as it exhibits characteristics and subsequently fish populations reflecting both upland and lowland features. Sensitive species made up a relatively small part of these populations. Throughout this region, these species comprised less than 15% of the total population relative abundance. Centrarchidae was the dominant fish family at these sample sites, but it was closely followed by Cyprinidae. Percidae was noticeably sub-dominant to the dominant families and Ictaluridae was nearly as abundant as the darters (Figure F-8). This was due primarily to an abundance of several species of madtoms within these samples. Many samples had two or more species of madtoms that were common to abundant. The yellow bullhead was also numerous in most samples.

The trophic feeding level of the fishes was significantly dominated by macroinvertebrate feeders. Carnivores and primary feeders made up nearly equal parts of the remainder of the population (Figure F-9).

REFERENCE 30

TELECON NOTE
AR DEPT. OF POLLUTION CONTROL & ECOLOGY

SITE ID. NUMBER: ARD983285255	DATE: December 9, 1992	TIME: 1545 Hours

DISTRIBUTION: ICI Burial Pit
824 East 12th Street
North Little Rock, AR 72114

BETWEEN: Elton Porter, Sr. Tech.	OF: AR Geological Commission	PHONE: 1-(501)-324-6391

AND: Tammie J. Hynum
Tammie J. Hynum, Inspector, ADPC&E

DISCUSSION:

Requested information regarding ICI's site drainage and the surface water pathway for 15 miles downstream.

The topographic slope in the general area in which ICI is located is approximately 1/2 percent to the northeast. Site drainage flows NE into a drainage ditch; thence unnamed tributary of the West Branch of Dark Hollow Canal; thence into West Branch of Dark Hollow Canal; thence Dark Hollow Canal; thence into the Arkansas River in Segment 3C of the Arkansas River Basin. The Arkansas River flows through 4 Arkansas counties and merges into the Mississippi River in Bolivar County, Mississippi.

There is no flow data available for the drainage ditch, unnamed tributary, West Branch of Dark Hollow Canal, or Dark Hollow Canal. The Arkansas River, whose watershed size is 158,288 sq. miles, has an average flow rate of 42,320 cfs. Of the 158,288 sq. miles, about 22,241 sq. miles is noncontributing. This information is recorded at David D. Terry Lock and Dam below Little Rock about 10.7 miles downstream from Main Street bridge at Little Rock. The Mississippi River, whose watershed size averages 932,800 sq. miles, has an average flow rate of 484,500 cfs.

There are no surface water intakes utilized for drinking water located within 15 downstream miles, along the Arkansas River, from ICI.

ACTION ITEMS:

REFERENCE 31

Harold K. Grimmett
Director

ARKANSAS NATURAL HERITAGE COMMISSION

1500 TOWER BUILDING
323 CENTER STREET
LITTLE ROCK, ARKANSAS 72201
Phone: (501) 324-9150

Bill Clinton
Governor

M E M O R A N D U M

To: Tammie Hynum, Hazardous Waste Inspector
Arkansas Department of Pollution Control and Ecology

From: Cindy Osborne, Data Manager Cindy Osborne
Arkansas Natural Heritage Commission

Date: December 16, 1992

ANHC No.: S-DPCE-92-085

Subject: Preliminary Assessment, ICI of Americas, Inc., Pulaski County, North Little Rock, Arkansas.

Attached please find a list of Elements of Special Concern known to occur within a fifteen mile radius of the ICI of Americas, Inc. site in North Little Rock, Arkansas. Within this fifteen mile radius there are a total of 62 occurrences of elements of special concern. An occurrence represents a location which provides habitat for sensitive species (both state and federal species), is an outstanding example of a natural community, or is a colonial bird nesting site. The following managed area falls

Federal Areas:
Camp Joseph T. Robinson National Guard Training Area (Dept. of Defense)

State Areas:
Bell Slough Wildlife Management Area (Arkansas Game & Fish Commission)
Camp Robinson Wildlife Management Area (Arkansas Game & Fish Commission, Dept. of Defense)
Holland Bottoms Wildlife Management Area (Arkansas Game & Fish Commission)
Holland Bottoms Willow Oak Forest Preserve (Arkansas Natural Heritage Commission, Arkansas Game & Fish Commission)
Pinnacle Mountain State Park (Arkansas Dept. of Parks & Tourism)

15 DEC 1992

ARKANSAS NATURAL HERITAGE COMMISSION
DEPARTMENT OF ARKANSAS HERITAGE
INVENTORY RESEARCH PROGRAM
ELEMENTS OF SPECIAL CONCERN
WITHIN 15-MILE RADIUS OF ICI OF AMERICAS, INC. SITE

ELEMENT NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
** Animals				
* Invertebrates				
ANODONTA SUBORBICULATA, FLAT FLOATER	-	INV	G4	S1?
* Vertebrates				
AIMOPHILA AESTIVALIS, BACHMAN'S SPARROW	C2	INV	G3	S3
AMMODRAMUS SAVANNARUM, GRASSHOPPER SPARROW	-	INV	G4	S3
BUTEO LINEATUS, RED-SHOULDERED HAWK	-	INV	G5	S1?
CASMERODIUS ALBUS, GREAT EGRET	-	INV	G5	S1
EGRETTA CAERULEA, LITTLE BLUE HERON	-	INV	G5	S2
GALLINULA CHLOROPUS, COMMON MOORHEN	-	INV	G5	S1?
→ HALIAEETUS LEUCOCEPHALUS, BALD EAGLE	LELT	INV	G3	S2
IXOBRYCHUS EXILIS, LEAST BITTERN	-	INV	G5	S1?
LIMNOTHLYPIS SWAINSONII, SWAINSON'S WARBLER	-	INV	G4	S3
NYCTANASSA VIOLACEA, YELLOW-CROWNED NIGHT-HERON	-	INV	G5	S2?
NYCTICORAX NYCTICORAX, BLACK-CROWNED NIGHT-HERON	-	INV	G5	S1?
PODILYMBUS PODICEPS, PIED-BILLED GREBE	-	INV	G5	S2?
PORPHYRULA MARTINICA, PURPLE GALLINULE	-	INV	G5	S1?
RALLUS ELEGANS, KING RAIL	-	INV	G4Q	S1?
REGINA RIGIDA SINICOLA, GULF CRAYFISH SNAKE	-	INV	G5T5?	S2?
→ STERNA ANTILLARUM ATHALASSOS, INTERIOR LEAST TERN	LE	INV	G4T2	S2
TACHYCINETA BICOLOR, TREE SWALLOW	-	INV	G5	S1?
TADARIDA BRASILIENSIS, BRAZILIAN FREE-TAILED BAT	-	INV	G5	S1?
THRYOMANES BEWICKII, BEWICK'S WREN	-	INV	G5	S2
** Plants				
* Vascular plants				
ASTRAGALUS DISTORTUS VAR. ENGELMANNII, A MILK-VETCH	-	INV	G5TU	S2S3
CAREX BROMOIDES, A SEDGE	-	INV	G5	S2.2
CAREX STRICTA, UPRIGHT SEDGE	-	INV	G5	SU
CASTANEA PUMILA VAR. OZARKENSIS, OZARK CHINQUAPIN	C1	INV	G5T3	S3S4
CHAMAELIRIUM LUTEUM, DEVIL'S-BIT	-	INV	G5	S3
CYPRIPEDIUM KENTUCKIENSE, SOUTHERN LADY'S-SLIPPER	C2	INV	G3	S3
→ ERIOCAULON KOERNICKIANUM, SMALL-HEADED PIPEWORT	C2	SE	G2G3	S1S2
ILEX VERTICILLATA, WINTERBERRY HOLLY	-	ST	G5	S2.2
LITHOSPERMUM INCISUM, NARROW-LEAVED PUCCOON	-	INV	G5	S2S3
PLATANTHERA CRISTATA, YELLOW-CRESTED ORCHID	-	INV	G5	S1S2.3

ELEMENT NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
PLATANTHERA PERAMOENA, PURPLE FRINGELESS ORCHID	3C	ST	G5	S2.3
RANUNCULUS FLABELLARIS, YELLOW WATER-CROWFOOT	-	INV	G5	S3
RHYNCHOSPORA CEPHALANTHA, CAPITATE BEAK RUSH	-	INV	G5	SH
SAXIFRAGA VIRGINIENSIS, VIRGINIA SAXIFRAGE	-	INV	G5	S2S3
SPIRAEA TOMENTOSA, HARDHACK	-	INV	G5	S2.2
STENANTHIUM GRAMINEUM, EASTERN FEATHERBELLS	-	INV	G5	S3
STREPTANTHUS OBTUSIFOLIUS, A TWISTFLOWER	-	INV	G3	S3
THELYPTERIS NOVEBORACENSIS, NEW YORK FERN	-	INV	G5	S3
** Natural Communities				
CATTAIL MARSH	-	INV	-	S1S2
NEPHELINE SYENITE (IGNEOUS) GLADE/OUTCROP	-	INV	-	S1
WILLOW OAK FOREST	-	INV	-	S2
** Other				
COLONIAL NESTING SITE	-	INV	-	-
GEOLOGICAL FEATURE	-	INV	-	-

LEGEND

PRECISION CODES

SC = Element is very specifically mapped (within a one second radius) and has been confirmed by Natural Heritage Commission field survey or similarly reliable source as of the information date.

M = Element mapped to within one minute radius (1.5 mile).

STATUS CODES

FEDERAL STATUS CODES

C1 = Category 1; the U.S. Fish and Wildlife Service states it currently has substantial information on hand that supports listing these species as threatened or endangered.

C2 = Category 2; the U.S. Fish and Wildlife Service states that further biological research and field study will be necessary in order to determine if these species should be listed as threatened or endangered.

3C = These species have been reviewed by the U.S. Fish and Wildlife Service and the determination has been made that special designation is not warranted.

3B = Names that, on the basis of current taxonomic understanding (usually as represented in published revisions and monographs) do not represent distinct taxa meeting the Endangered Species Act's definition of "species." Such supposed taxa could be reevaluated in the future on the basis of new information.

→ LE = Listed Endangered; the U.S. Fish and Wildlife Service has listed these species as endangered.

→ LT = Listed Threatened; the U.S. Fish and Wildlife Service has listed these species as threatened.

→ LELT = Listed Endangered and Threatened; the U.S. Fish and Wildlife Services has listed these species as endangered and threatened in different parts of the breeding range.

PE = Proposed Endangered; the U.S. Fish and Wildlife Service has proposed these species for listing as endangered.

PT = Proposed Threatened: the U.S. Fish and Wildlife Service has proposed these species for listing as threatened.

STATE STATUS CODES

INV = Inventory Element; The Arkansas Natural Heritage Commission is currently conducting inventory work on these elements to determine their status in the state. These elements may include outstanding examples of Natural Communities, colonial nesting sites, outstanding scenic and geologic features as well as plants and animals which, according to current information, may be rare, peripheral, or of an undetermined status in the state.

SE = State Endangered; The Arkansas Natural Heritage Commission applies this term to native taxa which are in danger of being extirpated from the state.

ST = State Threatened; The Arkansas Natural Heritage Commission applies this term to native taxa which are believed likely to become endangered in Arkansas in the foreseeable future, based on current inventory information.

DEFINITION OF RANKS

Global Ranks

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6-20 occurrences or few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 - 100.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered (e.g., Bachman's Warbler).

GU = Possibly in peril range-wide but status uncertain; more information needed.

GX = Believed to be extinct throughout range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered.

T-RANKS = T subranks are given to global ranks when a subspecies, variety, or race is considered at the state level. The subrank is made up of a "T" plus a number or letter (1, 2, 3, 4, 5, H, U, X) with the same ranking rules as a full species.

State Ranks

S1 = Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.

S2 = Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.

S3 = Rare to uncommon. Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to large-scale disturbances.

S4 = Common, apparently secure under present conditions. Typically 100 or more estimated occurrences, but may be fewer with many large populations, may be restricted to only a portion of the state, usually not susceptible to immediate threats.

SH = Historically known from the state, but not verified for an extended period, usually 15 years.

SU = Status uncertain, often because of low search effort or cryptic nature of the element.

SX = Apparently extirpated from state.

REFERENCE 32

STATE OF ARKANSAS

DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

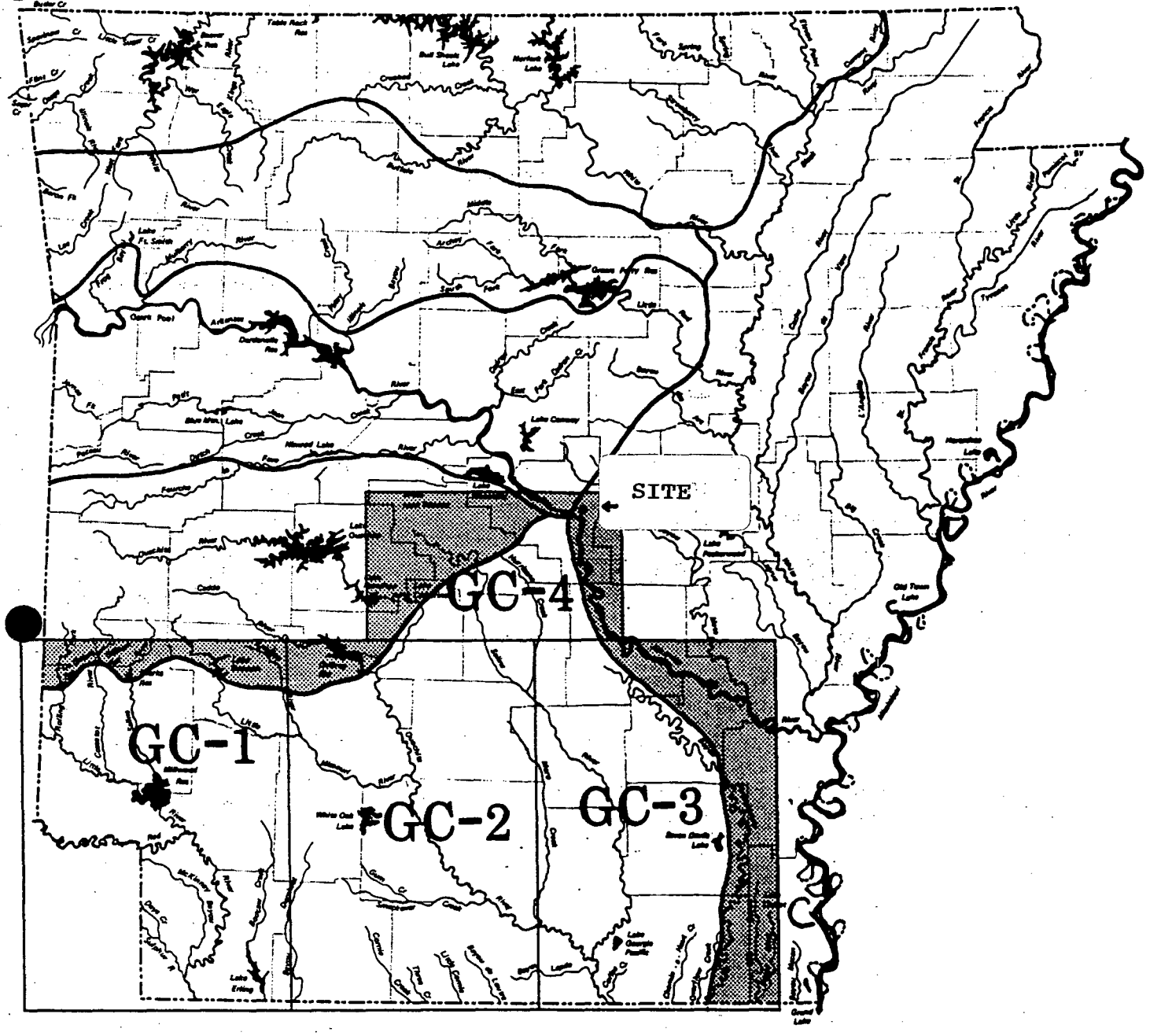
Regulation No. 2, As Amended

REGULATION ESTABLISHING WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF ARKANSAS

OCTOBER, 1991

Hynum

Index to Plates of the Gulf Coastal Plain



Designated Uses
Gulf Coastal Ecoregion
(Plates GC-1, GC-2, GC-3, GC-4)

Extraordinary Resource Waters
Saline River (GC-3, GC-4)
Moro Creek - adjacent to natural area (GC-3)

Natural and Scenic Waterways
Saline River from the Grant-Cleveland County line to mouth (GC-3)

Ecologically Sensitive Waterbodies
Little River above Millwood Reservoir - location of Ouachita rock pocketbook and pink mucket mussels (GC-1)
Grassy Lake and Yellow Creek below Millwood Reservoir - unique ecosystem and biota (GC-1)
Lower Little Missouri River - location of peppered shiner and longnose darter (GC-2)
Lower Saline River - location of peppered shiner, crystal darter and goldstripe darter (GC-3)
Ouachita River near Arkadelphia - location of flat floater, Ouachita rock pocketbook and pink mucket mussels (GC-2)

Streams with Substantial Springwater Influence
L'Eau Frais (GC-4)
Cypress Creek (GC-4)
East and West Fork Tulip Creeks (GC-4)
Others to be determined

Primary Contact Recreation - all streams with watersheds greater than 10 mi^2 and all lakes/reservoirs

Secondary Contact Recreation - all waters

Domestic, Industrial and Agricultural Water Supply - all waters

Fisheries
- Trout
  - Little Missouri River from Narrows Dam to confluence with Muddy Fork (GC-1)
- Lakes and Reservoirs - all
- Streams
  - Seasonal Gulf Coastal fishery - all streams with watersheds of less than 10 mi^2 except as otherwise provided in §6(E)
  - Perennial Gulf Coastal fishery - all streams with watersheds of 10 mi^2 or larger and those waters where discharges equal or exceed 1 CFS

Use Variations Supported by UAA
Loutre Creek - perennial fishery, except seasonal from railroad bridge to mouth (GC-2, #1)
Unnamed tributary to Smackover Creek - no fishable/swimmable uses (GC-2, #2)
Unnamed tributary swamp to Smackover Creek - no fishable/swimmable uses (GC-2, #3)
Unnamed tributary to Flat Creek - no fishable/swimmable uses (GC-2, #4)
Dodson Creek - perennial fishery (GC-4, #5)
Jug Creek - perennial fishery (GC-2, #6)
Lick Creek - seasonal fishery; no primary contact (GC-1, #7)
Coffee Creek - no fishable/swimmable or domestic water supply uses (GC-3, #8)

Specific Standards
Gulf Coastal Ecoregion
(Plates GC-1, GC-2, GC-3, GC-4)

	Typical Streams		Spring Water Streams		Lakes and Reservoirs
Temperature* °C (°F)	30 (86)		30 (86)		32 (89.6)
Ouachita River (state line to Little Missouri River)	32 (89.6)				
Red River	32 (89.6)				
Turbidity (NTU)	21		21		25
Red River	50				
Minerals			see §6(K)		see §6(K)
Dissolved Oxygen** (mg/l)	Pri.	Crit.	Pri.	Crit.	see §6(E)
<10 mi² watershed	5	2			
10 mi² - 500 mi²	5	3			
>500 mi² watershed	5	5			
All sizes			6	5	
All other standards	(same as statewide)				

Variations Supported by UAA

Loutre Creek - from headwaters to railroad bridge, critical season D.O. standard - 3 mg/l; primary season - 5 mg/l; from railroad bridge to mouth, critical season D.O. - 2 mg/l (GC-2, #1)

Unnamed tributary to Smackover Creek - headwaters to Smackover Creek, year round D.O. criteria - 2 mg/l (GC-2, #2)

Unnamed tributary and swamp to Smackover Creek - headwaters to Smackover Creek, year round D.O. criteria - 2 mg/l (GC-2, #3)

Unnamed tributary to Flat Creek - from headwaters to Flat Creek, year round D.O. criteria - 2 mg/l (GC-2, #4)

Dodson Creek - from headwaters to confluence with Saline River, critical season D.O. standard - 3 mg/l (GC-4, #5)

Jug Creek - from headwaters to confluence with Moro Creek, critical season D.O. standard - 3 mg/l (GC-2, #6)

Lick Creek - from headwaters to Millwood Reservoir, critical season D.O. standard - 2 mg/l (GC-1, #7)

Coffee Creek - exempt from §5(E) and §6 (GC-3, #8)

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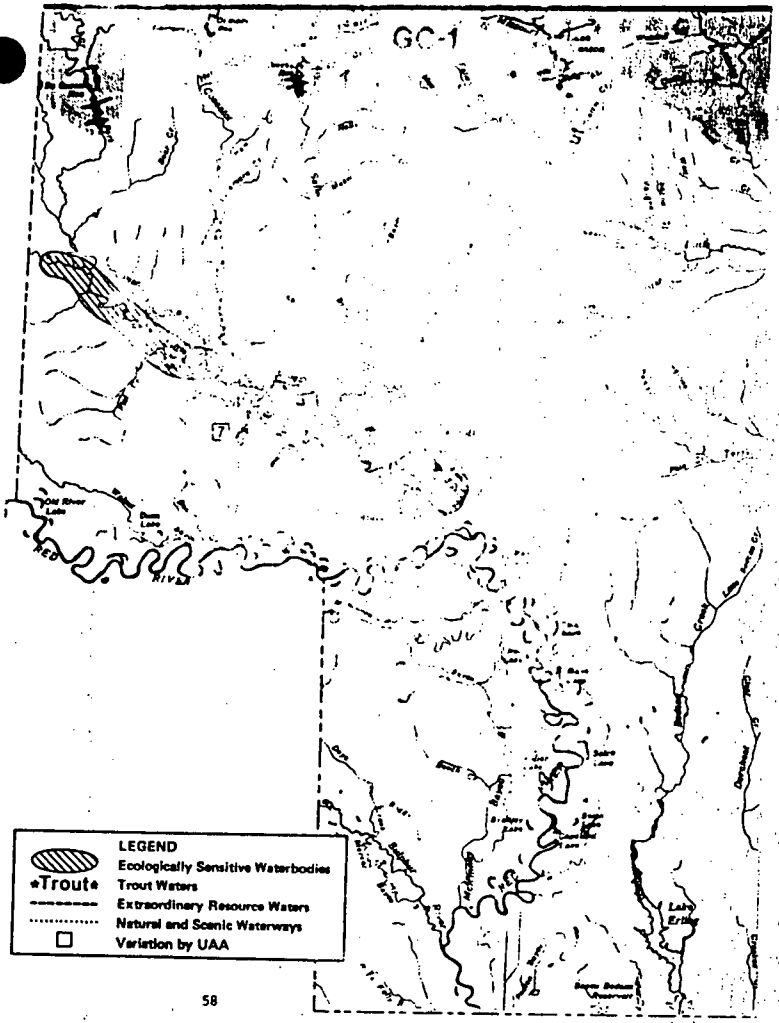
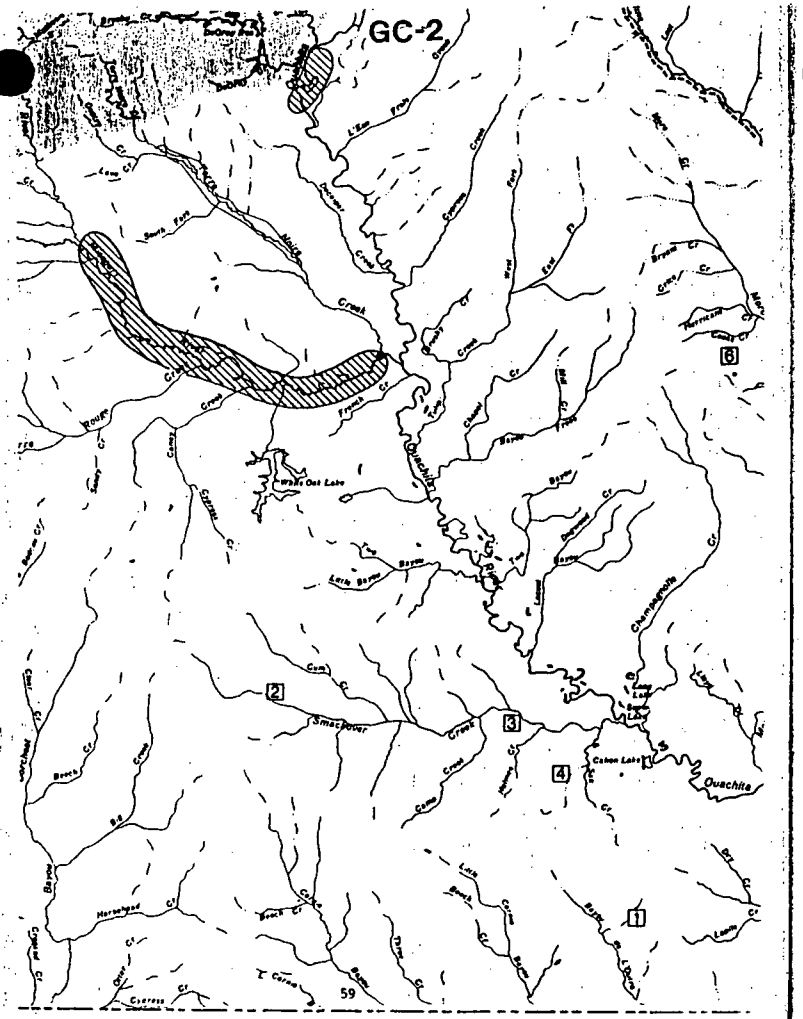
* Increase over natural temperatures may not be more than 2.8°C (5°F).

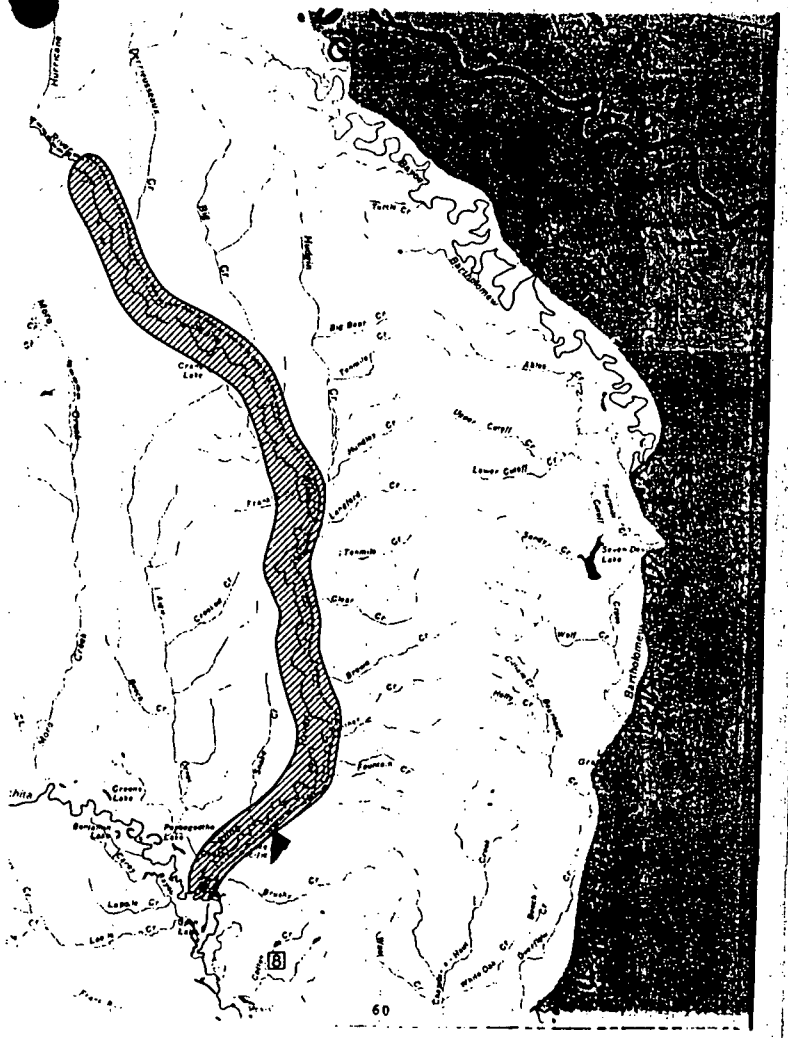
** At water temperatures ≤10°C or during March, April and May when stream flows are 15 CFS and greater, the primary season D.O. standard will be 6.5 mg/l. When water temperatures exceed 22°C, the critical season D.O. standard may be depressed by 1 mg/l for no more than 8 hours during a 24-hour period.


GC-1
LEGEND
Ecologically Sensitive Waterbodies
Trout
Trout Waters
Extraordinary Resource Waters
Natural and Scenic Waterways
Variation by UAA
RED RIVER
Lake Erling

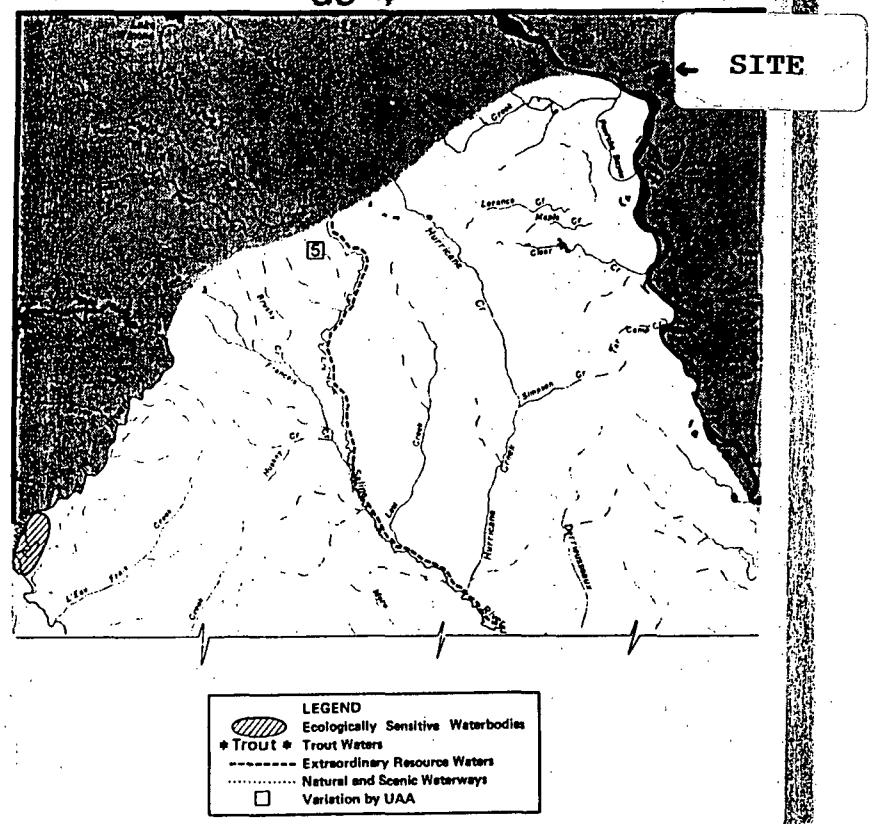
58


GC-2
Ouachita
Smackover
Creek
Champagnolle
Cabin Lake
1
2
3
4
6

59



GC-4


SITE
5
LEGEND
Ecologically Sensitive Waterbodies
Trout Trout Waters
Extraordinary Resource Waters
Natural and Scenic Waterways
Variation by UAA