#24991

Site Inspection Prioritization Report

REC'D.
NOV 0 4 1992

American Color & Chemical
Lobeco, Beaufort County, South Carolina
EPA ID Nº SCD046507018

SEA
9/24/92
L. Bozeman

Prepared Under:
Contract Nº 68-W9-0055
For The
U.S. Environmental Protection Agency

Prepared By:
B&V Waste Science and Technology Corp.
BVWST Project Nº 52012.040

October 30, 1992

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Project Manager

SITE ASSESSMENT
Site Inspection Prioritization
American Color & Chemical/ Venture Chemical
Lobeco, Beaufort County, South Carolina
SCD046507018
WasteLAN Reference Nº03291

1.0 Introduction

B&V Waste Science and Technology was tasked to conduct a Site Investigation Prioritization (SIP) for the American Color & Chemical/ Venture Chemical facility in Lobeco, Beaufort County, South Carolina. This study was performed under the authorization of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendment Reauthorization Act of 1986 (SARA).

The SIP will update the Site Investigation conducted by the NUS Corporation on September 13-15, 1989, which was performed prior to the implementation of the revised Hazard Ranking System. Sources of information used in this evaluation were State of South Carolina and USEPA Superfund file material. The SIP will quantify threats posed by the site and provide sufficient documentation in order to decide on the appropriate future course of action.

2.0 Site Description and History

The entire American Color & Chemical/Venture Chemical facility (AC&C) consists of approximately 250 acres of land southeast of the intersection of Highways 38 and 480. More specifically, the facility is located at 32° 33' 21.0" N latitude and 80° 43' 43.0" W longitude at an altitude ranging from 10 to 20 feet above mean sea level (amsl) (Refs. 1, 2, 3) (Figure 1). The facility is active, and located in a mostly rural area of little residential use, and even less industrial (Refs. 2; 3, p. 7) (Figure 2). The ACC facility includes several buildings and various components of a permitted NPDES water treatment system that consists of an equalization basin, an aeration basin, a digester basin, two clarifiers, drying beds, and two holding ponds (east and west). In addition to the active portions of the property, there are four areas of contamination that are of concern: an abandoned lagoon, an old drum storage area, a burn site, and an area of stressed vegetation; there is no evidence of liners present for these units. The facility is entirely fenced with the exception of the stressed vegetation area (Ref. 3, pp. 4, 5).

American Color & Chemical began operations in 1967 as the Tenneco Chemical Company. In 1974 the plant was sold to the American Color & Chemical Company, and then once again to the Venture Chemical Company in October of 1982. Venture Chemical has since then changed their name to the Lobeco Products, Inc. (Ref. 5, p. 1).

The Lobeco Products facility primarily manufactures agricultural products, dye intermediates, and drilling fluid chemicals for the oil industry. Chemicals used and produced onsite are primarily organic compounds. Acidic industrial wastewater is generated as a byproduct of the manufacturing process. This wastewater is neutralized in the onsite water treatment plant and then discharged into Campbell Creek (Ref. 5, 1-2).

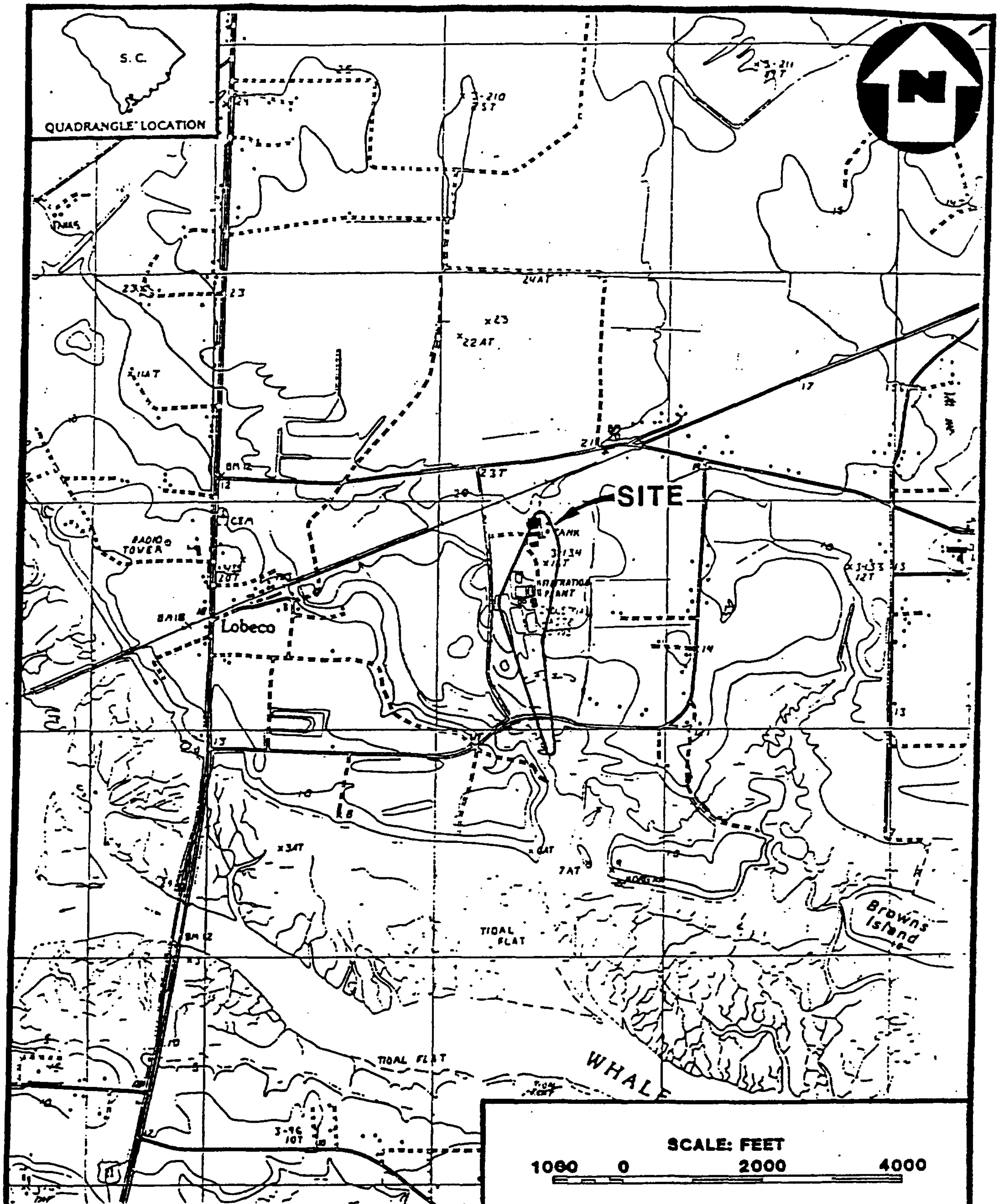
Prior to the installation of the waste-water treatment system, American Color & Chemical used the lagoon, burn site, and drum storage area to manage their facility waste. The lagoon was used as a settling basin for process washes and cooling waters mixed with sanitary wastes. Off-grade products and other specific process wastes were stored at the drum storage area prior to incineration at the burn site (Ref. 6, p.9, 10). Some of these materials were known to have contained PCBs, naphthalene, or toluene (Ref. 6, p. 11,12). The chemical plant also ran a hot oil circulating system for reactions that required higher than normal temperatures. Occasional leaks were handled by collecting as much of the spill as possible into drums; any residual oil was washed into the facility's floor drain system. From there, drainage went to the effluent system and eventually to the lagoon. The heating oil initially used was Arochlor 1248, a PCB supplied by Monsanto (Ref. 6, p. 10)

Lobeco Products filed a Part A application for interim status as a treatment facility; precisely, their tanks and the old lagoon. However, it was later determined that the tanks were exempt under a wastewater treatment exclusion. Also, further analysis determined that the waste in the lagoon was not hazardous (Refs. 4, p. 2; 7).

2.1 Waste Characteristics and Sampling Data

One hundred and ninety-seven samples were evaluated in the September 1990 Site Inspection performed by NUS Corporation. This data was compilated from an earlier, November 1986 G & E report and consisted of surface, subsurface, groundwater, product, sediment, sludge, and surface water samples collected from various locations on and around the facility. For the purposes of this prioritization samples pertaining to the drainage ditch will not be evaluated, as the only parameter detected in this area was total organic carbon (Ref. 3, pp. 13, 14). Data tables and sampling location maps are included as Attachment A at the end of this report.

Results from the abandoned lagoon area indicate that the soil and groundwater in this area are contaminated with chlorinated organics and metals primarily, such as

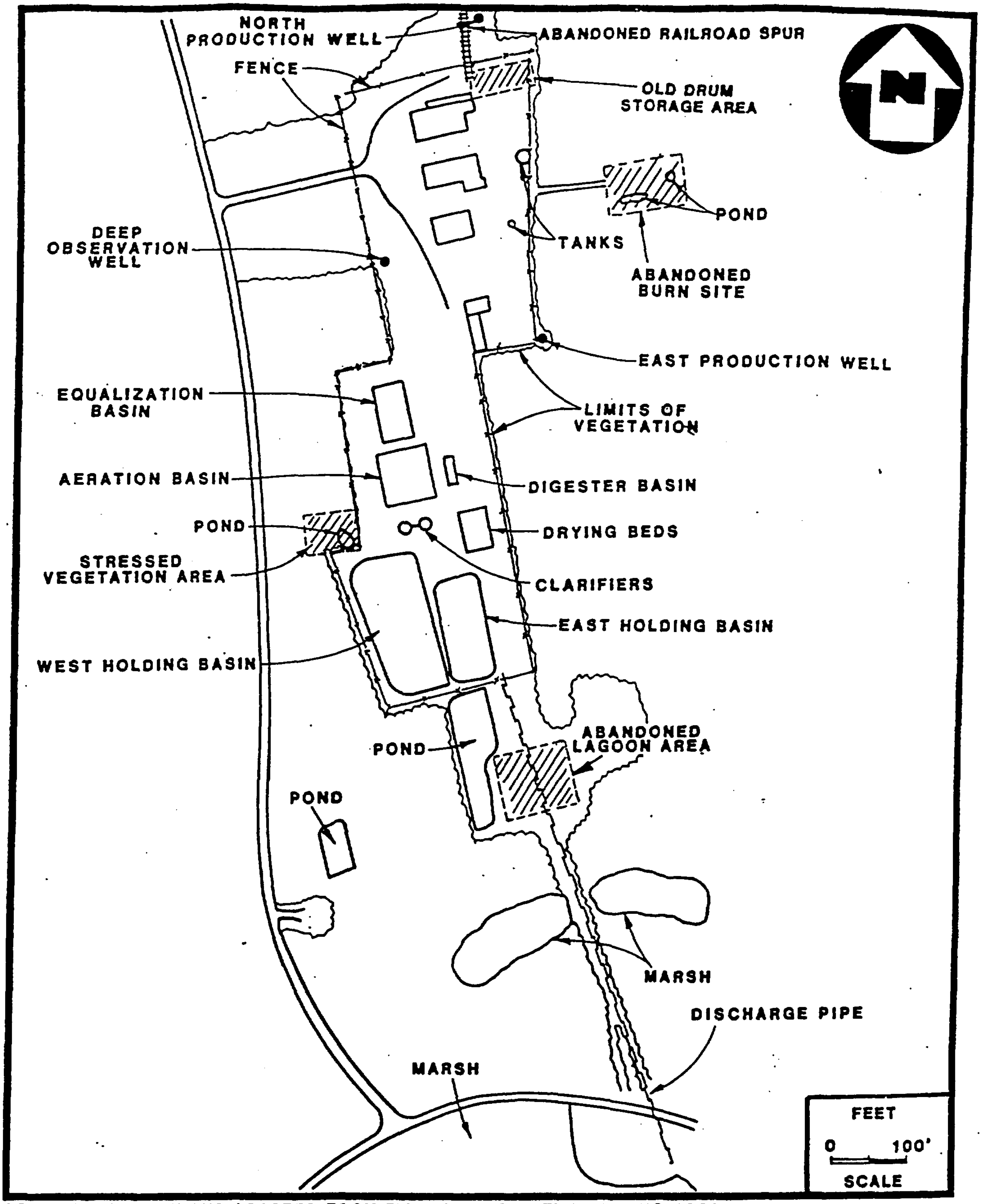


BASE MAP IS A PORTION OF THE U.S.G.S. 7.5 MINUTE QUADRANGLE DALE 1988, SHELDON 1988, FLORIDA.

SITE LOCATION MAP
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 1

EARTH SCIENCE AND TECHNOLOGY CORP.



SOURCE: REDRAWN AND ADAPTED FROM FIGURE 3A, G&E ENGINEERING 1986.

SITE LAYOUT MAP
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 2

American Color & Chemical began operations in 1967 as the Tenneco Chemical Company. In 1974 the plant was sold to the American Color & Chemical Company, and then once again to the Venture Chemical Company in October of 1982. Venture Chemical has since then changed their name to the Lobeco Products, Inc. (Ref. 5, p. 1).

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Results from the abandoned lagoon area indicate that the soil and groundwater in this area are contaminated with chlorinated organics and metals primarily, such as

PCBs, naphthalene, and 1,2,4-trichlorobenzene, chromium, lead, and mercury. Contamination in the lagoon was detected at a depth of 14 feet below land surface (bls) with average concentrations of 750 mg/kg PCBs (Ref. 3, p. 17). Contamination at the burn site also centered around chlorinated organics and metals, with methylene chloride, PCBs, and trichloroethene being the most prevalent compounds All three of the previously mentioned contaminants were detected in groundwater, with one water sample having a TCE concentration of 12 mg/l. PCB concentrations were found in the soil at depths ranging from 1 to 6 feet, and at concentrations of up to 250 mg/kg (Ref. 3, p. 17, Table 2). Chromium and lead were detected in the stressed vegetation area at concentrations of 3.3 mg/kg and 3.8 mg/kg respectively, however these concentrations are not well beyond naturally occuring levels. Ethylbenzene was also detected, at a concentration of 0.013 mg/l in groundwater from this area (Ref. 3, p. 20).

Groundwater was the only media sampled from the old drum storage area (barring product sampling), and indicated that chlorinated organics are the primary contaminants here. The most significant organic detected was carbon tetrachloride, with concentrations ranging from 12 to 39 mg/l in the various wells (Ref. 3, pp. 18, 19).

Of the four source areas to be considered in this report only one, an area of stressed vegetation, is found outside a fenced portion of the facility. Further, the old drum storage area is partially covered by a concrete pad, effectively covering roughly half of its area. None of these source areas had a liner of any sort (Ref. 3, pp. 4-6).

A study performed by the State of South Carolina on September 27 and October 10, 1985, indicated that edible crabmeat collected from blue crabs (Callinectes sapidus) in the AC&C area showed elevated levels of PCBs. In particular, tissue samples from crabs collected on Campbell Creek at the AC&C wastewater treatment facility discharge averaged 0.949 mg/kg PCB's, noticeably elevated values even by comparison to the samples collected elsewhere on Campbell Creek, Whale Branch, Huspa Creek, and the Coosaw River (Ref. 8). It should be noted that a more current study has been performed, but was not available at the time of this evaluation (Ref. 9).

3.0 Groundwater Pathway

American Color & Chemical is located in the lower part of the Coastal Plain Physiographic Province (Refs. 10, p. 9). The topography of the surrounding area is characterized by low relief, lagoons, tidal swamps, and salt marshes (Ref. 11, 4-1). The region is underlain by a thick wedge of sedimentary rocks, which unconformably overlie crystalline igneous and metamorphic rocks equivalent to rocks of the Piedmont Physiographic Province (Ref. 12, pp. 22-23). The average annual rainfall for the study area is 50 inches. The annual evapotranspiration is 44 inches, yielding a net annual precipitation of 6 inches(Ref. 13). The two year, 24 hour rainfall is 5.0 inches(Ref. 14).

The soil beneath the facility is part of the Yemassee soil series, a deep, somewhat poorly drained, moderately permeable, loamy sand with a slope generally less than 1 percent(Ref. 15, p. 86, Sheet 29).

The formations within the upper portion of the sedimentary wedge comprise the aquifers that are used in the study area (Refs. 10, p. 32; 12, p. 23; 11, p. 4-1). The uppermost of these is the Pamlico formation (Ref. 12, p. 25). The Pamlico consists of quartz sand and clay, with some glauconite, shells, and heavy minerals. In the vicinity of the facility, the Pamlico Formation is approximately 30 to 40 feet thick(Ref. 11, p. 4-1). Underlying units in descending order are the Hawthorne Formation, the Ocala and Santee limestones, and the Black Mingo Formation(Ref. 12, pp. 23, 25; 16, pp. 380-381).

The uppermost hydrogeologic unit found in the study area is the unconfined surficial or water table aquifer (Ref. 17, p. 25). The water table aquifer is comprised of alluvial and fluvial deposits. This unit consists primarily of quartz sand and lenses of clay with an estimated hydraulic conductivity of approximately 10^{-4} cm/sec, and is found to a depth of 35 to 40 feet below land surface (bls)(Refs. 11, p. 4-1; 17, appendix D). Although the saturated thickness of this unit is dependant on climatic conditions, elevations of nearby streams indicate the water table is between 5 and 10 feet bls (Refs. 12; 16, p. 379). Recharge to this aquifer is from local rainfall (Refs. 12, p.4-5; 16, p. 379).

The water table aquifer is underlain by the Hawthorne Formation (Refs. 11, pp. 4-2; 17, p. 26). Based on boring logs from two production wells onsite the Hawthorne Formation is approximately 50 feet thick beneath the site, with the upper portion consisting of stiff green clay (Refs. 11, p. 4-2; 17, p. 26). This unit has an estimated hydraulic conductivity of 10^{-7} cm/sec and serves as an aquitard that separates the overlying unit and the deeper Tertiary Limestone System (Refs. 11, p. 6-31; 17, p. 50). The Tertiary Limestone aquifer system is about 900 feet thick in Beaufort County and is divided into an upper and lower hydrologic unit (Refs. 12, p. 276; 18, p. 47). The upper unit consists of highly permeable fossiliferous limestone and is the primary source of groundwater in Beaufort County (Refs. 10, pp. 31-32; 16, p. 380; 18, p. 47). The lower unit is moderately productive and is not used as extensively as the upper unit (Ref. 18, p. 55). Recharge to the Tertiary Limestone is primarily through downward leakage through overlying units (Ref. 18 p. 73). The Tertiary Limestone Aquifer System is underlain by the 400 foot thick Black Mingo Formation, which consists of partly indurated fine sand, sandstone or diclastic limestone, and acts as a confining layer (Refs. 12, p. 23; 16, p. 381; 18, p. 27). This unit has an estimated hydraulic conductivity ranging from 10^{-4} to 10^{-6} cm/sec for limestone (Ref. 19, p. 29).

The surficial aquifer, which is the aquifer of concern, is used for drinking purposes (Ref. 3, p. 3; 16, 379). Groundwater in the surficial aquifer system flows south toward Campbell Creek, reflecting the general influence of topography on the water table (Ref. 11, p. 6-9). In the Tertiary Limestone aquifer, groundwater flow is regionally toward the east (Ref. 10, pp. 53-54). Within two miles of the site, however, an induced cone of depression exists in the potentiometric surface of the Tertiary Limestone aquifer (Ref. 10, figure 19). This occurs because two closely spaced production wells on the Lobeco property pump sizable quantities (about 500,000 gal/day each) from an area in the aquifer where the transmissivity is relatively low (less than 5,000 ft^2/d) compared to other locations in the region (Ref. 10, p. 56). Within the cone of depression, the groundwater flow is toward the Lobeco pumping center. A local well driller estimated that this aquifer only supplies five percent of the wells found within the study area (Ref. 20). This corresponds to 5 people between 0 and 0.25 mile radius; 8 between 0.25 and 0.5 miles; 15 between 0.5 and 1.0 miles; 70 between 1 mile and 2 miles; 114 between 2 and 3 miles; and 56 between 3 and 4 miles, based on a USGS topographic map house count and a reconnaissance survey. A total of 103 residences were identified between the one and four mile radii of AC&C at an average population of 2.59 people per household, based on the U.S. Department of Commerce Bureau of Census (Refs. 2, 21). There are no public water systems associated with the surficial aquifer in the study area, and the nearest potable private well is located 600 feet to the southeast (Refs. 3, 4, p. 5; 10, p. 27).

4.0 Surface Water Pathway

Surface water runoff at AC&C would be collected in the onsite drainage ditch system. Water in this system flows south and eventually empties into the tidally influenced marsh area surrounding Campbell Creek (Refs. 2, 13, p. 24; 22, p. 17-19). During ebb tide, Campbell Creek flows southeasterly 0.75 miles into Whale Branch, and a further 5.75 miles into the Coosaw River. The 15-mile surface water pathway expires on the Coosaw River without encountering any surface water intakes (Refs. 2, 23). During flood tide however, flow direction is reversed, and the migration pathway flows upstream to include several other tributaries of Whale Branch and the Coosaw River. (Ref. 24). The AC&C facility is located within a 100 year floodplain (Ref. 25).

Sensitive environments found in the study area are the ranges of several federally endangered species. These are the Bald eagle, the shortnose sturgeon, and the West Indian Manatee. There are no critical habitats within the State of South Carolina (Refs. 26, 27). Also, all surface water bodies lie contiguous to coastal wetlands. These wetlands and their associated drainageways serve as a breeding ground and nursery for the eastern oyster (Crassostrea virginica) (Ref. 26). Most area wetlands provide a habitat for numerous fish species, and recently Whale Branch has been re-approved for the harvest of shellfish. Prior to this time, Whale Branch shellfish could be used to restock other tributaries, but could not be directly harvested. It should be noted that Campbell Creek, Halfmoon Creek and several other tributaries of the Coosaware still closed to harvesting of shellfish (Ref. 8). At that time, ACC was the only apparent source of PCBs in the area.

5.0 Air and Soil Exposure Pathway

The population within a 4-mile radius of the ACC site is 2,956 (Refs. 2, 20). The facility is active and currently has 75 employees onsite; the nearest residence is located approximately 0.11 miles to the southeast. The active portion of the ACC property is fenced; however, the area of stressed vegetation is located outside their fenced portion of the facility. Land use in the area is extremely sparse, with little recreational value within a 0.5 mile radius. The nearest school is located 0.85 miles to the west. The town of Lobeco is located 0.7 miles to the west of the facility (Refs. 2, 4).

Sensitive environments found in the study area are the ranges of several federally endangered species. These are the Bald eagle, shortnose sturgeon, and the West Indian Manatee. There are no critical habitats within the State of South Carolina (Refs. 26, 27).

6.0 Conclusion

The American Color & Chemical facility was assessed to identify potential threats posed to human health and the environment and to determine the need for additional investigation. The surface water pathway is the pathway of concern for the ACC facility, owing to the potential for contamination to surrounding wetlands and fisheries. However, the size of the potentially affected water bodies, and the fact that they are tidally influenced has an ameliorating affect on the situation. It is therefore recommended that no further remedial action be planned for this facility.

RECONNAISSANCE CHECKLIST FOR HRS2 CONCERNS

Instructions: Obtain as much "up front" information as possible prior to conducting fieldwork. Complete the form in as much detail as you can, providing attachments as necessary. Cite the source for all information obtained.

Site Name: American Color and Chemical/Venture Chemical
City, County, State: Lobeco, Beaufort County, South Carolina
EPA ID No.: SCD046507018
Person responsible for form: James Miller
Date: September 14, 1989

Air Pathway

Describe any potential air emission sources onsite: Eight volatile organics were detected in the facility's effluent during a previous sampling investigation (Ref. 27, p. 1).

Identify any sensitive environments within 4 miles: There are no land-related sensitive environments within a 4-mile radius of the site (Refs. 13, p. 11; 17).

Identify the maximally exposed individual (nearest residence or regularly occupied building - workers do count): There are currently 75 employees at the Lobeco plant who regularly occupy buildings that are located adjacent to the abandoned burn site and the old drum storage area (Ref. 13, p. 3; Appendix B, figure 3a).

Groundwater Pathway

Identify any areas of karst terrain: None (Appendix C, p. 4-1).

Identify additional population due to consideration of wells completed in overlying aquifers to the AOC: NA; the AOC is a surficial aquifer (Ref. 3, p. 3).

Do significant targets exist between 3 and 4 miles from the site? There are probably about 10 homes or 38 people (10 houses x 3.8 people/house) relying on groundwater from the surficial aquifer between 3 and 4 miles from the site (Ref. 31; Appendix D).

Is the AOC a sole source aquifer according to Safe Drinking Water Act? (i.e. is the site located in Dade, Broward, Volusia, Putnam, or Flagler County, Florida): No.

Surface Water Pathway

Are there intakes located on the extended 15-mile migration pathway? No (Ref. 23).

Are there recreational areas, sensitive environments, or human food chain targets (fisheries) along the extended pathway? All of the potentially affected water bodies provide a habitat for numerous commercial fish species and most areas have been approved for shellfish harvesting (Refs. 17, 24). Other sensitive environments along the surface water migration pathway include a major breeding and nursery area, and two federally designated endangered species (Refs. 17; 25, section 6).

Onsite Exposure Pathway

Is there waste or contaminated soil onsite at 2 feet below land surface or higher? There are uncontained, contaminated soils at the burn site and the stressed vegetation area.

Is the site accessible to non-employees (workers do not count)? Only the stressed vegetation area is located outside of the fence that surrounds the facility and this is accessible to non-employees (Appendix B, figure 3a).

Are there residences, schools, or day care centers onsite or in close proximity? The nearest residence is located 500 feet east of the site (Appendix D). No day care centers are located onsite or in close proximity (Ref. 13, p. 11). The nearest school is James Davis Elementary, which is located approximately 1 mile east of the site (Appendix D).

Are there barriers to travel (e.g., a river) within one mile? The Whale Branch of the Coosaw River and several salt marshes are located within 1 mile of the site (Appendix D).

* All references and appendices cited on this form correlate to the Phase II, SSI report.

HAZARD RANKING SYSTEM SCORING SUMMARY

FOR

AMERICAN COLOR & CHEMICAL/VENTURE CHEMIC
EPA SITE NUMBER SCD046507018
LOBECO
BEAUFORT COUNTY, SC
EPA REGION: 4

SCORE STATUS: SUBMITTED TO REGION

SCORED BY JAMES MILLER
OF NUS CORPORATION
ON 12/13/89

DATE OF THIS REPORT: 04/16/90
DATE OF LAST MODIFICATION: 04/16/90

GROUND WATER ROUTE SCORE	:	59.18
SURFACE WATER ROUTE SCORE	:	21.82
AIR ROUTE SCORE	:	0.00
MIGRATION SCORE	:	36.46

This score was generated assuming that the confining layer separating the surficial and Tertiary Limestone aquifers is effective within a 2-mile site radius.

F.O.I.A.
EXEMPTION 5

Craig A. Benedikt 10/18/91
Approving Official Date

HRS GROUND WATER ROUTE SCORE

CATEGORY/FACTOR		RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE		YES	45	45
2. ROUTE CHARACTERISTICS				
DEPTH TO WATER TABLE				
DEPTH TO BOTTOM OF WASTE				
DEPTH TO AQUIFER OF CONCERN				
PRECIPITATION				
EVAPORATION				
NET PRECIPITATION				
PERMEABILITY				
PHYSICAL STATE				
TOTAL ROUTE CHARACTERISTICS SCORE:				N/A
3. CONTAINMENT				N/A
4. WASTE CHARACTERISTICS				
TOXICITY/PERSISTENCE:POLYCHLORINATED BIPHENYLS,NOS				18
WASTE QUANTITY	CUBIC YDS	2501		
	DRUMS	0		
	GALLONS	0		
	TONS	0		
	TOTAL	2501 CU. YDS	8	8
TOTAL WASTE CHARACTERISTICS SCORE:				26
5. TARGETS				
GROUND WATER USE			3	9
DISTANCE TO NEAREST WELL		1000 FEET		
AND		MATRIX VALUE	20	20
TOTAL POPULATION SERVED		144 PERSONS		
NUMBER OF HOUSES		38		
NUMBER OF PERSONS		0		
NUMBER OF CONNECTIONS		0		
NUMBER OF IRRIGATED ACRES		0		
TOTAL TARGETS SCORE:				29

GROUND WATER ROUTE SCORE (Sgw) = 59.18

HRS SURFACE WATER ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE	YES	45	45
2. ROUTE CHARACTERISTICS			
SITE LOCATED IN SURFACE WATER	-		
SITE WITHIN CLOSED BASIN			
FACILITY SLOPE			
INTERVENING SLOPE			
24-HOUR RAINFALL			
DISTANCE TO DOWN-SLOPE WATER			
PHYSICAL STATE			
TOTAL ROUTE CHARACTERISTICS SCORE:			N/A
3. CONTAINMENT			N/A
4. WASTE CHARACTERISTICS			
TOXICITY/PERSISTENCE:POLYCHLORINATED BIPHENYLS,NOS			18
WASTE QUANTITY CUBIC YDS	2501		
DRUMS	0		
GALLONS	0		
TONS	0		
TOTAL	2501 CU. YDS	8	8
TOTAL WASTE CHARACTERISTICS SCORE:			26
5. TARGETS			
SURFACE WATER USE		2	6
DISTANCE TO SENSITIVE ENVIRONMENTS		3	6
COASTAL WETLANDS	0 FEET		
FRESH-WATER WETLANDS	NONE		
CRITICAL HABITAT	NONE		
DISTANCE TO STATIC WATER	> 3 MILES		
DISTANCE TO WATER SUPPLY INTAKE	> 3 MILES		
AND	MATRIX VALUE	0	0
TOTAL POPULATION SERVED	0		
NUMBER OF HOUSES	0		
NUMBER OF PERSONS	0		
NUMBER OF CONNECTIONS	0		
NUMBER OF IRRIGATED ACRES	0		
TOTAL TARGETS SCORE:			12

SURFACE WATER ROUTE SCORE (Ssw) = 21.82

HRS AIR ROUTE SCORE

	CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1.	OBSERVED RELEASE	NO	0	0
2.	WASTE CHARACTERISTICS			
	REACTIVITY:		MATRIX VALUE	
	INCOMPATIBILITY			
	TOXICITY			
	WASTE QUANTITY CUBIC YARDS			
	DRUMS			
	GALLONS			
	TONS			
	TOTAL			
	TOTAL WASTE CHARACTERISTICS SCORE:			N/A
3.	TARGETS			
	POPULATION WITHIN 4-MILE RADIUS			
	0 to 0.25 mile			
	0 to 0.50 mile			
	0 to 1.0 mile			
	0 to 4.0 miles			
	DISTANCE TO SENSITIVE ENVIRONMENTS			
	COASTAL WETLANDS			
	FRESH-WATER WETLANDS			
	CRITICAL HABITAT			
	DISTANCE TO LAND USES			
	COMMERCIAL/INDUSTRIAL			
	PARK/FOREST/RESIDENTIAL			
	AGRICULTURAL LAND			
	PRIME FARMLAND			
	HISTORIC SITE WITHIN VIEW?			
	TOTAL TARGETS SCORE:			N/A

AIR ROUTE SCORE (Sa) = 0.00

HAZARD RANKING SYSTEM SCORING CALCULATIONS
FOR
SITE: AMERICAN COLOR & CHEMICAL/VENTURE CHEMIC
AS OF 04/16/90

GROUND WATER ROUTE SCORE

OBSERVED RELEASE		45
WASTE CHARACTERISTICS	X	26
TARGETS	X	29

= 33930 /57,330 X 100 = 59.18 = S_{gw}

SURFACE WATER ROUTE SCORE

OBSERVED RELEASE		45
WASTE CHARACTERISTICS	X	26
TARGETS	X	12

= 14040 /64,350 X 100 = 21.82 = S_{sw}

AIR ROUTE SCORE

OBSERVED RELEASE 0 /35,100 X 100 = 0.00 = S_{air}

SUMMARY OF MIGRATION SCORE CALCULATIONS

	S	S^2
GROUND WATER ROUTE SCORE (S_{gw})	59.18	3502.27
SURFACE WATER ROUTE SCORE (S_{sw})	21.82	476.11
AIR ROUTE SCORE (S_{air})	0.00	0.00
$S^2_{gw} + S^2_{sw} + S^2_{air}$		3978.38
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_{air}}$		63.07
$S_M = \sqrt{S^2_{gw} + S^2_{sw} + S^2_{air}}/1.73$		36.46

HAZARD RANKING SYSTEM SCORING SUMMARY

FOR

AMERICAN COLOR & CHEMICAL/VENTURE CHEMIC
EPA SITE NUMBER SCD046507018
LOBECO
BEAUFORT COUNTY, SC
EPA REGION: 4

SCORE STATUS: SUBMITTED TO REGION

SCORED BY JAMES MILLER
OF NUS CORPORATION
ON 12/13/89

DATE OF THIS REPORT: 04/16/90
DATE OF LAST MODIFICATION: 04/16/90

GROUND WATER ROUTE SCORE	:	89.80
SURFACE WATER ROUTE SCORE	:	21.82
AIR ROUTE SCORE	:	0.00
MIGRATION SCORE	:	53.42

This score was generated assuming that the confining layer separating the surficial and Tertiary Limestone aquifers is leaky within a 2-mile site radius.

F.O.I.A.
EXEMPTION 5

Craig A. Benedikt 10/18/91
Approving Official Date

HRS GROUND WATER ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE	YES	45	45
2. ROUTE CHARACTERISTICS			
DEPTH TO WATER TABLE			
DEPTH TO BOTTOM OF WASTE			
DEPTH TO AQUIFER OF CONCERN			
PRECIPITATION			
EVAPORATION			
NET PRECIPITATION			
PERMEABILITY			
PHYSICAL STATE			
TOTAL ROUTE CHARACTERISTICS SCORE:			N/A
3. CONTAINMENT			N/A
4. WASTE CHARACTERISTICS			
TOXICITY/PERSISTENCE:POLYCHLORINATED BIPHENYLS,NOS			18
WASTE QUANTITY CUBIC YDS	2501		
DRUMS	0		
GALLONS	0		
TONS	0		
TOTAL	2501 CU. YDS	8	8
TOTAL WASTE CHARACTERISTICS SCORE:			26
5. TARGETS			
GROUND WATER USE		3	9
DISTANCE TO NEAREST WELL	150 FEET		
AND	MATRIX VALUE	35	35
TOTAL POPULATION SERVED	3437 PERSONS		
NUMBER OF HOUSES	770		
NUMBER OF PERSONS	511		
NUMBER OF CONNECTIONS	0		
NUMBER OF IRRIGATED ACRES	0		
TOTAL TARGETS SCORE:			44

GROUND WATER ROUTE SCORE (Sgw) = 89.80

HRS SURFACE WATER ROUTE SCORE

CATEGORY/FACTOR		RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE		YES	45	45
2. ROUTE CHARACTERISTICS				
SITE LOCATED IN SURFACE WATER				
SITE WITHIN CLOSED BASIN				
FACILITY SLOPE				
INTERVENING SLOPE				
24-HOUR RAINFALL				
DISTANCE TO DOWN-SLOPE WATER				
PHYSICAL STATE				
TOTAL ROUTE CHARACTERISTICS SCORE:				N/A
3. CONTAINMENT				N/A
4. WASTE CHARACTERISTICS				
TOXICITY/PERSISTENCE:POLYCHLORINATED BIPHENYLS,NOS				18
WASTE QUANTITY	CUBIC YDS	2501		
	DRUMS	0		
	GALLONS	0		
	TONS	0		
	TOTAL	2501 CU. YDS	8	8
TOTAL WASTE CHARACTERISTICS SCORE:				26
5. TARGETS				
SURFACE WATER USE			2	6
DISTANCE TO SENSITIVE ENVIRONMENTS			3	6
COASTAL WETLANDS		0 FEET		
FRESH-WATER WETLANDS		NONE		
CRITICAL HABITAT		NONE		
DISTANCE TO STATIC WATER		> 3 MILES		
DISTANCE TO WATER SUPPLY INTAKE		> 3 MILES		
AND		MATRIX VALUE	0	0
TOTAL POPULATION SERVED		0		
NUMBER OF HOUSES		0		
NUMBER OF PERSONS		0		
NUMBER OF CONNECTIONS		0		
NUMBER OF IRRIGATED ACRES		0		
TOTAL TARGETS SCORE:				12

SURFACE WATER ROUTE SCORE (Ssw) = 21.82

HRS AIR ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE	NO	0	0

2. WASTE CHARACTERISTICS

REACTIVITY: MATRIX VALUE

INCOMPATIBILITY

TOXICITY

WASTE QUANTITY CUBIC YARDS
DRUMS
GALLONS
TONS

TOTAL

TOTAL WASTE CHARACTERISTICS SCORE: N/A

3. TARGETS

POPULATION WITHIN 4-MILE RADIUS
0 to 0.25 mile
0 to 0.50 mile
0 to 1.0 mile
0 to 4.0 miles

DISTANCE TO SENSITIVE ENVIRONMENTS
COASTAL WETLANDS
FRESH-WATER WETLANDS
CRITICAL HABITAT

DISTANCE TO LAND USES
COMMERCIAL/INDUSTRIAL
PARK/FOREST/RESIDENTIAL
AGRICULTURAL LAND
PRIME FARMLAND
HISTORIC SITE WITHIN VIEW?

TOTAL TARGETS SCORE: N/A

AIR ROUTE SCORE (Sa) = 0.00

HAZARD RANKING SYSTEM SCORING CALCULATIONS
FOR
SITE: AMERICAN COLOR & CHEMICAL/VENTURE CHEMIC
AS OF 04/16/90

GROUND WATER ROUTE SCORE

OBSERVED RELEASE		45
WASTE CHARACTERISTICS	X	26
TARGETS	X	44

$= 51480 / 57{,}330 \times 100 = 89.80 = S_{gw}$

SURFACE WATER ROUTE SCORE

OBSERVED RELEASE		45
WASTE CHARACTERISTICS	X	26
TARGETS	X	12

$= 14040 / 64{,}350 \times 100 = 21.82 = S_{sw}$

AIR ROUTE SCORE

OBSERVED RELEASE $0 / 35{,}100 \times 100 = 0.00 = S_{air}$

SUMMARY OF MIGRATION SCORE CALCULATIONS

	S	S^2
GROUND WATER ROUTE SCORE (S_{gw})	89.80	8064.04
SURFACE WATER ROUTE SCORE (S_{sw})	21.82	476.11
AIR ROUTE SCORE (S_{air})	0.00	0.00
$S^2_{gw} + S^2_{sw} + S^2_{air}$		8540.15
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_{air})}$		92.41
$S_M = \sqrt{(S^2_{gw} + S^2_{sw} + S^2_{air})}/1.73$		53.42

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REFERENCE 1

LAW ENVIRONMENTAL SERVICES

PRELIMINARY HYDROGEOLOGIC ASSESSMENT

for

VENTURE CHEMICALS INC.

LOBECO, SOUTH CAROLINA

JUNE 21, 1985

LAW ENVIRONMENTAL SERVICES
DIVISION OF LAW ENGINEERING TESTING COMPANY
2749 DELK ROAD, S.E.
MARIETTA, GEORGIA 30067
(404) 952-9005

July 2, 1985

Venture Chemicals, Inc.
P.O. Box 815
South Carolina Highway 38
Lobeco, South Carolina 29931

Attention: Mr. John M. Meeks

Subject: Preliminary Hydrogeologic Assessment
Venture Chemical Plant
Lobeco, South Carolina
Law Environmental Services Project No. AE5238

Dear Mr. Meeks:

Law Environmental Services is pleased to submit this preliminary hydrogeologic assessment report of Venture Chemicals, Lobeco, South Carolina plant site. Our services were performed in general accordance with the scope of work outlined in the March 18, 1985 Ground-Water Detection Monitoring Plan. Our services were authorized by your Purchase Order No. 6676 dated April 8, 1985.

Our services as described in this report include the installation and development of six (6) Type II ground water quality monitoring wells, permeability testing of selected wells, water-level measurements, evaluation of hydrogeologic data, and preparation of a report. Ground-water sampling and chemical analyses were performed by others.

RECEIVED
JUL 05 1985

We appreciate the opportunity to assist Venture Chemicals with this important project. Please call us if you have any questions about this report.

Sincerely yours,

LAW ENVIRONMENTAL SERVICES

William M. Gierke

William G. Gierke
Staff Hydrogeologist

Charles A. Spiers

Charles A. Spiers, P.G.
Project Hydrogeologist

Thomas L. Cross ds

Thomas L. Cross, P.E.
Senior Hydrologist

Enclosure

WGG:CAS:TLC:ds

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INTRODUCTION

Venture Chemicals, Inc. reached an agreement with the South Carolina Department of Health and Environmental Control (DHEC) to implement a ground-water monitoring program at Venture Chemical's Lobeco, South Carolina facility. The proposed monitoring well plan was reviewed and approved by Mr. Charles Clymer of DHEC as stated in his April 8, 1985 letter. However, several exceptions to the plan were noted in Mr. Clymer's letter. Most of these dealt with sampling and analyses of ground water from monitoring wells, which was performed by Davis and Floyd.

Other concerns noted in DHEC's letter are addressed in this report. This report discusses the installation of six monitoring wells and data generated from the wells, along with other pertinent site hydrogeologic data.

LOCATION AND DESCRIPTION

Venture Chemicals, Inc. operates a plant located in Lobeco, South Carolina approximately 12 miles northwest of the town of Beaufort, South Carolina (Figure 1). The site is located approximately one mile north of the Whale Branch of the Coosaw River and 0.75 miles east of U.S. Route 21. The facility property comprises about 250 acres and the plant occupies about 50 acres. Figure 2 illustrates the layout of the facility.

The plant primarily manufactures agri-products, dye intermediates, and drilling fluid chemicals for the oil industry. Chemicals used and produced on-site consist primarily of organic compounds. Acidic industrial waste water from the plant is treated and neutralized on-site, prior to discharge to Campbell's Creek (see inset on Figure 1) in accordance with NPDES permit requirements. All wastes treated on-site are considered non-hazardous. Sludge from the bio-treatment area is disposed of off-site in a DHEC approved landfill. Venture Chemicals transports liquid hazardous wastes off-site.

Previous tenants at this site include Tenneco Company from 1967 to 1974 and American Color Chemical Company from 1974 to 1982.

REGIONAL HYDROGEOLOGY

The Lobeco, South Carolina area is underlain by sedimentary rocks that range in age from late Cretaceous to Holocene, comprising an overall thicknes of about 3,500 feet. This sequence of sedimentary rocks supplies all of the ground water used in the area (Hayes, 1979).

The principal aquifer beneath the site is composed of the Santee Limestone and basal portion of the Cooper Marl. These stratigraphic units form the principal artesian aquifer that supplies the majority of ground water in Beaufort County. A

gamma ray log (Figure 4) of the deep observation well at the site shows that the top of the principal artesian aquifer is about 80 feet below land surface.

Specific yields of wells open to the principal artesian aquifer range from about 50 gallons per minute (gpm) to about 2,500 gpm (Hayes, 1979). Two deep production water wells exist at the site (Figure 2). These wells are 263 and 307 feet deep and periodically pump about 350 gpm each. The well sare screened at various intervals in the principal artesian aquifer (see Appendix for well details and logs). The most productive interval screened in these wells is the upper permeable zone of the principal artesian aquifer which extends from about 80 to 150 feet below land surface (Figure 4). Pumping of the two wells has caused a cone of depression of about 10 feet in the principal artesian aquifer as indicated on the regional potentiometric map published by The South Carolina Water Resources Commission (SCWRC) in June, 1984. The water level of the on-site SCWRC observation well was measured at 11.71 feet below mean sea level on March 27, 1985 (Table 1).

Overlying the principal aquifer is the Hawthorn formation which is composed of phosphatic, clayey sand and sandy clay with occasional zones of dolomitic, sandy to clayey limestone. The upper and lower sections of the Hawthorn formation act as confining beds. The middle section of the Hawthorn formation may be an aquifer (Hawthorn aquifer) in some areas; however, published

(21.6 feet), suggests that there is little or no hydraulic connection between the "uppermost" unconfined aquifer and the underlying principal artesian aquifer, even though the deeper aquifer is heavily pumped. This lack of hydraulic connection implies that downward seepage from the "uppermost" aquifer to the lower principal artesian aquifer is not likely to occur. As previously mentioned, the two aquifers are separated by the Hawthorn formation which is considered to be a confining bed.

Water elevations of the east and west holding basins were measured at 12.02 and 12.75 feet NGVD, respectively. These elevations are 6.43 and 7.16 feet higher than the water level in well V-5 which is directly downgradient (~ 10 feet) from the holding basins. This difference in water levels suggests that mounding of ground water caused by the holding basins is negligible.

A potentiometric map (Figure 2) derived from water levels obtained from site monitoring wells on April 27, 1985 shows that the direction of ground-water flow in the "uppermost" aquifer is to the south, toward Campbells Creek. In the "uppermost" aquifer, a slight hydraulic gradient of 0.003 ft/ft exists across the site.

Field permeability tests (found in the Appendix) performed on monitoring wells V-1, V-3, V-4, and V-6 yielded hydraulic conductivity (k) values ranging from 1.6×10^{-4} centimeters per second (cm/s) in well V-6 to 1.3 x 10^{-3} cm/s in well V-3 (Table 2). An average k-value for the permeability tests is 4.8 x 10^{-4} cm/s. This value is representative of the silty fine sands found in test holes at each monitoring well location.

The velocity of ground-water flow at the site can be estimated by using the formula V=Ki/Ne (Darcy's Law)

where; V = Velocity (cm/sec)

K = hydraulic conductivity (cm/sec)

i = hydraulic gradient (ft/ft)

Ne = effective porosity (dimensionless)

An estimated ground-water flow velocity was estimated by using the following data:

K = 4.8 x 10^{-4} cm/s

i = 0.003 ft/ft

Ne = 0.20 (assumed)

Based on the above data, an estimated flow velocity of 7.2 x 10^{-6} cm/s (7.4 feet/year) is calculated for ground water in the uppermost aquifer at the site.

CONCLUSIONS

Based on existing data, the following conclusions are presented:

1. The ground-water flow direction in the "uppermost" aquifer at the Venture Chemical's facility is from north to south, toward Campbells Creek.

2. An estimated ground-water flow velocity in the site area is 7.2×10^{-6} cm/s or 7.4 feet/year.

3. Significant differences between water levels in the holding basins and nearby monitoring wells suggests that mounding of ground water caused by the basins is negligible.

4. The "uppermost" unconfined aquifer and the underlying principal artesian aquifer do not appear to be hydraulically connected. Evidence supporting this lack of connection includes the presence of the Hawthorn Formation (a confining bed) and water level differences of 21.6 feet or more between the two aquifers.

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OVERSIZED

DOCUMENT

REFERENCE 3

R-586-9-0-27

approved
10/30/90
Recommend SIP
E. Bozeman

FINAL REPORT

SCREENING SITE INSPECTION, PHASE II
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA
EPA ID #SCD046507018

Prepared Under
TDD No. F4-8904-54
CONTRACT NO. 68-01-7346

Revision 0

FOR THE

WASTE MANAGEMENT DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 21, 1990

NUS CORPORATION
SUPERFUND DIVISION

Prepared By	Reviewed By	Approved By
James Miller	Greg Schank for	Phil Blackwell
James Miller	Bob Donaghue	Phil Blackwell
Project Manager	Assistant Regional Project Manager	Regional Project Manager

NOTICE

The information in this document has been funded wholly by the United States Environmental Protection Agency (EPA) under Contract Number 68-01-7346 and is considered proprietary to the EPA.

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EXECUTIVE SUMMARY

American Color and Chemical/Venture Chemical is located near the Coosaw River, about 12 miles northwest of Beaufort, South Carolina. The 26-acre site is currently owned by Lobeco Products, Inc. Previous tenants at the site include the Tenneco Chemical Company and the American Color and Chemical Company. The facility has primarily manufactured dye chemicals and intermediates during its more than 20-year history. Prior to February 1977, a lagoon, burn site, and drum storage area were used to manage waste at the facility. These areas have consistently shown elevated concentrations of chlorinated organics and heavy metals in environmental samples collected during previous investigations. The facility is currently under a consent order with the state to remediate the lagoon and burn site by December 1990.

Lobeco, South Carolina, is situated within the Coastal Plain Physiographic Province in a region that is characterized by low flatland inundated with water. The geology of the study area involves a thick wedge of sedimentary rocks, which can be divided into several hydrologic units based on differences in permeability and hydrologic characteristics. The uppermost hydrologic unit at this facility is the surficial aquifer, which consists of intermixed sand and clay layers. It is underlain by a thick sequence of green clay, which acts as an aquitard that separates the overlying unit from the deeper Tertiary Limestone Aquifer System. There are no wells in the Lobeco area that penetrate the full thickness of the Tertiary Limestone Aquifer System.

The surface water, groundwater, air, and onsite exposure pathways are of concern at American Color and Chemical/Venture Chemical. The surface water pathway was determined to be of primary concern. Several previous sampling investigations have shown that the sediment and fauna of nearby Campbell Creek are contaminated with polychlorinated biphenyls (PCBs). Numerous commercial fish species are considered at risk from releases of contaminants to the surface water pathway. The groundwater pathway is the next most significant pathway of concern at this site. There are approximately 182 people using the surficial aquifer within 4 miles of the site, and at least one of these users is located directly downgradient of the burn site. The air and onsite exposure pathways are of concern due to the presence of uncontained, contaminated soils. Potentially affected targets include local students, employees, and residents.

In November 1986, G & E Engineering, Inc. conducted a study at American Color and Chemical/Venture Chemical which involved a geophysical screening and the evaluation of analytical data from 197 samples. The geophysical instrument that was utilized delineated several zones of higher conductivity, which are interpreted to represent areas containing contaminated soil and groundwater. The analytical test results verify that the same areas are primarily contaminated with chlorinated organics and/or metals. The constituents, which are of primary concern, include: PCBs, trichloroethene (TCE), methylene chloride, lead, and mercury. All of these were found in soil and groundwater samples at concentrations significantly over background and are known components of waste deposited at this site. Also, the same type of contamination was found in several downgradient wells, which suggests that contaminants are migrating from this site.

Although extensive contamination has been documented in soil, groundwater, and sediment at and near the site, the facility is under a consent order with the state for remediation. Should all wastes and contaminated soils be removed, this site would not be a viable candidate for a Listing Site Inspection (LSI). Therefore, FIT 4 recommends that consideration of any further action at this site be contingent upon results of the ongoing remediation.

1.0 INTRODUCTION

The NUS Corporation Region 4 Field Investigation Team (FIT) was tasked by the U.S. Environmental Protection Agency (EPA), Waste Management Division to conduct a Phase II Screening Site Inspection (SSI) at the American Color and Chemical/Venture Chemical site in Lobeco, Beaufort County, South Carolina. The investigation was performed under the authority of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The task was performed to satisfy the requirements stated in Technical Directive Document (TDD) number F4-8904-54. At EPA's directive, FIT conducted no field activities for this SSI; analytical data incorporated into this report were generated during two previous studies at the site.

1.1 OBJECTIVES

The objectives of this investigation were to determine the nature of contaminants present at the site and to determine if a release of these substances has occurred or may occur. Further, this investigation sought to determine the possible pathways by which contamination could migrate from the site and the populations and environments it would potentially affect. Through these objectives, a recommendation was made regarding future activities at the site.

1.2 SCOPE OF WORK

The objectives were achieved through the completion of a number of specific tasks. These activities were to:

- Obtain and review background material relevant to HRS scoring of the site;
- Obtain maps of site;
- Obtain information on local water systems;
- Evaluate target population within a 4-mile radius of the site with regard to the groundwater and air pathways, and the possibility of direct contact, and within 15 downstream miles with regard to surface water use;

- Conduct a survey for private wells;
- Determine location and distance to nearest potable well;
- Develop a site sketch to scale;
- Reevaluate previous field investigations performed by Davis & Floyd, Inc. and G & E Engineering, Inc.; and
- Complete a Site Inspection Report, provided as Appendix A in this report.

2.0 SITE CHARACTERIZATION

2.1 SITE BACKGROUND AND HISTORY

American Color and Chemical/Venture Chemical is located just north of the Coosaw River, approximately 12 miles northwest of the town of Beaufort (Ref. 1, p. 1). Specifically, the site is located southeast of the intersection of highways 38 and 480 (Ref. 2). It is presently owned and operated by Lobeco Products, Inc. (Ref. 3, p. 1).

The plant was originally built by Tenneco Chemical Company in 1967. It was sold to American Color and Chemical Company in January 1974, and then resold to Venture Chemical Company in October 1982. Venture Chemical Company has since then changed its name to Lobeco Products, Inc. (Ref. 3, p. 1).

Lobeco primarily manufactures agric-products, dye intermediates, and drilling fluid chemicals for the oil industry. The chemicals used and produced on site consist mostly of organic compounds. Acidic industrial wastewater is generated as a by-product of the manufacturing process. This wastewater is neutralized in an onsite water treatment plant and then discharged into nearby Campbell Creek (Ref. 3, pp. 1-2).

Prior to the installation of the wastewater treatment system, a lagoon, drum storage area, and burn site were used to manage waste at the facility. These areas have consistently shown elevated concentrations of chlorinated organics (especially polychlorinated biphenyls) and/or heavy metals in environmental samples collected thus far (Ref. 3, p. 2). The samples were collected during three previous investigations: in September 1985, between January and May of 1986, and in March and April of 1988 (Appendices B, spread sheet; C, p. 1-5). The 1985 and 1986 sampling investigations were conducted by Davis & Floyd, Inc. and G & E Engineering, Inc., respectively. Both studies were performed because the South Carolina Department of Health and Environmental Control (DHEC) suspected contamination based upon previous water quality studies in nearby Campbell Creek (Appendix C, pp. 1-3, 1-4). G & E evaluated both sets of data in their November 1986 report entitled, Ongoing Soil and Groundwater Study and Conceptualized Cleanup Plan, Venture Chemicals, Inc., Lobeco, South Carolina (Appendix B, p. 31). The 1988 investigation was initiated by RMT, Inc. to fulfill the requirements of a DHEC Consent Order (No. 87-65-W) dated June 25, 1987 (Appendix C, pp. 1-4, 1-5). The findings of this study are presented in RMT's Lobeco Site Environmental Assessment, Results and Proposed Remedial Action Plans for American Color and Chemical Corporation and Tenneco Resins, Inc., dated September 1988 (Appendix C).

Consent Order 87-65-W was amended on October 11, 1989 (Ref. 4). The amendment was incorporated into the original order and requires that the present and past owner(s) of the chemical plant are to remove "high level" contamination at the abandoned lagoon and burn site (Ref. 5, pp. 1, 3). The latter document also includes a provision which specifies that the extent of groundwater contamination for "certain" areas on the property be delineated during future studies (Ref. 5, p. 1). This stipulation was intended to expedite implementation of the clean-up plan, which is targeted for completion in December of 1990 (Refs. 5, p. 1; 6; Appendix C, p. 10-2).

Lobeco Products, Inc. was also issued consent orders for two separate violations of its National Pollution Discharge Elimination System (NPDES) permit (no. SC0000914). The first consent order (86-94-W) was issued on September 29, 1986 for a violation of the toxicity limit (Ref. 7). The company also violated the toxicity limit, in addition to the limits for biochemical oxygen demand, total coliform, and ultimate oxygen demand, which initiated the issuance of the second order (88-37-W) (Ref. 8, p. 5). The August 8, 1988 document ordered Lobeco to "immediately begin and continue to properly operate and maintain its waste treatment facilities so as to maximize treatment" (Ref. 8, pp. 6-7). The only other permit violation that is known to have occurred at this facility is for failure to monitor polychlorinated biphenyls (PCBs) on a weekly basis. Venture Chemicals, Inc. received a Notice of Violation on December 18, 1985 for this infraction, but no enforcement action was ever taken (Ref. 9).

Lobeco Products, Inc. filed a part A application under the Resource Conservation and Recovery Act (RCRA) for waste treatment in tanks and the old lagoon. The tank treatment was later given exclusion under RCRA because it was a Waste Water Treatment Unit. Also, the waste in the lagoon was determined to be nonhazardous. Because of this, the Part A application was withdrawn on October 18, 1984 (Ref. 3, p. 2).

2.2 SITE DESCRIPTION

2.2.1 Site Features

The facility property consists of approximately 250 acres (Ref. 1, p. 1). Within these 250 acres, five contaminated areas connect to form an elongated, 26-acre parcel of land, which is considered the site (Figure 1). The contaminated areas include: the abandoned lagoon, the sediments and marsh near the Lobeco outfall, the old drum storage area, the old burn site, and an area of stressed vegetation (Ref. 3, pp. 2-3, 5). The site has an average downward slope of 0.006 ft/ft (Appendix B, p. 24).

Several active waste management facilities are located in the site area. These are part of the NPDES water treatment system and consist of the following: an equalization basin, an aeration basin, a digester basin, clarifiers (two), drying beds, and holding ponds (east and west ponds) (Ref. 3, p. 2). All of the active waste management facilities, and one of the inactive waste sites (drum storage area), are completely surrounded by a fence. A gate at the northwest corner provides the only security access. The site layout is depicted in Figure 2.

2.2.2 Waste Characteristics

Historical effluent and solid waste management practices at this facility involved the lagoon, drum storage area, and burn site. The lagoon was used as a settling basin for process effluent, which consisted of aqueous product extractions (washes) and cooling water mixed in with sanitary waste. Off-grade products and other process wastes were kept at the drum storage area prior to being incinerated at the burn site (Ref. 10, p. 9). Several of these materials are known to have contained either PCB, naphthalene, or toluene (Ref. 10, pp. 11-12). No known waste quantity information exists for inactive waste management facilities at this site (Ref. 10, p. 12).

The chemical plant also operated a hot oil circulating system for certain reactions that require higher than normal temperature. The hot oil system operated on electric heaters in a pump-around loop. On occasion, pump leaks developed and/or electric heating tubes failed, which resulted in spills onto the plant floor. When this happened, the standard clean-up procedure was to scoop up as much as possible into drums. The residue was then washed into the floor drain system, which ultimately led into the effluent system and then to the lagoon. The heating oil that was initially used was a PCB (Arochlor 1248) supplied by Monsanto (Ref. 10, p. 10).

Historical aerial photographs show that the new wastewater treatment facilities were installed between September 1975 and February 1977 (Appendix B, p. 12). The plant currently utilizes the activated sludge method to treat wastes (Refs. 3, p. 2; 11). Only non-hazardous wastes undergo treatment (Ref. 1, p. 2). Sludge solids from the bio-treatment area are landfilled at an offsite location (Refs. 1, p. 2; 11). Lobeco Products, Inc. transports liquid hazardous wastes off site (Ref. 1, p. 2).

Various types of containment exist at each of the former disposal areas. A PCB contaminated sludge layer at the bottom (8 feet) of the old lagoon was covered by a 1- to 2-foot natural earth cap and then backfilled (Ref. 10, p. 11; Appendices B, pp. 13, 39; C, p. 2-2). The old drum storage area has been partially covered with a concrete pad (Appendix B, p. 6). There is no artificial cover on the burn site, but the area is completely overgrown with groundcover-type vegetation (Appendix B, pp. 13-14, 39). Finally, all of the former disposal areas are unlined (Refs. 10, p. 12; 12).

3.0 REGIONAL POPULATIONS AND ENVIRONMENTS

3.1 POPULATION AND LAND USE

3.1.1 Demography

American Color and Chemical/Venture Chemical is in a moderately populated rural area approximately 12 miles northwest of Beaufort, South Carolina (Ref. 3, p. 3; Appendix B, p. 24). Most of the population in the area consists of full-time residents. A house count on USGS topographic maps covering the area indicated that 4,313 people (1,135 houses x 3.8 people/house) live within 4 miles of the site; 380 people (100 houses x 3.8 people/house) were counted within 1 mile. The nearest residence is located 500 feet east of the site (Appendix D).

There are very few work areas and schools in the study area. The only major work area known to exist within 4 miles of the site is the Marine Corps Air Station on Port Royal Island (Appendix D). Also, there are currently 75 employees at the Lobeco plant (Ref. 13, p. 3). No schools or day-care centers are located adjacent to the site (Ref. 13, p. 11; Appendix D). The nearest school is James Davis Elementary, which is located approximately 1 mile east of the site (Appendix D). There are 436 students attending this school (Ref. 14).

3.1.2 Land Use

The area within a 4-mile radius of the site is characterized by low flatland inundated with surface water (Ref. 15, pp. 5, 13). Because of this, the majority of land surrounding American Color and Chemical/Venture Chemical is sparsely settled (Ref. 15, p. 13). Nevertheless, agriculture plays an important role in the economy of the area (Ref. 15, p. 16).

Agricultural uses include livestock and crop production. Crops grown include corn, soybeans, small grains, fruits, and vegetables (Ref. 16). There are no parks or land-related sensitive environments within 4 miles of the site (Refs. 13, p. 11; 17; Appendix D).

3.2 SURFACE WATER

3.2.1 Climatology

Beaufort County is characterized by a subtropical climate with hot and humid summers and mild winters. The annual rainfall is approximately 50 inches with the greatest precipitation occurring from June to August (Ref. 15, pp. 5, 9). Annual evapotranspiration is 44 inches, making net annual precipitation approximately 6 inches (Ref. 18). Mean annual temperature for the Lobeco area is approximately 66°F (Ref. 15, p. 10).

3.2.2 Overland Drainage

Surface water runoff from the property collects in an onsite drainage ditch system (Appendix B, p. 24). The water in the ditch flows south and eventually empties into a tidally influenced marsh area that surrounds Campbell Creek (Ref. 19, p. 17; Appendix B, p. 24).

3.2.3 Potentially Affected Water Bodies

Overland drainage discharges into the tidal marsh surrounding Campbell Creek. During ebb tide, Campbell Creek flows southeasterly into Whale Branch of the Coosaw River (Ref. 20; Appendix D). The surface water migration pathway ends in the Coosaw River, approximately 9 miles downstream from its confluence with Whale Branch (Ref. 17). During flood tide, however, flow direction is reversed, and the migration pathway extends to include several additional tributaries of Whale Branch and the Coosaw River (Refs. 17; 20; 21; Appendix D).

Along the surface water migration pathway, the waters are designated Class SA (Ref. 22, pp. 272, 277). This is indicative of saltwaters suitable for harvesting of clams, mussels, and oysters for human consumption (Ref. 22, p. 272). There are no drinking water intakes downstream from the site (Ref. 23).

Numerous sensitive environments are present along the surface water migration pathway. All of the potentially affected water bodies lie contiguous to coastal wetlands (Ref. 17; Appendix D). These wetlands, and their associated drainageways, serve as a nursery and breeding ground for the eastern oyster (Crassostrea virginica) (Ref. 17). The drainageways also provide a habitat for numerous commercial fish species and most areas have been approved for shellfish harvesting (Refs. 17, 24). Minor exceptions basically include Campbell Creek, a portion of Whale Branch near its confluence with the creek, and several tributaries to the Coosaw River that are hydrologically interconnected with the nearby Beaufort River (Ref. 24). Finally, the Florida manatee (Trichechus manatus) and shortnose sturgeon (Acipenser brevirostrum) are designated as federally endangered and may be found along the migration pathway (Refs. 17; 25, section 6). These species have no critical habitats in the state of South Carolina (Ref. 25, section 7).

A significant amount of analytical data has been generated from previous water quality studies along the surface water migration pathway. The earliest samples were collected in August 1983 as part of an evaluation for the facility's discharge permit. At this time, the Chemical Oceanography Section of the Marine Resources Research Institute collected oyster samples from Campbell Creek. The samples contained very complex mixtures of organic compounds and showed elevated concentrations of lead (>2.0 ppm). Subsequent to these findings, DHEC conducted an assessment of the creek area in order to further evaluate the influence of the plant's discharge on the environment (Ref. 26). Samples that were collected in November 1983 showed sixty-six (66) organic chemical compounds in oyster tissue, sediment, and the Lobeco plant effluent (Ref. 27, p. 1). The investigation concluded that the fauna in Campbell Creek had been moderately to severely impacted due to the discharge of wastewater from the facility. However, the study did not present any direct evidence of fish kills in the creek (Ref. 27, p. 2).

The November 1983 sampling investigation led to several additional water quality studies in the Campbell Creek area. The testing was conducted in 1984 by both DHEC and an outside consultant to the chemical plant. The results from these studies showed an improvement in the water quality and biota of Campbell Creek, although PCBs were detected in the sediment near the Lobeco outfall. Analysis for PCBs was not performed during previous testing (Appendix C, p. 1-3).

The remaining water quality studies that have been conducted along the surface water migration pathway basically involve the monitoring of PCBs. DHEC collected samples of blue crabs (Callinectes sapidus) from Campbell Creek and its associated water bodies during September and October of 1985 (Ref. 28; Appendix C, p. 1-3). Detectable levels of PCBs were found in nearly all the samples (Ref. 28). The samples that showed the highest concentrations (mean = 0.949 ppm) were those collected near the discharge pipe (Ref. 28; Appendix C, pp. 1-3, 1-4). Other PCB monitoring was performed by the Marine Resources Division between June and October of 1985. During this time, they collected crab, oyster, and sediment samples along Campbell Creek and Whale Branch. The results from this analyses were similar to previous DHEC findings. The highest concentration detected (25.21 ppm) was from a sediment sample collected at the Lobeco outfall (Ref. 26). Finally, the facility is required to monitor PCBs on a weekly basis as part of their NPDES permit (Refs. 9; 19, p. 18). The permit also requires that several types of biological studies be conducted on a regular basis, but discussion of these studies is outside the scope of this investigation (Ref. 19, pp. 18-19).

3.3 GROUNDWATER

3.3.1 Hydrogeology

American Color and Chemical/Venture Chemical is located in the lower part of the Coastal Plain Physiographic Province (Refs. 15, pp. 5, 9; 29, p. 379; Appendix D). The topography of the surrounding area is characterized by low relief, lagoons, tidal swamps, and salt marshes (Appendix C, p. 4-1). The region is underlain by a thick wedge of sedimentary rocks, which unconformably overlie crystalline igneous and metamorphic rocks equivalent to rocks of the Piedmont Physiographic Province (Ref. 22, pp. 22-23).

The formations within the upper portion of this sedimentary wedge comprise the aquifers that are used in the study area (Refs. 15, p. 32; 22, p. 23; Appendix C, p. 4-1). The youngest of these is the Pamlico Formation, which represents the surface geology at the site (Appendix B, p. 25). Underlying units in descending order include: the Hawthorn and Cooper formations, the Ocala and Santee limestones, and the Black Mingo Formation (Refs. 22, pp. 23, 25; 29, pp. 380-381; Appendix B, pp. 25-26). These formations may be divided into several hydrologic units based on differences in permeability and hydrologic characteristics.

The uppermost hydrogeologic unit at American Color and Chemical/Venture Chemical is the unconfined surficial or water-table aquifer (Appendix B, p. 25). This unit consists primarily of quartz sand and lenses of clay to a depth of 35 to 40 feet below land surface (bls) (Appendices B, p. 4-1; C, p. 25). Although the saturated thickness of this unit is dependent on climatic conditions, elevations of nearby streams indicate the water table is between 5 and 10 feet bls (Refs. 3, p. 3; 29, p. 379). Recharge to this aquifer is from local rainfall (Ref. 29, p. 379; Appendix C, p. 4-5).

The water-table aquifer is underlain by approximately 50 feet of green clay from the Hawthorn and Cooper formations (Appendices B, p. 26; C, p. 4-2). This unit has a hydraulic conductivity of 10^{-7} cm/sec and serves as an aquitard that separates the overlying unit and the deeper Tertiary Limestone Aquifer System (Appendices B, p. 50; C, p. 6-31). The Tertiary Limestone aquifer is about 900 feet thick and is divided into an upper and a lower hydrologic unit (Refs. 22, p. 276; 30, p. 47). The upper unit consists of highly permeable fossiliferous limestone and is the primary source of groundwater in Beaufort County (Refs. 15, pp. 31-32; 29, p. 380; 30, p. 47). The lower unit is moderately productive and is not used as extensively as the upper unit (Ref. 30, p. 55). Recharge to the Tertiary Limestone aquifer is primarily through downward leakage from overlying units (Ref. 30, p. 73). The Tertiary Limestone Aquifer System is underlain by the Black Mingo Formation, which acts as a 400-foot thick confining layer (Refs. 22, p. 23; 29, p. 381; 30, p. 27).

Groundwater in the surficial, water-table aquifer system flows south toward Campbell Creek, reflecting the general influence of topography on the water table (Appendices B, pp. 28-29; C, p. 6-9). In the Tertiary Limestone aquifer, groundwater flow is regionally toward the east (Ref. 15, pp. 53-54). Within 2 miles of the site, however, an induced cone of depression exists in the potentiometric surface of the Tertiary Limestone aquifer (Ref. 15, figure 19; Appendix B, p. 27). This occurs because two closely spaced production wells on the Lobeco property pump sizable quantities (about 500,000 gal/d each) from an area in the aquifer where the transmissivity is relatively low (less than 5,000 ft^2/d) compared to other locations in the region (Ref. 15, p. 56). Within the cone of depression, the groundwater flow direction is toward the Lobeco pumping center.

The production wells at the chemical plant have depths of 263 and 307 feet and are open to both the upper and lower units of the Tertiary Limestone Aquifer System. The upper unit is the most productive interval screened in these wells, and it extends from about 90 to 150 feet bls (Ref. 1, p. 3). It is also the unit in which most of the remaining wells in the Lobeco area are completed (Refs. 15, p. 32; 31; Appendix B, p. 27). These wells commonly yield between 100 and 300 gallons per minute (Ref. 29, p. 380).

3.3.2 Aquifer Use

The surficial aquifer, which is also the aquifer of concern, is used for drinking purposes (Refs. 3, p. 3; 29, p. 379). However, a local well driller estimated that it supplies water to only 5 percent of the wells found within the study area (Ref. 31). This corresponds to 38 homes within 3 miles of the site, since approximately 770 private well owners were identified on the USGS topographic maps covering the area; an additional 10 (0.05 x 193) are included when considering a 4-mile radius. This gives a total of 48 homes or 182 people (48 houses x 3.8 people/house) relying on groundwater from the surficial aquifer within 4 miles of the site. There are no public water systems associated with the surficial aquifer (Refs. 3, p. 4; 13, pp. 4-5; Appendix B, p. 27).

DHEC conducted all of the previous studies on potable groundwater near the site area. The only available analytical data are from a July 1989 report, which gives the results of samples taken from six nearby private water supply wells. These samples were analyzed for volatile organics, priority pollutant metals, selected secondary metals, acid base and neutral extractable components, PCBs, alkalinity, and total dissolved solids. The analytical test results show that the groundwater surrounding the American Color and Chemical/Venture Chemical site is not contaminated. However, the report indicates that PCBs were detected in one of the wells during an earlier study. This well, owned by Mr. Ronald Glenn, is screened in the Tertiary Limestone aquifer. It serves 5 people and is located about 800 feet from the abandoned lagoon. The Anderson well is located adjacent to the Glenn well and is the only well within one-quarter mile of the site that is completed in the surficial aquifer. The shallow well was one of the six wells sampled during the 1989 investigation (Ref. 32).

3.4 SUMMARY OF POTENTIALLY AFFECTED POPULATIONS AND ENVIRONMENTS

There are four pathways of concern at the site: the surface water, groundwater, air, and onsite exposure pathways. Each of these has been deemed a potential contaminant migration route because each pathway is viable and targets are associated with each pathway.

Surface water is the primary pathway of concern. It has been demonstrated from several previous sampling investigations that the sediment and fauna of Campbell Creek are contaminated with PCBs. The creek serves as a habitat for numerous commercial fish species and would be open to shellfish harvesting if it were not for the influence of the chemical plant's wastewater discharge. Also, there are at least two endangered species that may be present along the migration pathway.

The groundwater pathway is less significant but also of concern. Although the target population associated with the surficial aquifer is small, there is at least one shallow well located downgradient from the burn site which may eventually become contaminated. Furthermore, there has been evidence of possible PCB contamination in a nearby private well that is screened in the deeper Tertiary Limestone aquifer. If the two aquifers were considered as a single hydrologic unit, the target population would increase significantly from 182 people to about 4,170 people.

The air and onsite exposure pathways are of concern due to the presence of uncontained, contaminated soils. Potentially affected targets within a 4-mile site radius include students, employees, and residents. The population of residents within 4 miles of the site is estimated at 4,313. Targets for onsite exposure include 75 employees at the subject facility and 380 residents located within a 1-mile radius of the site.

4.0 FIELD INVESTIGATION

The data presented in this section was obtained from the G & E Engineering, Inc. report entitled Ongoing Soil and Groundwater Study and Conceptualized Cleanup Plan, Venture Chemicals, Inc., Lobeco, South Carolina. The G & E report provides analyses for nearly all environmental samples collected at the site prior to November 1986 (Appendix B, pp. 8, 31, spread sheet). The analytical results from the most recent sampling investigation by RMT, Inc. (Appendix C) are not discussed in this section because those samples were tested for only a limited number of constituents (Appendix C, p. 6-17). The G & E report also provides data from a geophysical survey that was conducted in March and April of 1986 (Appendix B, p. 15). This survey appears to have been utilized as a screening tool that aided in the selection of locations for subsequent sampling events. The results of the survey are presented in section 4.1; sampling information is presented in sections 4.2 and 4.3.

4.1 GEOPHYSICAL INVESTIGATION

A geophysical survey was conducted by G & E during their assessment of the subject site. The survey was performed to detect and map contaminated soil and groundwater by delineating zones of lower and higher conductivity around areas of concern (Appendix B, pp. 2, 15). The zones of higher conductivity are interpreted to represent areas where contaminants have escaped into the soil or groundwater systems (Appendix B, p. C). These contaminants produce an increase in free ion concentration (measured as conductivity) when introduced into the underlying media (Appendix B, p. 15). The zones of lower conductivity are indicative of natural background (Appendix B, p. C).

Background conductivity values ranged between 20 and 25 millimhos/meter (mmhos/m). Several areas at the facility showed conductivity values much greater than these background levels (Appendix B, p. 15). The old drum storage area, the abandoned lagoon, the burn site, and the stressed vegetation areas had anomalously high conductivities (50 to 80 mmhos/m or greater) relative to the background levels (Appendix B, pp. 15-16, figure 5a). The most anomalous area (150 mmhos/m) is that area just south of the abandoned lagoon, thought to be the location of runoff between the lagoon and marsh (Appendix B, pp. 15-16). The locations of all anomalous areas are depicted in Figure 3.

4.2 SAMPLE COLLECTION

The analytical data presented in the G & E report was collected during two previous sampling investigations: on September 18, 1985 and between January 13 and May 1 of 1986 (Appendix B, spread sheet). The earlier samples were collected to perform preliminary evaluations of the groundwater conditions at the site (Appendices B, p. 6; C, p. 1-3). To accomplish this, Davis & Floyd, Inc. sampled six permanent monitoring wells, the two plant production wells, and one deep observation well (Appendix B, p. 6). The latter samples were collected "to determine the source, nature and extent of zones of surface and subsurface contamination" (Appendix B, p. 1). To accomplish this, G & E collected product, sludge, soil, surface water, and groundwater samples from a number of strategic locations (Appendix B, spread sheet). These locations were selected based on previous monitoring well data, historical aerial photographs, an onsite reconnaissance, and the geophysical survey (Appendix B, p. 14). A total of 197 samples were collected between the two investigations (Appendix B, p. G, spread sheet). Only the background samples and samples that showed significant contamination will be discussed in this report.

4.2.1 Sample Collection Methodology

All sample collection, sample preservation, and chain-of-custody procedures used during these investigations were in accordance with standard operating procedures as specified in Sections 3 and 4 of the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual; United States Environmental Protection Agency, Region IV, Environmental Services Division (ESD), April 1, 1986 (Appendix B, p. G).

4.2.2 Description of Samples and Sample Locations

One hundred and ninety-seven samples were evaluated in the November 1986 G & E report: 91 from the abandoned lagoon, 31 near the discharge pipe, 21 from the old drum storage area, 31 from the burn site, 8 from the stressed vegetation area, 7 from miscellaneous locations, and 8 from background locations (Appendix B, spread sheet). The miscellaneous locations represent groundwater samples collected by Davis & Floyd that are outside the confines of the contaminated areas (Appendix B, figure 4). Other samples (6) collected at the site include product, sludge, and surface water samples. These were taken from either the ponds at the burn site or the eastern part of the marsh area at the discharge pipe (Appendix B, p. 19, spread sheet). The remaining 184 (197-7-6) samples (soil and groundwater) were collected from numerous hand and truck-mounted auger borings that were converted into either temporary or permanent monitoring wells (Appendix B, pp. 16, 18-19, spread sheet). Sample locations for each of the five contaminated areas are shown in Figures 4 through 8.

The auger borings for the G & E investigation were drilled as either part of the "waste facility sampling program" or a program for "soil exploration." Under the waste facility sampling program, the borings were placed within areas of known contamination and advanced to shallow depths (<8 feet) (Appendix B, pp. 18-19). The samples obtained from these borings were collected at specified depths and used for analytical testing (Appendix B, p. 18, spread sheet). The test results provided important information concerning the vertical extent of contamination beneath each "source" area. The soil exploration borings are different because these were drilled adjacent to areas of known or suspected contamination (Appendix B, p. 17). This was done in order to determine the horizontal extent of contaminated media so that some of the borings could be converted into upgradient and downgradient permanent monitoring wells (Appendix B, pp. 2, 17). In addition to analytical testing, laboratory tests were performed on selected soil samples to determine permeability and engineering properties (Appendix B, p. 18). The final difference is that the soil exploration borings involved continuous split-spoon sampling (Appendix B, p. 17).

4.2.3 Field Measurements

Water level elevations were recorded by both G & E and Law Environmental Services during field activities. The measurements were used to generate water table maps (Ref. 1, p. 7; Appendix B, figures 11a, 11b). Also, each consultant conducted in-situ permeability tests (slug tests) on selected groundwater monitoring wells. The slug tests were performed to calculate hydraulic conductivities of the monitored soil strata (Ref. 1, p. 7; Appendix B, p. 20). Water level and time measurements were recorded during each slug test (Appendix B, pp. 20-21).

4.3 SAMPLE ANALYSIS

4.3.1 Analytical Support and Methodology

There are differences in the parameters tested and the analytical support for each investigation. Davis & Floyd performed their own analyses and tested each groundwater sample for the following parameters:

- temperature;
- pH;
- specific conductance;
- Total Organic Carbon (TOC);
- chloride;
- priority pollutant analysis for volatile organics (32 compounds);
- 1-aminoanthraquinone;
- aniline;
- dimethyl amine;
- p-chlorophenol;
- n-cyanoethyl-n-ethyl-m-toluidene (CEET); and
- metals (Appendix B, pp. 6-7).

Samples collected by G & E were analyzed for a variety of parameters including:

- pH;
- specific conductance;
- TOC;
- Volatile Organic Analysis (VOA);
- selected chlorinated organics (TCE, TCB, etc.);
- naphthalene;
- phenolic compounds;
- PCB; and
- metals including lead, mercury, arsenic, cadmium, and chromium (Appendix B, p. 22).

However, not every sample was tested for each parameter listed above (Appendix B, p. 45, spread sheet). Initial samples collected during G & E's investigation were analyzed by J.L. Rogers & Callcott Engineers, Inc. of Greenville, South Carolina; subsequent analyses were performed by West-Paine Laboratories, Inc. from Baton Rouge, Louisiana (Appendix B, p. E, spread sheet).

A variety of EPA approved analytical methods and procedures were utilized for the Davis & Floyd and G & E samples. The specific methods and procedures are listed on the individual analytical reports which are contained in Volume II of Appendix B.

4.3.2 Analytical Data Quality

All analyses are reported to have been performed by EPA approved methods. Only limited information on data quality is available. There is no evidence of independent quality assurance (QA) review or data validation. The data packages presented do not include sufficient information for complete QA review of the data. Individual analytical reports and data spread sheets are provided in Appendix B.

4.3.3 Presentation of Analytical Results

This section discusses the results from the analyses of samples collected by Davis & Floyd in 1985 and G & E in 1986. The discussion is broken into subheads for each of the five contaminated areas. Separate tables (2 through 6) have been generated to present the analytical data for each area. Table 1 is also included and this presents the data from a background location. Only the significant results are shown on the tables.

4.3.3.1 Abandoned Lagoon

Analytical test results from the abandoned lagoon (Table 2) indicate that the soil and groundwater are primarily contaminated with chlorinated organics and metals. The chlorinated organic of greatest concern is Arochlor 1248, which is a PCB that was detected in both media. Chromium, lead, and mercury account for the most significant metal contamination. None of the above-mentioned constituents are known to have been detected in background samples.

Samples from C-1, W-3, W-4, V-6, and B-1 (6-8 ft, 10-12 ft, 14-16 ft, 43-45 ft) indicate that the PCB soil and groundwater contamination is restricted to the areal extent of the lagoon. The lagoon soils are contaminated at depths of up to 14 feet bls with average PCB concentrations of 750 mg/kg. The most significant PCB soil contamination was found in a sludge layer that varies in depth from about 4 to 7 feet bls. The depth to the contaminated sludge is greatest in the center of the lagoon. The highest concentration detected in the sludge layer was from sample G&E-3 (4-5 ft), which showed a PCB concentration of 6,750 mg/kg. The groundwater at the abandoned lagoon showed an Arochlor 1248 concentration of 6.02 mg/l (L-1, L-2, L-3 composite).

Other organic compounds found in environmental samples include 1,2,4-trichlorobenzene (1,2,4-TCB) and naphthalene. Naphthalene was detected at a maximum concentration of 122 mg/kg in soil boring L-33 (12-14 ft) and in the groundwater composited from L-1, L-2, and L-3 at 2.340 mg/l. Similar concentrations (103 mg/kg and 3.470 mg/l) of 1,2,4-TCB were detected in the same samples.

The soil samples from the old lagoon showed elevated levels of chromium, lead, and mercury. These constituents were detected at maximum concentrations in borings L-1 and G&E-3. The maximum levels are as follows: 46 mg/kg for chromium and 2,286 mg/kg for lead in boring G&E-3 (4-5 ft) and 19 mg/kg of mercury in boring L-1 (1 ft). The lowest levels were generally found in boring G&E-5 Concentrations for the sample taken 4-5 feet bls range from not detected for lead and mercury to 4.9 mg/kg for chromium.

Chromium, lead, and mercury were also detected at relatively high levels in groundwater samples collected from the abandoned lagoon. The groundwater composited from G&E borings 1 and 5 showed a lead concentration of 34 mg/l, which is 680 times greater than the EPA maximum contaminant level (MCL). The other constituents were detected at lesser amounts, but their concentrations are still well above the MCL (Ref. 33). Also, the presence of chromium and lead in downgradient wells (W-3, V-6) suggests that the contaminants are migrating from the lagoon.

Monitoring wells W-3 and V-6 also indicate chloride and organic contamination. The organic compounds that were detected include chlorotoluene and trichloroethene (TCE). All of these constituents were found at concentrations significantly greater than the concentrations detected in background samples.

4.3.3.2 Discharge Pipe

TOC is the only parameter that was detected along the discharge pipe south of the abandoned lagoon (Table 3). Concentrations ranging from 50 to 100 mg/l were revealed in groundwater samples obtained from borings A-3, A-5, and A-6. These concentrations are significantly greater than the values obtained from background wells. There was no TOC analysis performed on soil samples collected from this area.

4.3.3.3 Old Drum Storage

Analytical results for groundwater samples collected from the old drum storage area indicate that the major contaminants of concern are chlorinated organics. TOC and chloride are also of concern. Selected analytical data for this area are presented in Table 4.

TOC and chloride were present at elevated levels in groundwater samples collected at the old drum storage area. Samples A-9, A-10, and A-11 showed TOC concentrations of 30, 20, and 30 mg/l, respectively. The chloride concentrations for the same samples ranged from 115 to 595 mg/l. Only the chloride concentrations are significantly greater than the values reported from any of the background wells.

The most significant chlorinated organic is carbon tetrachloride. This constituent was detected in all groundwater samples collected within the boundaries, and downgradient, of the source area. Within the source area, soil borings A-9 through A-11 showed carbon tetrachloride concentrations ranging from 12 to 39 mg/l. Monitoring well W-7, located slightly downgradient from the source area, revealed the highest concentration (89 mg/l) of carbon tetrachloride. There are no other downgradient wells that monitor the old drum storage area (Appendix C, plate 7). Carbon tetrachloride was not detected in any of the background groundwater samples.

Monitoring well W-7 also showed a TOC concentration of 150 mg/l. This concentration is significantly greater than any of the values detected in background wells.

4.3.3.4 Burn Site

The contamination at the burn site mainly involves chlorinated organics and metals (Table 5). Methylene chloride, PCBs, and TCE account for the most significant organic contamination. These constituents were found at relatively high levels in several groundwater samples. The same samples also showed elevated concentrations for cadmium, chromium, lead, and mercury. None of the above mentioned constituents are known to have been detected in background samples.

Within the confines of the burn site area, methylene chloride, PCBs, and TCE were detected in the groundwater. Methylene chloride was detected at a maximum concentration of 6.40 mg/l in a water sample obtained from boring G&E-10. Monitoring wells W-10 and W-11 showed PCB (Arochlor 1242) and TCE concentrations of 0.012 mg/l and 12 mg/l, respectively. The PCBs were also detected in the soil at depths ranging from 1 to 6 feet bls. The highest concentration was detected in sample BS-3 (3-4 ft), which showed an Arochlor 1248 concentration of 250 mg/kg.

Mercury is the only other contaminant that was detected within the confines of the burn site at significant levels. A concentration of 0.24 mg/l was found in a surface water sample obtained from a lagoon that is located within the burn site. A solid sample removed from a product bag that was located within the same lagoon revealed a mercury concentration of 19.0 mg/kg.

Groundwater monitoring well W-9, located near the burn site, showed a PCB concentration of 0.114 mg/l, a TCE concentration of 180 mg/l, and concentrations for chromium and lead that significantly exceed the MCL (Ref. 33). Cadmium and mercury were also detected although at much lower levels. These findings suggest a definite contaminant migration trend since the well is located hydraulically downgradient from the burn site.

The furthest downgradient well (W-13) that monitors the burn site showed elevated levels of cadmium, chromium, and lead. There were no PCBs detected in this well, or in any other wells located downgradient from W-9.

4.3.3.5 Stressed Vegetation

The only contamination at the stressed vegetation area is with chromium and lead, which were detected in a soil sample. Chromium and lead were detected in sample D-1 (1-2 ft) at concentrations of 3.3 mg/kg and 3.8 mg/kg, respectively. Selected analytical data for this area are presented in Table 6.

4.4 SUMMARY OF FIELD INVESTIGATION

G & E's geophysical investigation provided the necessary data needed to detect and map contaminated soil and groundwater at this site. Several zones of higher conductivity were delineated during the investigation, and these are thought to be representative of contaminated areas. The geophysical results were then utilized to determine optimum sampling locations.

One hundred and ninety-seven samples were collected by G & E and Davis & Floyd during 1985 and 1986. Soil and groundwater samples account for the majority of samples that were collected. These were mostly taken within and adjacent to areas of concern. The samples were analyzed for total organic carbon (TOC), volatiles, acid and base neutrals, polychlorinated biphenyls (PCBs), and metals.

The findings of the geophysical investigation are supported by the analytical test results for environmental samples collected at this site. The areas that showed anomalously high conductivity values are primarily contaminated with chlorinated organics and/or metals. The chlorinated organic of greatest concern is PCB. This constituent is present in the lagoon soil at an average concentration of 750 mg/kg and in the lagoon groundwater at 6.02 mg/l. The PCBs were also detected at the burn site, along with trichloroethene (TCE) and methylene chloride. All three of these constituents were detected in groundwater samples at concentrations of 0.012 mg/l or greater. The burn site and lagoon also account for the most significant metal contamination. Several soil and groundwater samples showed relatively high levels of lead and mercury.

There is a strong correlation between the sample results and the wastes disposed of at American Color and Chemical/Venture Chemical. The PCB contamination is present because the effluent that was treated during the active life of the lagoon occasionally contained PCBs from in-plant spill incidents; PCBs were also constituents of a waste incinerated at the burn site. Much of the other organic contamination can also be attributed to incineration at the burn site, or to spills and leaks that occurred in the associated drum storage area (Ref. 10, pp. 9, 11-12). The only strong correlation that can be made for metals is that the product bags found at the burn site were the source of mercury contamination in environmental samples collected at the same location.

5.0 SUMMARY

The surface water, groundwater, air, and onsite exposure pathways are of concern at American Color and Chemical/Venture Chemical. The surface water pathway is of primary concern. Polychlorinated biphenyls (PCBs) are known to have been introduced into Campbell Creek, which receives both runoff and processed wastewater from this facility. These constituents are known to be accumulating in the food chain. The creek and associated waters have already been closed to shellfish harvesting because of this contamination. The groundwater pathway is also of concern. There is at least one shallow well located downgradient of the site. Also, potential users could be seriously endangered. The air and onsite exposure pathways are of lesser concern.

A total of 197 previously collected samples were reevaluated in this report. The samples were collected within and adjacent to areas of concern which include: the abandoned lagoon, the sediments and marsh near the plant's discharge pipe, the old drum storage area, the old burn site, and an area of stressed vegetation. The abandoned lagoon and burn site are by far the most contaminated areas. Significantly high concentrations of PCB, trichloroethene (TCE), methylene chloride, lead, and mercury were detected in soil and groundwater samples collected from these areas. All of these constituents are known components of waste deposited at the site. Also, several of the downgradient wells that are monitoring the abandoned lagoon and burn site are contaminated with the same constituents, which suggests a definite migration trend.

Although extensive contamination has been documented in soil, groundwater, and sediment at and near the site, the facility is under a consent order with the state for remediation. Should all wastes and contaminated soils be removed, this site would not be a viable candidate for a Listing Site Inspection (LSI). Therefore, FIT 4 recommends that consideration of any further action at this site be contingent upon results of the ongoing remediation.

19. South Carolina Department of Health and Environmental Control Water Pollution Control Permit (Number SC0000914) issued to Venture Chemicals, Inc., May 23, 1985, pp. 17-19.

20. George Nelson, Low Country District, South Carolina Department of Health and Environmental Control, telephone conversation with James Miller, NUS Corporation, December 14, 1989. Subject: Flow reversals in Campbell Creek and associated water bodies.

21. Russell E. Berry, Shellfish Manager, Low Country District, interoffice memorandum to Luke Hause, Director of Shellfish & Recreational Waters, South Carolina Department of Health and Environmental Control, April 10, 1984. Subject: Source of contamination in Whale Branch and the Huspah Creek area, p. 2.

22. H. Stephen Snyder, et al., South Carolina State Water Assessment, Water Resources Commission Report Number 140 (State of South Carolina, September 1983), pp. 22-23, 25, 272, 276-277.

23. Map of Surface Water Treatment Plant Intakes for South Carolina; obtained from state file.

24. Bill Seaborn, South Carolina Department of Health and Environmental Control, telephone conversation with James Miller, NUS Corporation, December 27, 1989. Subject: Closure zones for shellfish harvesting along the surface water migration pathway.

25. U.S. Fish and Wildlife Service, Endangered and Threatened Species of the Southeastern United States, (Atlanta, Georgia, 1988), sections 6-7.

26. Marine Resources Division, Polychlorinated Phenyls (PCB's) in the Campbell Creek System, received by Low Country District, South Carolina Department of Health and Environmental Control on November 5, 1985.

27. J.M. Marcus and G.R. Swearingen, A Water Quality Assessment of Campbell Creek, Beaufort County, South Carolina, Bureau of Water Pollution Control Technical Report No. 037-83, (Columbia, South Carolina, 1984), pp. 1-2.

28. Glenda R. Swearingen, Biological Services Section, interoffice memorandum to Russell W. Sherer, Director, Division of Water Quality Assessment and Enforcement, South Carolina Department of Health and Environmental Control, October 28, 1985. Subject: Crab Tissue Analyses for PCBs at Venture Chemicals, Incorporated, p. 1.

REFERENCES

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2. Map of Beaufort County, South Carolina (Charlotte, North Carolina: Champion Map Corporation, 1988).

3. Updated Preliminary Assessment Report for American Color and Chemical/Venture Chemical. Prepared by Charles Strange, South Carolina Department of Health and Environmental Control, December 2, 1988, pp. 1-5.

4. Tom Knight, Division of Water Quality Assessment and Enforcement, South Carolina Department of Health and Environmental Control, telephone conversation with James Miller, NUS Corporation, February 8, 1990. Subject: Amendment to Consent Order 87-65-W.

5. South Carolina Department of Health and Environmental Control, Columbia Office, Amendment to Consent Order 87-65-W: South Carolina DHEC vs. Tenneco Resins, Inc., American Color and Chemical Corporation, and Lobeco Products, Inc., pp. 1, 3.

6. Sandra Hursey, Division of Water Quality Assessment and Enforcement, South Carolina Department of Health and Environmental Control, telephone conversation with James Miller, NUS Corporation, February 7, 1990. Subject: Scheduled completion date for remediation activities at American Color and Chemical/Venture Chemical.

7. South Carolina Department of Health and Environmental Control, Columbia Office, Consent Order 86-94-W: South Carolina DHEC vs. Lobeco Products, Inc., issued September 29, 1986, pp. 3-4.

8. South Carolina Department of Health and Environmental Control, Columbia Office, Consent Order 88-37-W: South Carolina DHEC vs. Lobeco Products, Inc., issued August 8, 1988, pp. 5-7.

9. Sandra L. Hursey, Environmental Quality Manager, Division of Water Quality Assessment and Enforcement; South Carolina Department of Health and Environmental Control, letter to J.M. Meeks, Plant Manager, Venture Chemicals, Inc., December 18, 1985. Subject: Notice of Violation, Venture Chemicals, Inc., NPDES Permit #SC0000914.

10. Lane Environmental Services Corporation, "Historical Operational Survey of the Lobeco Products, Incorporated Lobeco, South Carolina Plant," (February 1988), pp. 9-12.

11. Nelson L. Nemerow, "Wastes, Industrial," Kirk-Othmer Encyclopedia of Chemical Technology, 3rd ed., Vol. 24 (New York: John Wiley & Sons, 1984), p. 248.

12. Potential Hazardous Waste Site Identification and Preliminary Assessment (EPA Form T2070-2), Part IV--Characterization of Site Activity for American Color and Chemical. Filed by B.J. Garland, Ecology and Environment, January 14, 1981.

13. NUS Corporation Field Logbook No. F4-1608 for American Color and Chemical/Venture Chemical, TDD No. F4-8904-54. Documentation of facility reconnaissance, September 13-15, 1989, pp. 3-5, 11.

14. Darryl Owens, James Davis Elementary, telephone conversation with James Miller, NUS Corporation, February 8, 1990. Subject: Student population of school.

10 15. Larry R. Hayes, The Ground-Water Resources of Beaufort, Colleton, Hampton, and Jasper Counties, South Carolina, Water Resources Commission Report Number 9 (State of South Carolina, 1979), pp. 5, 9-10, 13, 16, 31-32, 53-54, 56, figure 19.

16. U.S. Dept. of Agriculture, Soil Conservation Service, Soil Survey of Beaufort and Jasper Counties, South Carolina (January 1980), p. 2.

17. U.S. Fish and Wildlife Service, Atlantic Coast Ecological Inventory Map, Savannah, Georgia - South Carolina, (U.S. Geological Survey, 1980).

18. U.S. Dept. of Commerce, Climatic Atlas of the United States (Washington, D.C.: GPO, June 1968) Reprint: 1983, National Oceanic and Atmospheric Administration, p. 63.

29. U.S. Geological Survey, National Water Summary 1984: Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources, Water Supply Paper 2275 (1984), pp. 379-381.

30. B.C. Spigner and Camille Ransom, Report on Ground-Water Conditions in the Low Country Area, South Carolina, Water Resources Commission Report Number 132 (State of South Carolina, December 1979), pp. 27, 47, 55, 73.

31. Henry Walker, Dickenson Well Drilling & Pump Service, telephone conversation with James Miller, NUS Corporation, December 13, 1989. Subject: Use of surficial aquifer in the Lobeco area.

32. Clyde M. Livingston, Manager, Geohydrologic Section, Water Pollution Control Bureau, interoffice memorandum to George Nelson, Director, Low Country District, South Carolina Department of Health and Environmental Control, July 25, 1989. Subject: Private well water quality reconnaissance near Lobeco Products, Inc.

33. Steve Pardieck, Chief, Drinking Water Branch (W-6), interoffice memorandum to Regional Drinking Water Branch Chiefs, Regions I-VIII, X, U.S. Environmental Protection Agency, October 6, 1987. Subject: Updated Drinking Water Standards and Health Advisory Table.

REFERENCE 4

"Rite in the Rain"®

ALL-WEATHER

LEVEL

Notebook No. 311

F4-1608

TDD # F4-8904-54

American Color & Chemical / Ventura Chemical

Lobeco, Beaufort Co., SC

Project Manager: James Miller

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LOGBOOK REQUIREMENTS
REVISED - NOVEMBER 29, 1988

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

1. Record on front cover of the Logbook: TDD No., Site Name, Site Location, Project Manager.
2. All entries are made using ink. Draw a single line through errors. Initial and date corrections.
3. Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' signatures
4. Record weather conditions and general site information.
5. Sign and date each page. Project Manager is to review and sign off on each logbook daily.
6. Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
7. Provide reference to Sampling Field Sheets for detailed sampling information.
8. Describe sampling locations <u>in detail</u> and document all changes from project planning documents.
9. Provide a site sketch with sample locations and photo locations.
10. Maintain photo log by completing the stamped information at the end of the logbook.
11. If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
12. Record I.D. numbers of COC and receipt for sample forms used. Also record numbers of destroyed documents.
13. Complete SMO information in the space provided.

My signature indicates that I have read and understand the work plan for American Color & Chemical / Venture Chemical in Lobeco, Beaufort County, South Carolina.

James Miller James Miller
Mark Adams Mark A. Adams

All equipment used on this site is identified in the Equipment Location Log for TDD # F4-8904-54 and will be retained in the project file.

1130 We are going to the Lobeco Company's Carolina Cove Office on Highway 21 to return their copies of the November 1980 G & E report and the September 1988 RMT report.

James Miller (JM) 4/10/89

000001

We have just met with John Hicks, the Vice President of the company, and he had a few general questions about the type of investigation we are conducting. He also requested a copy of the final report when it is completed and offered to answer any questions. The questions and their corresponding answers are as follows:

- Is the Consent Order requiring that the site be remediated? Remediation at the site is required and the representatives from several companies will meet on September 1st to bid for the work.

- Could you tell me about the onsite community well? There are actually two wells that supply drinking water

J.M. 7/15/91

J.M. 7/15/91 ~~to plant employees: the north production well and the east production well. The water~~

to plant employees: the north production well and the east production well. The water obtained from these wells is mixed, treated, and then distributed throughout the plant.

- How deep are the wells? Greater than 200 feet.

- How many workers are currently employed at the Tobacco plant? Seventy-five.

12:15 We are going to pick-up city maps at the Chamber of Commerce.

J.M. 7/15/91

We are eating lunch and we are going to spend the rest of the day obtaining public drinking water information.

Vyke Spencer, from the Beaufort-Jasper Water Authority (BJWA), is showing me where municipal and county hookups are in the area. I showed him the 4-mile radius map, and a map of water lines he has previously drawn for nearby Beaufort County Landfill. Mr. Spencer stated that there were no more water lines in my study area. I asked him about the source for BJWA. He said that BJWA obtains their water from several surface water intakes along an intake canal on the Savannah River. The intake canal is located six miles from the site. Also, Mr. Spencer indicated that there is currently no hookup for the Marine Corps Air Station located on the south side of the study area. They obtain their water from deep wells.

J.M. 01/15/87

J.M. 01/15/87

[illegible] We have just arrived at the site. The weather is overcast and the temperature is in the mid [illegible]'s.

[illegible] We are riding around the site taking pictures. The area of stressed vegetation, as indicated on [illegible] Figure [illegible], does not appear to be stressed. Also, this is the only source area at the site that is not fenced in. The other source areas at the site are completely fenced in and there are warning signs posted that indicate the environmental hazards which exist.

[illegible] We are at the intersection of the discharge pipe and Highway [illegible]. No state health department signs warning against harvesting shellfish in the area are visible.

[illegible] We are beginning the well survey of

J.M. 01/14/89

the area and all information gathered will be recorded on the water use survey forms which are an extension to this logbook.

1115 Ms. Sally Burgess, who is located 600 feet southeast of the [illegible] site, told us that she obtains her drinking water from a drilled well of unknown depth. According to Ms. Burgess, the only problem with the water is that it ~~takes~~ J.M. 01/14/89 tastes like sulfur. Ms. Burgess has no municipal water from alternate unthreatened sources presently available.

1200 We have knocked on several doors (Anderson, Glenn, etc.), but none of these residents were home.

J.M. 01/14/89

000008

[illegible] We are trying to speak with Mr. [illegible] Graham, who is located 500 feet southeast of the abandoned lagoon. Mr. Graham opened his door and he was drunk. Mr. Graham was not sure how he obtained his drinking water or who we were.

[illegible] The remainder of the water use survey will be postponed until tomorrow evening because that is when most residents will be home. Also, we will need the remainder of this day and most of tomorrow to speak with state officials who are familiar with this site and to complete the state file search. The state file for this site at the Low Country Office is reportedly about 3-feet-thick.

[illegible] We are eating lunch.

[illegible] We are reviewing the file for

J. M. [illegible]/84

[illegible]

this site at the Low Country Office for the South Carolina Department of Health and Environmental Control (DHEC).

[illegible] Ms. Penny Cornett, from DHEC, introduces herself and she is familiar with the Lobeco site. I asked Ms. Cornett some questions about the site. The questions and their corresponding answers are as follows:

- What are the present effluent parameters for this facility? Biochemical oxygen demand (BOD), total suspended solids (TSS), ammonia, ultimate oxygen demand (UOD), total chlorine, total coliform, and toxicity studies three times a year on fish. No heavy metals or [illegible] are

000009

J. M. [illegible]/84

allowed in the discharge.

- Are all of the former waste disposal areas unlined? Ms. Cornett was not positive about this, but she indicated they were unlined.

[illegible] We are spending the rest of the day reviewing and copying file material.

J.M. 09/14/84

[illegible] reviewing and copying file material at the DHEC office.

1215 We are eating lunch.

1330 We are driving back to the site to finish the well survey. The weather is sunny and the temperature is in the high-70's.

1530 There are no land-related sensitive environments such as national or state wildlife refuges, national monuments, or national parks within 4 miles of this site. Also, there are no day care centers located onsite or in close proximity. The nearest school is James Davis Elementary, and this is shown on the topographic quadrangle maps that cover the area.

J.M. 09/15/84

[illegible] We stopped at Mr. Earnestine Corey's trailer which is located south of the facility across Highway [illegible]. Mr. and Mrs Corey were not available, so we talked with their children. The children stated that they obtain their water from a Mr. Gilbert who lives next door. As we were leaving ~~the property~~ J.M. 04/15/89 Corey property, Mr. Gilbert drove in with his truck. We told Mr. Gilbert who we were, explained the type of investigation we were conducting, and asked about his water source. Mr. Gilbert stated that he obtains his drinking water from a drilled well that is between [illegible] and [illegible] feet deep. The well is also used for household purposes and serves a total of [illegible] people. This includes the number of occupants residing at the Corey property. Mr. Gilbert also stated that he previously owned [illegible] cattle, until [illegible] of them died suddenly. At the time,

J.M. 04/15/89

local health officials sent several meat samples away for PCB analysis, but PCBs were determined not to be the cause of death. Mr. Gilbert sold the remaining 18 cattle shortly after this incident occurred.

1030 We returned to the Anderson and Glenn residences, and also visited the nearby Lane household. None of these residents were available for the survey.

* A site layout map with picture locations is shown at the back of this logbook.

J.M. 04/15/89

UPDATED PRELIMINARY ASSESSMENT REPORT
American Color and Chemical/Venture Chemical
SCD 046 507 018
Beaufort County

Completed by: Charles Strange
Date completed: December 2, 1988

I. INTRODUCTION/EXECUTIVE SUMMARY

The American Color and Chemical/Venture Chemical site is now owned by Lobeco Products, Inc. The Lobeco Products, Inc. facility is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Coosaw River.

The plant was built by Tenneco Chemical Company (later Tenneco Resins, Inc.) in 1967, but was purchased by American Color and Chemical Company in January, 1974. American Color and Chemical Company subsequently sold the facility to Venture Chemical Company (now Lobeco Products) in October, 1982. Lobeco has operated the facility since that time (Ref. No. 6, pg. 2).

The plant primarily manufactures agric-products, dye intermediates and drilling fluid chemicals for the oil industry. Chemicals used and produced on-site consist primarily of organic compounds. Acidic industrial wastewater from the plant is treated and neutralized on-site, prior to discharge to Campbell's Creek. Elevated chlorides and volatile organics have been detected in the groundwater on site. PCBs and Hg have also been detected in the groundwater. An area of stressed vegetation was found to have elevated levels of chromium and lead. A high priority for a screening site inspection is assigned.

II. SITE BACKGROUND AND HISTORY

A. Ownership History

The plant was originally owned by Tenneco Chemical Company (later Tenneco Resins, Inc.) but was later purchased by American Color and Chemical Company in January, 1974. American Color and Chemical subsequently sold the facility to Venture Chemical Company (now Lobeco Products) in October, 1982. Lobeco Products, Inc. has operated the facility since that time.

B. Site Description

The facility is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Coosaw River. No schools or Day Care Centers were noted in the vicinity of the

site by reviewing topographic quadrangle maps. The geographical coordinates of the site are latitude 32 degrees, 33 minutes, 03.0 seconds and longitude 80 degrees, 43 minutes, 46.0 seconds (Ref. No. 8).

C. Regulatory History/RCRA Summary

The Lobeco site is under a Consent Order dated August 8, 1988 for violation of its NPDES permit (Permit #SC 0000914) by discharging waste into the environment in violation of the discharge permit, specifically in violation of the toxicity, biochemical oxygen demand, total coliform and ultimate oxygen demand limits. Lobeco was ordered to immediately begin and continue to properly operate and maintain its waste treatment facilities so as to maximize treatment.

Lobeco Products, Inc. were protective filers under RCRA. Lobeco Products, Inc. submitted their part A application under RCRA because of treatment in tanks and surface impoundments. It was later determined that the tank treatment was not under RCRA as it was a Waste Water Treatment Unit. Additionally the waste in the surface impoundment was determined to be non-hazardous. Lobeco requested withdrawal of their RCRA notification/application. The withdrawal was approved on October 18, 1984.

D. Process and Waste Disposal History

Active waste management facilities at the site are part of the NPDES water treatment system (extended aeration and activated sludge) and consists of the following:

- Equalization basin
- Aeration basin
- Digester basin
- Clarifiers (two)
- Drying beds
- Holding ponds (east and west ponds)

Inactive or abandoned waste sites on the property include the following: (Ref. No. 5, pp. 12,13,14 & 15).

1. Abandoned Lagoon Site - Soil samples have shown contamination of 6750 ppm of Pb and 54 ppm of TCB (Ref. No. 7, p. 37).

2. Burn Site - Soil samples have shown 250 ppm of PCB's and 19 ppm of Hg and groundwater monitoring wells have shown 114 ppm PCB's and 180 ppm of Trichloroethene (Ref. No. 7, p. 47).

3. Drum Storage Area - Carbon Tetrachloride found at 89 ppm in monitoring well (Ref. No. 7, p. 47).

4. <u>Stressed Vegative Area</u> - Elevated chromium and lead found in soil (Ref. No. 3).

On November 14-15, 1983, the department conducted an assessment of the ambient water quality of Campbell Creek, into which the Lobeco plant effluent discharges. Analysis of water samples for dissolved oxygen, pH, temperature, salinity and specific conductance indicated satisfactory water quality within the context of the parameters examined. However, a total of sixty-six (66) organic chemical compounds were detected in oyster tissue samples, sediment samples and the Lobeco plant effluent. The community structure of hard substrate and soft substrate fauna in Campbell Creek was found to have been moderately to severely impacted, and significantly fewer oysters were observed, relative to the control station. Also, a department study done December 5, 1984 detected PCB's in sediment at the Lobeco outfall and downstream of the outfall (Ref. No. 6, p. 2).

E. <u>Remedial and Removal Actions</u>

To the department's knowledge no removal/remedial actions have taken place to date at the site.

F. <u>Demography/Regional Setting</u>

The Lobeco Products, Inc. site is located in a moderately populated rural area. The area is characterized by mostly flat land (Ref. No. 8).

III. GROUNDWATER PATHWAY

A. <u>Regional Hydrogeology</u>

The results of the hydrogeologic review are as follows:

1. The depth to the water table is five to ten feet based on elevations of nearby streams determined from topographic maps.

2. The aquifer of concern is the (1) Hawthorne - Recent and (2) Tertiary Limestone which is composed of sandy limey clays and light colored fossiliferous clayey limestone. The depth to the aquifer of concern is the same as the depth to the ground water (Ref. No. 2).

3. The composition of the unsaturated zone is Chisolm loamy fine sands containing ten to twenty-five percent clay according to the 1980 Soil Survey of Beaufort County. Soils of this type have an approximate hudraulic conductivity of > 10^{-3} cm/s.

4. A well inventory within a radius of four miles of the site reveals that ground water is used for drinking purposes in the aquifer of concern, with no other source presently available.

5. The nearest domestic well developed within the aquifer of concern is 0.3 mile to the south of the site, whereas the nearest community well is on the site.

B. Ground Water Use

The use made of ground water in the area is drinking water with no other source presently available.

The number of homes within a four mile radius of the site with domestic wells, as identified from topographic quadrangles, are as follows:

Radius	Number of Houses
0-1 Mile	35
1-2 Miles	122
2-3 Miles	176
3-4 Miles	236
	569

C. Ground-Water Impact

Sample analyses from monitoring wells on site indicate contamination of the aquifer of concern with PCB's and volatile organic compounds (Ref. No. 4).

IV. SURFACE WATER PATHWAY/SURFACE WATER CONCERNS

The surface water has been contaminated with PCB's which have been detected in sediment at the Lobeco outfall and downstream from it.

There are no surface water intakes located downstream from the facility, however, recreational use is made of the surface water including fishing and swimming. Additionally, the possibility exists for the contamination of the human food chain due to contamination of hard substrate and soft substrate fauna in Campbell Creek which receives plant effluent discharges from Lobeco (Ref. No's 1 & 3).

VII. CONCLUSIONS AND RECOMMENDATIONS

A high priority for a screening site inspection is recommended due to the potential for contamination of area domestic drinking water wells. Further sampling of the stressed vegetation area is recommended to determine if the dead vegetation was caused by elevated levels of heavy metals or other contaminants. Further conductivity studies are recommended for mapping contaminant plumes that may affect nearby domestic wells. Sampling of off-site wells that may be endangered is also recommended. Additionally, a magnetometer survey of the "Burn Site" should be done to identify any waste burial sites that may exist. Any other suspected burial sites should also be surveyed.

VIII. REFERENCES

1. Map of Water Intakes for S.C. (Copy attached).

2. Memo from Judy Canova to John Cresswell, dated September 14, 1988 (Copy attached).

3. SCDHEC Industrial Wastewater Files.

4. SCDHEC Groundwater Protection Division Files.

5. Historical Operational Survey of the Lobeco Products, Incorporated, Lobeco, South Carolina plant, February, 1988 (referenced pages attached).

6. Plan of Study, Lobeco Products, Inc. Manufacturing site, January 20, 1987 (referenced material attached).

7. Ongoing Soil and Groundwater Study and Conceptualized Cleanup Plan, Venture Chemicals, Inc., April 1986 (referenced pages attached).

8. Four mile radius map compiled from topographic quadrangle maps.

REFERENCE 6

HISTORICAL OPERATIONAL SURVEY

of the

LOBECO PRODUCTS, INCORPORATED

LOBECO, SOUTH CAROLINA PLANT

February, 1988

RECEIVED

MAR 7 1988

BUREAU OF WATER POLLUTION CONTROL

LANE
ENVIRONMENTAL SERVICES CORPORATION

TABLE OF CONTENTS

1.0 SUMMARY

A comprehensive search of the operating files at Lobeco Products, Inc., Lobeco, S. C. has been performed to identify chemicals used, stored and manufactured at the Lobeco plant and to determine past waste management and health and safety practices. Similar searches have been conducted of SCDHEC files and the retained files of Tenneco, Inc. and American Color and Chemicals, Inc.

Chemicals used and manufactured have been identified and are listed herein. Historical effluent and solid waste management practices have been established and the source of PCBs found at the site is discussed, as these items relate to the site investigation to be performed.

Fifteen chemical materials are identified as having possibly been associated with the so called "burn site". These are listed in Section 5.2, and are the only materials which are likely to be encountered in undiluted form during the Lobeco Investigation.

Potential hazards are discussed and the limited analytical protocol available is presented.

4.0 WASTES AND DISPOSAL PRACTICES

4.1 Effluent Systems

Plant operations were initially designed to have process wastes, consisting primarily of aqueous product extractions (washes) and cooling water, combine with a low flow sanitary waste stream en route to a settling basin (lagoon), and then discharge to a tidal creek. Discharge into the creek, as approved by the South Carolina Pollution Control Authority, was designed to be only on ebb tide, to assure effective dilution of the effluent stream.

Subsequently, pH neutralization, carbon adsorption, and biological treatment were added to the effluent system as the National Environmental Policy Act and the Federal Water Pollution Control Act (and amendments) required more sophisticated effluent treatment throughout the U.S.

4.2 Solid Wastes

Plant trash was initially burned in a small area to the east of the plant operating area, and later was sent to a local sanitary landfill.

Off-grade products and other process wastes were drummed and stored temporarily in what is now referred to as the "drum storage area". Subsequently, the contents of these drums were incinerated at the "burn area" and the empty containers were disposed of at approved sanitary landfills (Beaufort County Landfill and Hickory Hill Landfill). Empty raw material containers (drums and bags) were likewise sent to these landfills.

4.3 Polychlorinated Biphenyls (PCBs)

Certain of the Lobeco manufacturing processes require higher reaction temperatures than can be obtained with normal steam heating. To provide for these special reaction temperatures, the plant was designed and constructed to use a hot oil circulating system. Initially, as was the "state of the art", the heating oil used was a polychlorinated biphenyl; in this case Arochlor 1248 supplied by Monsanto. Later, the Arochlor 1248 was replaced with a non-PCB containing heating oil.

The Lobeco hot oil system utilized electric heaters in a pump-around loop. Occasionally pump leaks developed and/or electric heating tubes failed, resulting in spills onto the plant floor. When this occurred, the standard procedure was to scoop up as much as possible into drums and flush the residue into the floor drain system which ultimately fed into the effluent system and hence to the lagoon.

5.0 LOBECO SITE STUDY AREAS

As a result of prior concerns and investigations, and as set forth in Consent Agreement 87-65-W between the South Carolina Department of Health and Environmental Control and the present and prior owners, certain portions of the plant site have been designated for further study. These areas are discussed in the following paragraphs.

5.1 Abandoned Lagoon Area

Subsection 4.1 and 4.3 describe the Lobeco effluent handling system and potential chemical constituents. During the active life of the lagoon the process effluent may have contained product and raw material residues extracted in the aqueous wash cycles, and, on occasion, PCBs from in-plant spill incidents.

In addition to providing the holding time necessary to allow the prescribed ebb-tide discharge, the lagoon also served as a settling basin to permit any undissolved particles to settle out. This "settling out" formed a sediment layer on the lagoon bottom which was clearly visible (by color) in the core samples obtained during the G&E Engineering preliminary investigation. It is probable that this sediment layer, which will be defined during the current study, may contain PCB residues.

5.2 Burn Site Area

A list of materials possibly associated with the Burn Site Area (e.g., burned, stored, etc.) has been compiled. These materials are:

Material*	Chemical Name
Amino G	7-amino-1,3-napthalene disulfonic acid
Gamma Acid	2-amino-8-naphthol-6-sulfonic acid
G-Salt	2-naphthol-6,8-disulfonic acid
PNTS	4-nitrotoluene-2-sulfonic acid
R-Salt	2-amino-8-naphthol-6-sulfonic acid
Anthrarufin	1,5-dihydroxy anthraquinone

Cassella Acid	2-naphthylamine-4,8-disulfonic acid
J Acid	2-amino-5-naphthol-7-sulfonic acid
Peri Acid	1-naphthylamine-8-sulfonic acid
CUP	Copper phthalocyanine
DMS	4,4'-dinitrostilbene disulfonic acid
Heat Transfer Oil/Residue	Arochlor 1248
Iron Filings	______
Recovered Aniline	Aniline Oil
Chloral	Trichloroacetaldehyde

*It should be noted that the source of information linking these materials to the Burn Area is employee recollection except for Chloral (which information was found during records search).

5.3 Old Drum Storage Area

As discussed in Subsection 4.2, off-grade products and other process wastes were drummed and temporarily stored in this area. Any chemicals which may be contained in the soil or groundwater at this site would be due to spills or drum leaks and are not likely to be present in any major quantity.

No specific list of such chemicals can be developed, but would likely be similar to the list in 5.2.

5.4 Campbell Creek/Marsh Area

Prior SCDHEC and Venture Chemical studies of the Campbell Creek

REFERENCE 7

RCRA Notifiers List   State: TN   Region IV Merge Dat.   3.13.09   11/13/91

Facility/ID Leg. Dist			Contact - Name	- Phone	Notif.Date	TSD	GEN	TRNS	BBL	REC
LIFE CYCLE ENGINEERING, INC.			WILLIAM KLEIN	(803)556-7110	08/22/90	-	CEG	-	-	-
SCD987573847	Facil.:	2205-A LEEDS AVENUE	N. CHARLESTON	SC	29405 CHARLESTON CO.					
	Mail:	1 POSTON R. SUITE 300	CHARLESTON	SC	29407					
LIFETIME DOORS INC			THOMAS CUNNINGHAM	(313)851-7700	08/18/80	-	-N-	-	-	-
SCD003361664	Facil.:	MAYFIELD ST	DENMARK	SC	29042 BAMBERG CO.					
LS	Mail:	30700 NORTHWESTERN HIGHWAY	FARMINGTON HILLS	MI	48018					
LIL CARS			JUDY-OWNER LOVELADY	(803)571-2032	08/30/90	-	SQG	-	-	-
SCD987574175	Facil.:	2473 SAVANNAH HIGHWAY	CHARLESTON	SC	29417 CHARLESTON CO.					
	Mail:	PO BOX 30596	CHARLESTON	SC	29417					
LINDAU CHEMICALS INC			ROBERT ROBINSON	(803)799-6863	08/18/80	-	LQG	-	-	-
SCD044942670	Facil.:	750 GRANBY LANE	COLUMBIA	SC	29201 RICHLAND CO.					
CM	Mail:	PO BOX 641	COLUMBIA	SC	29202					
LIPE-ROLLWAY CORP LIPE CLUTCH ROEBUCK			THOMAS BELL	(315)488-5411	08/18/80	-	-N-	-	-	-
SCD078047941	Facil.:	OLD AIRPORT ROAD	ROEBUCK	SC	29376 SPARTANBURG CO.					
A3	Mail:	DRAWER 296	ROEBUCK	SC	29376					
LIQUID AIR CORPORATION INDUSTRIAL GAS			HANS DOMSCHEIT	(803)579-4695	10/17/84	-	LQG	-	-	-
SCD077991818	Facil.:	BROOKS BLVD & HWY 57	SPARTANBURG	SC	29303 SPARTANBURG CO.					
A5	Mail:	PO BOX 6387	SPARTANBURG	SC	29304					
LIQUID TRANSPORT CORP			JOHN WILSON	(803)277-0422	10/29/91	-	-	TRNS	-	-
SCD987583689	Facil.:	1331 BARCELONA DRIVE	GREENVILLE	SC	29605 GREENVILLE CO.					
	Mail:	1331 BARCELONA DRIVE	GREENVILLE	SC	29605					
LITTLE RIVER CLEANERS INC			NORMAN LITTLE	(803)249-3559	04/29/88	-	LQG	-	-	-
SCD982120701	Facil.:	HWY 17	LITTLE RIVER	SC	29566 HORRY CO.					
	Mail:	PO BOX 335	NORTH MYRTLE BEACH	SC	29597					
LITTON INDUSTRIES HEWITT ROBINS DIV			WILLIAM TERRY	(803)788-1424	07/21/80	-	LQG	-	-	-
SCD054247051	Facil.:	US HWY 1 NORTH	COLUMBIA	SC	29202 RICHLAND CO.					
CM	Mail:	PO BOX 1481	COLUMBIA	SC	29202					
LM INDUSTRIES INC.			ROBERT ALVERSON	(803)242-4760	08/22/89	-	LQG	-	-	-
SCD987571130	Facil.:	1881 SUBER MILL ROAD	GREER	SC	29652 GREENVILLE CO.					
	Mail:	P.O. BOX 5876	GREENVILLE	SC	29606					
LO-STATE TRACTOR INC			JAN THOMAS	(803)632-3391	10/22/86	-	SQG	-	-	-
SCD981758915	Facil.:	HWY 321 SOUTH	FAIRFAX	SC	29827 ALLENDALE CO.					
	Mail:	P O BOX 68	FAIRFAX	SC	29827					
LOBECO PRODUCTS, INC.			JOHN MEEKS	(803)846-8171	08/18/80	-	LQG	-	-	-
SCD046507018	Facil.:	SC HWY 38	LOBECO	SC	29931 BEAUFORT CO.					
LC	Mail:	HWY 38 PO BX 815	LOBECO	SC	29931					

1 FILE - VENTURE WW

REFERENCE 8

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

MEMORANDUM

TO: Russell W. Sherer, Director
Division of Water Quality Assessment and Enforcement

THRU: Harry L. Gaymon, Manager Harry L. Gaymon
Biological Services Section

FROM: Glenda R. Swearingen Glenda R Swearingen
Biological Services Section

SUBJECT: Crab Tissue Analyses for PCBs at Venture Chemicals, Incorporated, Beaufort County, NPDES #SC0000914

DATE: October 28, 1985

On September 27, 1985, the Biological Services Section with assistance from the South Carolina Wildlife and Marine Resources collected legally harvestable ($\geq$12.7 cm/5 inches) blue crabs, Callinectes sapidus, from seven locations (Table 1, Figure 1) in the vicinity of Venture Chemicals, Incorporated, Beaufort County for the purpose of polychlorinated biphenyl (PCBs) analyses of edible meat. The crab pots in Campbell Creek and Huspah Creek were not recovered, therefore, on October 10, 1985, the Biological Services Section collected crabs from MD-664, the station lost earlier in Campbell Creek and two additional stations in Campbell Creek.

Immediately after collection, crabs were placed on ice and transported live to the Biological Services Section for meat extraction. Individual samples consisted of composited backfin tissue from three crabs with three replicates per station. All sampling procedures and chain-of-custody of samples conformed to all applicable sections in The Standard Operating Procedures Manual and Quality Assurance Procedures Plan (SCDHEC) and Procedures and Quality Control Manual for Chemistry Laboratories.

Results of the analyses showed detectable levels of PCBs in nearly all samples (Table 2) which is not unexpected due to the ubiquitous nature of PCBs in the environment (National Academy of Sciences, 1979). However, PCBs in crab tissue from MD-664, at Venture Chemicals, Incorporated, outfall were elevated above values reported elsewhere for crab tissue (Table 3). The mean level of .949 ppm PCBs in crab muscle from MD-664 was significantly higher ($p<.05$, Kruskal-Wallis H test) than Stations MD-665 ($\bar{x}$ = .061) and MD-634 ($\bar{x}$ = .036). Although the other stations sampled were not significantly less than MD-664, all the values except for the 1.479 ppm level at MD-631 were comparable to levels seen elsewhere in crab muscle (Table 3). The one high PCB level at MD-631, a control station, indicates that contamination of the sample may have occurred during meat extraction. The heptaopancreas of the crab concentrates PCBs, frequently to levels of 20 ppm, and contamination of muscle tissue during dissection for meat extraction is quite possible and probably

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occurred in this case (personal communication, Dr. Ron Sloan, New York Toxics Monitoring Program, New York Department of Environmental Conservation).

However, all levels of PCBs in the crab tissue analyzed are below the 2.0 ppm tolerance level recommended by the Food and Drug Administration (Federal Register 21 CFR Part 109, Volume 49, No 100).

HLG/GRS/al

cc: Bob Gross
Jim Joy
George Nelson
Luke Hause
Lewis Shaw
Bob King
Tom Berry

attachments

Table 1: Sampling locations and Station descriptions for crab tissue sampling, September 27, 1985, and October 10, 1985.

Station	Location
MD-535	Whale Branch approximately 15 meters west of US 21 bridge
MD-538	Campbell Creek at confluence with Whale Branch
MD-664	Campbell Creek immediately at the Venture Chemicals, Incorporated, wastewater treatment facility discharge
MD-629	Campbell Creek approximately 50 meters upstream from Venture Chemicals, Incorporated, wastewater outfall
MD-630	Campbell Creek approximately 300 meters downstream of Venture Chemicals, Incorporated, wastewater outfall.
MD-631	Unnamed tributary to Haulover Creek, approximately 25 meters upstream from confluence with Haulover Creek
MD-634	Cossaw River at western point of Morgan Island where Bull River and Parrot Creek enter the Coosaw
MD-653	Huspah Creek at mouth of Field Creek
MD-665	North bank of Whale Branch at Stuarts Point

Figure 1: Sampling locations for crab tissue analysis for PCBs, September 27, 1985 and October 10, 1985, Beaufort County, S.C.

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Cancer Risk
.00017 mg/kg

Table 2: Total PCBs detected in muscle tissue of Callinectes sapidus in the vicinity of Venture Chemicals, Incorporated, September 27, 1985 and October 10, 1985. All values in ppm.

Replicate	MD-629	MD-664	MD-630	MD-538	MD-535	MD-653	MD-631	MD-665	MD-634
1	.1627	.606	.189	.121	.207		1.479	<.05[a]	.036
2	.216	.952	.027	.286	.027		.253	<.05	<.05
3	.302	1.025	.258	.212	.057		.098	.085	.022
4[b]		1.215				.157			
Mean	.227	.949	.158	.206	.097		.61	.061	.036
Standard Deviation	.070	.254	.119	.083	.096		.757	.02	.014

a = Non-detectable values treated as .049

b = Values in Replicate row 4 collected September 27, 1985

Table 3: PCBs (ppm) in Crab Muscle Tissue from various locations.

Location	Species	Levels	Reference
Chesapeake Bay, MD	C. sapidus	N.D. -.08	Eisenberg and Topping, 1984
Hudson River, NY	C. sapidus	0.16-0.29 ppm	NY Dept. of Environ. Cons., 1981
Palos Verdes, CA	crab	.019	Young, 1982
Whale Branch, SC	C. sapidus	.014 - 1.479	Present study

<u>References</u>

Eisenberg, M. and J.J. Topping. 1984. Organochlorine residues in shellfish from Maryland waters, 1976-1980. J. Environ. Sci. Health, B19 (7), 673-688.

National Academy of Sciences. 1979. Polychlorinated Biphenyls. Washington, D.C.

New York State Department of Environmental Conservation. 1981. Toxic Substances in Fish and Wildlife: 1979 and 1980 Annual Reports. Vol. 4. No. 1. 50 Wolf Road, Albany, N.Y. 12233

Young, D.R. 1982. Chlorinated hydrocarbon contaminants in the Southern California and New York Bights. <u>IN</u> Ecological Stress and the New York Bight: Science and Management (ed) G.F. Mayer. Estuarine Research Federation, Columbia, S.C.

REFERENCE 9

BLACK & VEATCH

TELEPHONE MEMORANDUM

USEPA
Site Inspection Prioitization
Shellfish harvesting in the
Lobeco, South Carolina area

B&V Project 52012.040
B&V File
February 4, 1992
9:00 A.M.

To: Terry Yarborough
Company: SCDHEC Shellfish Section
Phone No.: (803)522-9097

Recorded by: Bryan J. Williams BJ Williams

I spoke with Terry Yarborough, Manager of the shellfish section. He said that based on samples collected for a recent study performed this past July (1991), SCDHEC had decided to open Whale Branch to harvest. Untill this it was possible to use shellfish from here to stock other areas, but not to use them for human consumption. Terry said their decision to open Whale Branch was based on the same PCB cancer rate that we use for HRS. He also said that Halfmoon Creek and Campbell Creek are still closed to harvest.

THE GROUND-WATER RESOURCES OF BEAUFORT, COLLETON, HAMPTON, AND JASPER COUNTIES SOUTH CAROLINA

REFERENCE 10

By
Larry R. Hayes

SOUTH CAROLINA
WATER RESOURCES COMMISSION

REPORT NUMBER 9
1979

The Ground-Water Resources of Beaufort, Colleton, Hampton and Jasper Counties, South Carolina

by

Larry R. Hayes
Hydrologist

U. S. Geological Survey
Water Resources Division

Prepared by
U. S. Geological Survey
in cooperation with
South Carolina Water Resources Commission
Columbia, South Carolina

1979

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The Ground-Water Resources of Beaufort, Colleton, Hampton and Jasper Counties, South Carolina

by

Larry R. Hayes

ABSTRACT

In 1976, Beaufort, Colleton, Hampton, and Jasper Counties used an estimated 7.6 billion gallons of ground water, with about 6.2 billion gallons coming from the principal artesian aquifer. Southwest of the study area the city of Savannah, Georgia and nearby industries pump 75 Mgal/d (million gallons per day) from the principal artesian aquifer. As a result of these withdrawals, water level declines of 20 to about 100 feet have occurred.

With the exception of the Savannah River, the surface water in Beaufort and Jasper Counties is generally too salty for human consumption. In Hampton and Colleton Counties fresh surface water is available but it is not used to any significant extent. The Beaufort-Jasper Water Authority supplies about 5 Mgal/d of treated Savannah River water to the military installations in Beaufort, the residents of the Beaufort-Port Royal area, and some of the residents of Ladies Island.

Sedimentary rocks, ranging in age from Late Crétaceous to Holocene and ranging in thickness from about 2,500 feet in the northern part to about 3,500 feet in the southern part of the study area, store and supply all the ground water used in the area.

Rocks of Tertiary age, consisting of the Black Mingo Formation, Santee Limestone, Cooper Marl, and Hawthorn Formation, are the chief sources of ground-water supplies in the study area. The Black Mingo aquifer is a source of 50 to 250 gal/min (gallons per minute) of good quality water in Colleton and Hampton Counties, but is not used in Beaufort or Jasper Counties.

The Santee Limestone and lower part of the Cooper Marl form the principal artesian aquifer and furnish most of the ground water used in the area.

The principal artesian aquifer is divided into (1) an upper permeable zone, which furnishes about 75 percent of the water pumped from this aquifer in Hampton County and nearly all of the water pumped from this aquifer in Beaufort and Jasper Counties; (2) a middle zone of relatively low permeability, which yields small amounts of water to wells in Hampton and Colleton Counties; and (3) a lower permeable zone, which provides most of the water pumped from this aquifer in Colleton County.

The average transmissivity of the upper permeable zone ranges from about 10,000 ft^2/d (square feet per day) to about 50,000 ft^2/d. The transmissivity of the lower permeable zone ranges from about 500 ft^2/d to about 5,000 ft^2/d. The transmissivity of both zones decreases to the north and east. Yields of wells open to the principal artesian aquifer range from about 50 gal/min to about 2,500 gal/min. Except where saltwater contamination occurs, water from the principal artesian aquifer is usually of good quality. Saltwater contamination of the principal artesian aquifer is usually of good quality occurs from two sources: (1) sea water entering the aquifer through breaks or in areas of relatively high permeability in the overlying confining bed and (2) conate salty water present in underlying formations and in the lower two zones of the aquifer moving upward into the upper permeability zone.

Water containing more than 1,500 mg/L (milligrams per liter) of chloride is present throughout the aquifer at Parris Island, Fripp Island, Edisto Beach, and probably other small sea islands southeast of Beaufort. Salty water is present in the middle and lower permeable zones of the principal artesian aquifer in Beaufort County, in southern Colleton County, and maybe in southern Jasper County.

Water containing about 50 mg/L of chloride is present in the upper permeable zone of the principal artesian aquifer at Hilton Head Island. Salty water is moving laterally toward Hilton Head Island from the northeast and east and vertically upward from the middle and lower permeable zones. Estimates of the rate of salt-water movement towards Hilton Head Island range from 140 to 360 ft/yr (feet per year).

The upper and lower sections of the Hawthorn Formation act as confining beds. The middle section of the Hawthorn is a fairly persistent, sandy, dolomitic limestone (Hawthorn aquifer) and is a source of 50 to 200 gal/min of fairly good quality water in western Beaufort County and in Jasper County.

INTRODUCTION

Ground water is used throughout Beaufort, Colleton, Hampton, and Jasper Counties for domestic, public, agricultural, and industrial purposes. While ground water of sufficient quality and quantity is available almost everywhere in this area, previous investigations have shown that progressive lowering of water levels, impairment of quality, and decrease of quantity in some areas have raised concern that over-pumping or improper development might be depleting the aquifers and aggravating the saltwater contamination problem.

The Ground Water Use Act of 1969 [Section 4.(a)] requires that: "The South Carolina Water Resources Commission (SCWRC) upon the request of a county, municipality or other political subdivision of State government, may declare and delineate from time to time, and may modify, capacity use areas of the State where it finds that the use of ground water requires coordination and limited regulation for protection of the interest and rights of residents or property owners of such areas or of the public interest." Prior to declaring a capacity use area, the act requires that an investigation be made to determine if the water problems are significant enough to warrant such an action.

The implementation of such a study was requested by the public officials of Beaufort, Colleton, Hampton, and Jasper Counties. These officials believed that present as well as projected use and development of the ground-water resources had reached a point where assessment and management were necessary. They also believed that a properly designed and implemented ground-water investigation was needed to determine what must be done to insure the availability of water of sufficient quantity and quality for meeting increasing water demands. The SCWRC agreed that a comprehensive ground-water investigation was needed and asked the U.S. Geological Survey to participate in a cooperative study as a part of the Survey's nationwide interest in coastal aquifers.

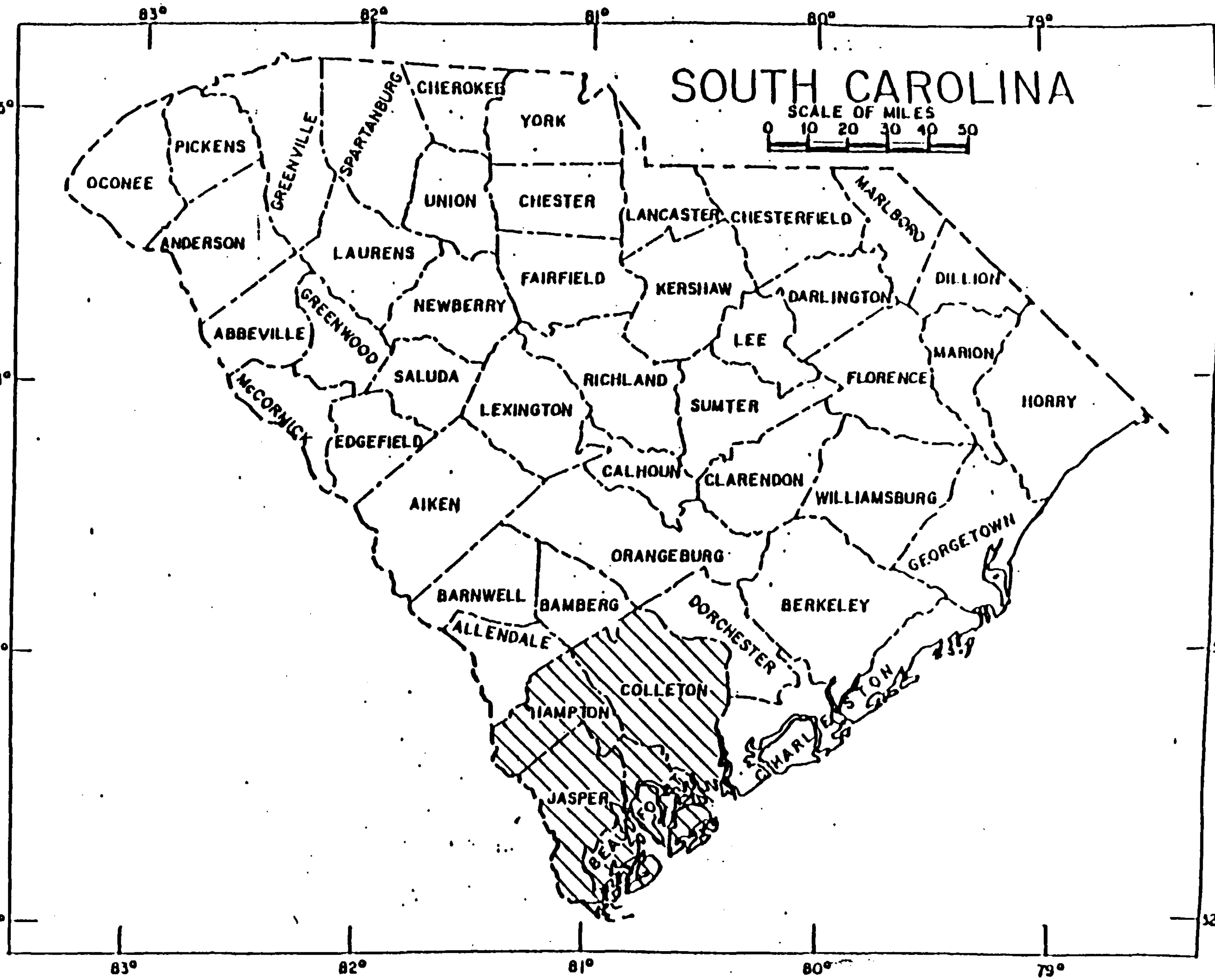

Figure 11. Area of investigation

ACKNOWLEDGMENTS

The author is greatly indebted to representatives of industries, to the well owners, and to water well contractors for their cooperation in supplying information on their ground-water developments and water use. Special thanks is due to Mr. Robert Glover, Hilton Head Plantation, for the lease of a plot of land upon which to drill test wells Bft 786, Bft 787, and Bft 788. Thanks also is due to the officials of Beaufort, Colleton, Hampton, and Jasper Counties as well as the staff of the Lowcountry Council of Governments for their help with this investigation. The assistance provided by South Carolina Development Board, Division of Geology, Shell Oil Co. and Texaco Oil Co. in describing the paleontology and lithology of drill cuttings is greatly appreciated.

A very special note of thanks is due to Louis Nexsen, Larry Drolet, Camille Ransom, Daisy Sammons, and B. C. Spigner, SCWRC, for their valuable assistance with all phases of the study.

GEOGRAPHY

CLIMATE

The climate of the study area is subtropical with hot and humid summers and mild winters. These climatic conditions contribute to a long growing season that, when coupled with the availability of rich land and considerable rain, makes the area agriculturally active. The average length of the freeze-free period is about 280 days.

Maximum temperatures range from 95° to 100°F during July and August; minimum temperatures occasionally range from 20° to 30°F during December, January, and February. The average annual temperature was 65° to 66°F for the period 1972 to 1976 (table 1 and fig. 2). The average annual precipitation for the period of 1972 to 1976 was 50 inches. Precipitation is well distributed; the largest amounts of precipitation occur during June, July and August (fig. 3) primarily as a result of thunderstorm and shower activity.

PHYSIOGRAPHY

The South Carolina Coastal Plain, which lies in the central part of the Atlantic Coastal States, is divided into three regional belts. These belts are roughly parallel to the Atlantic Ocean, extending from the Fall Line to the Atlantic Ocean. The study area lies within the Lower Coastal Plain which is characterized by a series of terraces, ranging from sea level to about 270 feet above sea level. These terraces are highly dissected by numerous streams and contain many shallow depressions. In the study area these depressions may be sinkholes caused either by solution of underlying limestone or by surficial irregularities

Table 1. Average monthly and annual temperature (°F) at Beaufort, Hampton, Hilton Head, Ridgeland, Walterboro, and Yemassee, 1972-76.

Month	Beaufort	Hampton	Hilton Head	Ridgeland	Walterboro	Yemassee
January	54.3	52.8	54.7	52.5	52.1	53.0
February	52.9	52.8	52.2	52.1	50.6	52.3
March	60.1	61.2	60.4	60.5	60.5	60.4
April	64.4	64.7	63.8	62.3	63.7	63.9
May	73.1	71.9	72.0	71.5	71.4	70.5
June	77.3	76.5	76.3	76.2	76.1	76.8
July	81.0	80.2	79.7	79.3	79.7	80.2
August	80.7	79.4	79.2	78.8	79.4	80.0
September	77.2	75.6	76.2	75.2	75.6	75.3
October	66.6	64.1	66.4	65.2	65.0	64.6
November	57.3	56.0	57.3	56.3	55.9	53.5
December	52.1	51.2	51.8	50.4	50.1	50.5
Average Annual	66.4	65.5	65.8	65.0	65.0	65.3

"Modified from" U. S. National Weather Service National Oceanic and Atmospheric Administration, 1977, Climatological Summary for South Carolina.

that were formed on the floor of the ocean or in the shallow water of tidal marshes when the sea stood at a higher level.

Much of the study area is characterized by low flatland inundated with water; by numerous streams, rivers, marshes and lakes; and by moss covered woodland. The area is relatively isolated and is sparsely settled. Transportation within the region is severely restricted by marshes and waterways that impede rapid access from outside of the region. Of the 69 islands in Beaufort County, 20 are inhabited, 18 of which are accessible by bridges or causeways.

POPULATION AND ECONOMY

The Lowcountry area is the least populated region of South Carolina. The 1970 population of 106,521 persons ranked the area lowest in population density with 37.2 persons per square mile. The study area was classified as 32.6 percent urban in 1970. With the exception of Beaufort County, the population of the area has not changed significantly in this century (fig. 4).

Beaufort County is 637 square miles in size and contains four incorporated communities and ten small unincorporated communities. The incorporated area of Beaufort and Port Royal, with a combined population of over 12,000, has the highest population density and the largest industrial and business concentration in the study area. The unincorporated Hilton Head Island resort community, with a 1976 population of about 8,000 persons, is the next largest urban area in Beaufort County.

Colleton County, covering more than 1,000 square miles, is the largest county in the study area. Five incorporated towns and eleven small unincorporated communities are located in the county. With the exception of Walterboro, which has a population of 7,500, the towns are small and rural in nature with less than 500 persons in each.

Hampton County has an area of 562 square miles and contains 15 small towns and communities. The largest town is Hampton, the county seat, with a population of about 3,000 persons.

Jasper County has an area of 662 square miles and contains two small towns, Ridgeland and Hardeeville, and seven community settlements. The town of Ridgeland, the county seat, has only about 1,200 persons. Jasper County is the only county within the study area that is classified as 100 percent rural.

The study area has the lowest average per capita personal income in the state. The largest employment segment in 1970 was federal and local government with 7,130 employees (table 2). From 1965 to 1970, the fastest employment growth in absolute terms was government with 1,600 new positions.

since before the turn of the century and is expected to decline even more in the future (South Carolina Employment Security Commission, 1971). Nevertheless income derived from farm products is still substantial to the economy of the area since total farm income is increasing as a result of improved farming methods and higher prices for products sold. Income from agriculture was up 51.4 percent in 1970 over 1964 (table 3).

Table 3. Value of all farm products of the study area.

VALUE ADDED BY FARM PRODUCTS ($000)

	Value all farm products sold		Value all crops sold		Value all livestock products sold		Percentage change all farm products sold
	1964	1970	1964	1970	1964	1970	
Beaufort	4,778	7,330	3,776	5,569	924	1,761	53.4
Colleton	4,528	7,408	2,735	3,497	1,783	3,911	63.6
Hampton	6,056	8,073	4,512	4,929	1,540	3,144	33.3
Jasper	1,512	2,740	796	1,390	706	1,350	81.2
TOTAL	16,874	25,551	11,819	15,385	4,953	10,166	51.4

Source: U. S. Department of Commerce, 1964 Census of Agriculture, and Department of Agricultural Economics, S. C. Agricultural Experiment Station, Clemson University in Cooperation with U. S. Department of Agriculture, South Carolina, Cash Receipts From Farm Marketing, 1971.

Income from livestock products was up 105.2 percent during this six-year period and value added by crops sold was up only 30 percent. If past trends hold up, the study area's farm economy will soon be dominated by livestock products as opposed to the current domination of crop products.

Soybeans, the biggest money crop in the area, accounted for 36.2 percent of all crop sales in 1970, followed by the production of vegetables at 22.6 percent. Forest products, peaches, corn, tobacco, and cotton account for 9.8, 5.6, 5.0, 4.0, and 2.9 percent of crop sales, respectively.

quality and quantity for domestic or small agricultrual and industrial needs. The yield and quality vary considerably from place to place. Water from these formations may be hard and may contain high concentrations of iron and hydrogen sulfide. Near the coast or saltwater estuaries, water from these deposits may be salty.

HYDROGEOLOGY OF THE PRINCIPAL ARTESIAN AQUIFER

Underlying the study area is an artesian aquifer composed of a series of limestones ranging from Eocene to Oligocene in age. This aquifer extends into southeastern Georgia, Florida, and adjacent parts of Alabama. The aquifer is referred to as the Ocala or principal artesian aquifer in Georgia, as the Floridan aquifer in Florida, and as the principal artesian aquifer in South Carolina.

In the Lowcountry area, the principal artesian aquifer ranges in thickness from less than 400 feet to more than 1,000 feet. The uppermost section of the underlying Black Mingo Formation (which consists of fine, white to yellow sand and red to brown, sandy clay) acts as the lower confining bed. The upper Oligocene (?) section consisting of sandy, calcareous, phosphatic clay and the lower Miocene section consisting of fine, sandy, greenish clay together act as the upper confining bed. The upper confining bed varies in thickness from zero to more than 50 feet. In parts of southern Beaufort County where the upper confining bed is absent, the Hawthorn aquifer is contiguous and hydraulically connected to the principal artesian aquifer.

WATER YIELDING ZONES

The principal artesian aquifer is divided into an upper permeable zone, a middle zone of relatively low yield, and a lower permeable zone. Geohydrologic sections AA' and BB' (fig. 7), CC' (fig. 8), and DD' (fig. 9) show the top of the principal artesian aquifer and the stratigraphic positions of the upper and lower permeable zones. These zones were determined on the basis of lithology, geophysical response, aquifer tests, and current meter tests. The permeable zones as defined herein include all the smaller zones of different yields and no attempt has been made to delineate them. All the smaller wateryielding zones have been combined into one relatively high wateryielding section or "permeable zone."

The upper permeable zone consists of white to light-gray calcitized, indurated, very fossiliferous limestone and varies considerably in thickness and lateral extent. It is more than 200 feet thick in southern Jasper County and western Beaufort County and thins toward the north and northeast, pinching out near the Beaufort-Colleton County line (figs. 7, 8, and 9). The upper permeable zone is very thin in eastern Beaufort County over the Beaufort arch where the top of the principal artesian aquifer is within 25 feet of land surface (figs. 7 and 8). Throughout

Beaufort and Jasper Counties and much of Hampton County, the upper permeable zone of the principal artesian aquifer is the primary source of ground water.

The upper permeable zone is separated from the lower permeable zone by a middle zone of low permeability, consisting of a soft, sandy, clayey limestone ranging in thickness from 200 feet or less in the northwestern part of the study area to more than 700 feet in the southeastern part of the study area (figs. 8 and 9).

The lower permeable zone consists of an indurated, siliceous, slightly-glauconitic, light-gray to creamy-yellow limestone. It ranges in thickness from less than 30 feet in parts of Beaufort County to more than 90 feet in Colleton and Hampton Counties (fig. 8 and 9). This lower permeability zone is the primary source of ground water in Colleton County (except for the city of Walterboro, which obtains water from the Black Creek and Middendorf aquifers) and in northeastern Hampton County, where the upper permeable zone is missing or is very thin.

Eight wells in Beaufort County are known to be open to both the lower and the upper permeable zones. No wells have been found in Jasper County that penetrate below the upper permeable zone; consequently the extent, thickness, and water-bearing characteristics of the lower permeable zone is unknown in Jasper County.

A map showing the top of the principal artesian aquifer in the area was constructed using natural gamma radiation, electric, and lithologic logs (fig. 10). Point C, shown in figure 6, represents the top of the principal artesian aquifer. This point is the top of the water-yielding Oligocene section of the principal artesian aquifer and in most cases the top of the upper permeable zone. The top of the principal artesian aquifer is a highly irregular surface that ranges from less than 20 feet below msl in the Beaufort arch to more than 200 feet below msl in the Ridgeland Trough (fig. 10).

The irregular surface of the top of the principal artesian aquifer may reflect solution occurring as a result of advance and recessions of the Pleistocene Sea. During Pleistocene time when the sea level was much lower than now, the land area extended to the edge of the Continental Shelf and the upper Tertiary sediments were above sea level. At this time, solution cavities and sinkholes were probably formed in the limestone. Numerous circular depressions in the topography of the Beaufort area appear to be the result of settling of sediment filled sinkholes.

HYDRAULIC PROPERTIES

Ground-water hydraulics is concerned with the natural or induced movement of water through permeable formations. Knowledge of the geologic framework and of the hydraulic properties of the formation

Beaufort County accounts for over 75 percent of the total ground-water withdrawal from the principal artesian aquifer in the Lowcountry, with Hilton Head Island accounting for over half of the ground water used in Beaufort County.

Ground-water use in Beaufort County is predominately concentrated in the eastern part of the county and on Hilton Head Island, with golf courses and crop irrigation accounting for over half of the ground water used. Golf course irrigation is heaviest from March through October, and crop irrigation takes place almost exclusively in the months of May, June, September, and October.

The estimated 1976 withdrawal of 650 Mgal in Jasper County was primarily for rural domestic use and for public-supply use in Ridgeland and Hardeeville. Ground-water use in Hampton County is almost equally divided between rural domestic, public supply, and stock use. In Colleton County the largest pumping center is at Walterboro, which pumps about 150 Mgal/yr for public supply and industrial use.

The Savannah area, which includes the City of Savannah and nearby industries, is the largest user of ground water from the principal artesian aquifer in this part of the Coastal Plain area. According to Counts and Krause (1976) the Savannah area pumped an average of 75 Mgal/d in 1970.

POTENTIOMETRIC SURFACE AND GROUND-WATER FLOW

In an artesian aquifer, ground water is always under pressure and moves from points of higher hydraulic pressure to points of lower hydraulic pressure. The rate of movement of water between two points depends upon the hydraulic conductivity and porosity of the aquifer, upon the viscosity of the water, and upon the difference in head pressure between the two points. The slope of the water surface or head change between the two points, generally expressed in feet per mile, is called the hydraulic gradient. By contouring or connecting the heights of measured water levels in feet above or below a common datum in wells tapping an artesian aquifer an imaginary surface is developed which indicates the height to which water will rise in tightly cased wells open only to that particular artesian aquifer.

Before withdrawal of large amounts of water from the principal artesian aquifer, the potentiometric surface was controlled mainly by the hydraulic characteristics of the aquifer and the overlying and underlying confining beds, by the topography and altitude of the outcrop areas, and by natural recharge and discharge. The potentiometric map of 1880 constructed by Warren (1944, p. 26) showed an easterly hydraulic gradient of about 1 ft/mi, with natural discharge occurring in the Port Royal Sound and Parris Island area.

While the potentiometric contour map may be used to determine the general direction of ground-water flow, the actual movement of a single water molecule is very complex and may differ considerably from that which is implied by the two dimensional potentiometric map. The actual flow of ground water is three dimensional and is affected not only by hydraulic gradient but also by changes in aquifer characteristics (such as permeability, porosity, and thickness) and by boundary effects between fluids of different densities (such as a freshwater-saltwater interface). Furthermore, flow characteristics in a limestone aquifer vary widely depending upon the hydrogeologic characteristics of the aquifer.

White (1969) proposed a three part classification of carbonate aquifers based upon recognizable physical features: (1) a diffuse-flow aquifer in which the carbonate rocks have been affected the least by solutional modification; (2) a free-flow aquifer in which ground-water flow paths have been localized by solutional modification into well integrated systems of conduits; and (3) a confined-flow aquifer in which geologic boundaries are the flow-limiting factors rather than hydraulics. Ground-water movement through the diffused-flow system is analagous to flow in a homogeneous aquifer and more nearly follows the "basic" assumptions upon which ground-water flow equations are based. In a free-flow system, flow occurs in distinct conduits or channels while nearby rock may have little porosity or permeability. Flows in these conduits often have high velocities and may be turbulent.

The principal artesian aquifer generally functions as a confined diffuse-flow aquifer. Consequently, flow equations that assume laminar flow in an isotropic and homogeneous medium cannot be rigorously applied to the principal artesian aquifer. Nevertheless, if the limitations of basic flow equations as regards a particular set of geohydrologic conditions are considered, these flow equations and potentiometric maps may be used to indicate the general direction and average velocity of ground-water flow.

Calculations of the average velocity of ground-water movement indicate that water moves very slowly in the principal artesian aquifer. The average velocity of ground-water flow may be computed by the following equation:

$$\bar{v} = \frac{-K\ dh/dl}{\theta} \qquad \text{(Lohman, 1972)}$$

where:

$\bar{v}$ = average velocity, in feet per day
K = hydraulic conductivity, in feet per day
dh/dl = change in head with respect to change in distance, in feet per foot
θ = porosity, as a decimal fraction
$-$ = the minus sign indicates that flow is in direction of decreasing head

The potentiometric map of December 1976 (fig. 19) is similar to Siple's map of June 1959 with the exceptions: (1) the cone of depression centered at the Burton Well Field is absent; (2) the potentiometric high at the Marine Corps Air Station has changed in shape and increased in size; (3) the regional zero potentiometric contour has moved about three miles to the northeast; and, (4) a small but relatively deep cone of depression is present southeast of Lobeco.

The cone of depression that was present in the vicinity of the Burton Well Field in 1959 is no longer present because the pumpage in this area ceased almost entirely when the U.S. Marine Corps facilities at Parris Island, the Marine Corps Air Station, and Capehart Housing changed from ground-water to surface-water use in January 1965. The regional zero contour has moved to the northeast as a result of increased pumpage at Hilton Head and Savannah, and has been accompanied by a gradual steepening of the slope of the potentiometric surface toward Savannah and of a gradual increase in the size of the cone of depression. The small but relatively deep cone of depression near Lobeco occurs as a result of large withdrawals (about 500,000 gal/d) from two closely spaced wells where the principal artesian aquifer has a relatively low transmissivity (less than 5,000 ft^2/d).

Since 1880, the potentiometric surface in the area east and southeast of Burton (which includes Beaufort, Ladies Island, St. Helena Island, and numerous small sea islands) has shown little change, with water levels generally ranging between zero and 5 feet above msl. This suggests that recharge has been balanced by discharge for some time. It also suggests that, since very little pumping was taking place in this vicinity before the 1960's, natural discharge from the aquifer must have taken place through breaks in the confining bed or in regions where the hydraulic conductivity of the confining bed is relatively high. Evidence of this is shown by test drilling at Brickyard Point on the northern end of Ladies Island. Also, numerous wells in the vicinity of Brickyard Point and near the estuaries separating the sea islands contain salty water (fig. 22). This salty water is probably entering the aquifer where the confining bed is either thin or missing, and pumping has locally reduced the potentiometric surface below msl.

WATER QUALITY

The quality of ground water is largely controlled by the soluble minerals of the aquifer. Materials lying above or below the aquifer may also contribute dissolved substances. The concentrations of dissolved substances generally increase with greater depths and greater distances from recharge areas.

Ground water is generally more highly mineralized than surface water because of the relatively slow movement of ground water and because of its more intimate contact with soluble minerals. Surface water always contains some suspended inorganic sediment and varying amounts of organic

A main conclusion of this study concerning the saltwater encroachment in the upper permeable zone of the principal artesian aquifer is that the contamination at Hilton Head and Parris Island results primarily from ocean water entering the aquifer. If this conclusion is correct, analyses of aquifer water showing different degrees of contamination plotted on the trilinear diagram should generally not deviate too far from the predicted theoretical positon, or if they do deviate, these deviations should be explainable.

Points 2, 3, 4, 11, 12, and 13 fall reasonably close to a straight line plot (line A-B, fig. 28) and indicate a simple mixture of water from the upper permeable zone and water from Port Royal Sound. Points 1, 5, 9, and 10 fall somewhat above line A-B and points 6, 7, and 8 fall below line A-B.

Point 1 represents an analysis of water from a well in an area receiving local recharge from the overlying water table aquifer. Point 5 represents a water analysis from a well showing contamination, in part, from the vertical movement of salty water from below. Points 9 and 10 represent analyses of water from wells that are near the saltwater recharge areas underlying Battery Creek. Point 6 represents an analysis of water from a well that is open to the middle zone of the aquifer immediately underlying the upper permeable zone, and point 8 represents an analysis of water from a well that is receiving recharge from Coosaw River and from the overlying water table. Point 7 represents the typical sodium-bicarbonate type water from the Middendorf aquifer at Parris Island. None of these points represents a simple mixture of water from the upper permeable zone and water from Port Royal Sound. Consequently the points deviate from line A-B.

Analyses of water quality data plotted on the trilinear diagram does in part support the conclusion that saltwater contamination in the upper permeable zone of the principal artesian aquifer primarily results from a mixing of ocean water with aquifer water. However, the plotted data also indicate that in some cases the source of the salty water is not simply modern ocean water or else that there has been alteration of the chemical quality of the mixture of modern ocean water and aquifer water by ion exchange.

SUMMARY AND CONCLUSIONS

The Lowcountry area is characterized by low flat land, much of which is inundated with water; by numerous streams, rivers, marshes and lakes; and by moss covered woodland. It is relatively isolated and sparsely settled. Average per capita personal income is the lowest in the State.

Water in quantities adequate for most domestic, public-supply, and agricultural needs is generally available from one or more aquifers. In 1976 Beaufort, Colleton, Hampton, and Jasper Counties used an estimated

7,600 Mgal of ground water. About 6,200 Mgal or 82 percent of the ground water used by these four counties came from the principal artesian aquifer. Of this water, about 77 percent or 4,800 Mgal were used in Beaufort County, with Hilton Head Island accounting for about 64 percent of the water use in Beaufort County. Golf course and crop irrigation accounted for over half of the water usage from the principal artesian aquifer. To the southwest of the study area, the City of Savannah, Georgia and industries in the Savannah area pump more than 25,000 Mgal/yr from the principal artesian aquifer.

As a result of the large ground water use in Savannah, water-level declines of more than 100 feet have occurred in the extreme southwestern tip of Jasper County. Throughout most of Jasper County and western Beaufort County, the decline has been more than 20 feet. In Hampton County and eastern Beaufort County, the decline generally has been less than 10 feet; around Walterboro, Colleton County, declines of 10 to 30 feet have occurred; declines in the rest of Colleton County are less than 10 feet.

Surface water is abundant throughout the area, but in Beaufort and Jasper Counties (with the exception of the Savannah River) this surface water is generally too salty for human consumption. In Hampton and Colleton Counties fresh surface water is available but is not used to any significant extent. The Beaufort-Jasper Water Authority supplies the military installations in Beaufort, the Beaufort-Port Royal area, and some residents of Ladies Island with treated surface water from the Savannah River.

Underlying the study area are a series of unconsolidated and semi-consolidated sedimentary rocks ranging in age from Late Cretateous to Holocene. These rocks, which range in thickness from less than 2,500 feet in the northern part to more than 3,500 feet in the southern part of the study area, store and transmit all the ground water used in the area.

The oldest penetrated rocks in the study area were formed during Late Cretaceous time. These Upper Cretaceous deposits are, in ascending order, the Middendorf Formation (equivalent to and locally known as the Tuscaloosa Formation), the Black Creek Formation, and the Peedee Formation. No wells have penetrated the Upper Cretaceous section in Hampton and Jasper Counties. Consequently, the geohydrology of the Cretaceous rocks is unknown in these two counties.

Walterboro, Colleton County has two wells open to the upper part of the Middendorf Formation that have natural flows at the land surface of 1,200 gal/min and 1,400 gal/min of high quality water. Wells open to the Middendorf Formation at Parris Island, Hilton Head Island, and Fripp Island have natural flows at land surface of about 75 gal/min of highly mineralized water that has a temperature of around 38°C.

Although the Black Creek Formation is a productive aquifer in other parts of the state, its potential as an aquifer in the study area is unknown. A water sample taken during drilling of well 3ft 457 contained 1,100 mg/L of chloride. While it appears unlikely that this formation will yield significant quantities of freshwater in Beaufort County and possibly Jasper County, the Black Creek Formation may be capable of yielding large quantities of good quality water in Colleton and Hampton Counties.

The Peedee Formation is an important aquifer in Georgetown and Horry Counties, but does not appear to be of significant value as an aquifer in the study area.

The Tertiary System consists, in ascending order, of the Black Mingo Formation of Paleocene and Early Eocene (Wilcox) age, the Santee Limestone of Middle and Late Eocene (Claiborne and Jackson) age, the Cooper Marl of late Eocene and Oligocene age, the Hawthorn Formation of Miocene age, and the Duplin Marl of Pliocene age. The Tertiary formations are the chief sources of ground-water supplies in the study area.

The Black Mingo aquifer is a source of moderate quantities of good quality water in Colleton and Hampton Counties. Wells open to this aquifer in these counties have natural flows of 50-250 gal/min at land surface. The water-bearing characteristics of this formation are unknown in Jasper County. In Beaufort County the Black Mingo Formation is unlikely to yield large quantities of fresh water.

The Santee Limestone is part of the principal artesian aquifer and furnishes much of the ground water used in the area. Except where salt-water contamination has taken place, the Santee Limestone is capable of yielding from 200 to more than 2,000 gal/min of good quality water.

In Colleton County and in parts of northeastern Hampton County, the Cooper Marl is not used extensively as an quifer. In much of Hampton, Beaufort and Jasper Counties, however, the lower part of the Cooper Marl is considered to be part of the principal artesian aquifer and capable of yielding more than 200 gal/min of good quality water.

The upper and lower sections of the Hawthorn Formation act as confining beds. The middle section of the Hawthorn is a fairly persistent, sandy, dolomitic limestone (Hawthorn aquifer) and is a source of 50 to 200 gal/min of good quality water in western Beaufort County and in Jasper County.

The water-bearing characteristics of the Pliocene to Holocene deposits are not known. Wells tapping the Pliocene-Holocene deposits are reported to yield water of acceptable quality and quantity for domestic or small agricultural and industrial need. The yield and quality vary considerably from place to place. Water from these formations may be hard and contain high concentrations of iron and hydrogen sulfide. Near the coast or saltwater estuaries, water from these deposits may be salty.

About 82 percent of the ground water used comes from the principal artesian aquifer, which is composed mainly of rocks of the Santee Limestone and lower part of the Cooper Marl. The principal artesian aquifer is divided into three zones: (1) the upper permeable zone, which furnishes most of the water pumped from the aquifer in Hampton County and almost all of the water pumped from the aquifer in Beaufort and Jasper Counties; (2) a middle zone of relatively low hydraulic conductivity, which yields small amounts of water to wells; and (3) the lower permeable zone, which provides about all of the water pumped from the aquifer in Colleton County.

Aquifer tests show that, in general, transmissivities of the principal artesian aquifer decrease to the north and northeast and increase toward the southwest. Transmissivities range from about 30,000 ft^2/d to 50,000 ft^2/d west of Broad River and range from about 2,000 ft^2/d to 15,000 ft^2/d east of Broad River.

The average transmissivity of the upper permeable zone of the principal artesian aquifer in western Beaufort County and southern Jasper County is about 50,000 ft^2/d; in eastern Beaufort County the average transmissivity is probably less than 10,000 ft^2/d.

The transmissivity of the upper permeable zone in northern Jasper County and southwestern and southeastern Hampton County ranges from 10,000 ft^2/d to 30,000 ft^2/d, with transmissivity decreasing to the northeast and east.

The transmissivity of the lower permeable zone of the principal artesian aquifer in northern Colleton County and northeastern Hampton County ranges from 5,000 ft^2/d to as low as 500 ft^2/d, with transmissivity generally decreasing to the north. The average transmissivity of the lower permeable zone of the principal artesian aquifer in southern Colleton County is estimated to be 5,000 ft^2/d.

The coefficient of storage of the principal artesian aquifer ranges from 3×10^{-5} to 3×10^{-3}. The higher values generally occur where the overlying confining material is thin or relatively permeable, allowing leakage into the principal artesian aquifer from the overlying Hawthorn aquifer. Consequently the higher storage values are apparent values and should be considered as upper limit figures only, and subject to considerable error.

Yields of wells open to the principal artesian aquifer vary from less than 50 gal/min to more than 2,500 gal/min. The specific capacities of wells in the study area range from more than 250 (gal/min)/ft) at Hilton Head Island to less than 5 (gal/min)/ft) in Colleton County.

It is estimated that about 40 Mgal/day of recharge enters the principal artesian aquifer in the outcrop area 30 to 40 miles to the west and northwest of the study area. Approximately 5 to 10 Mgal/day of recharge is believed to be entering the principal artesian aquifer within the boundaries of the study area by leakage through overlying or underlying confining beds.

Water from the principal artesian aquifer is generally of suitable quality for most uses. In Beaufort County, however, the chloride concentration usually ranges between 25 to 75 mg/L and in more seriously contaminated areas may range from 500 to more than 5,000 mg/L.

Saltwater contamination is believed to be occurring from two sources: (1) sea water entering the aquifer through breaks in, or in areas of relatively high hydraulic conductivity of, the overlying confining material and (2) unflushed salty water in the lower part of the aquifer moving upward into the upper permeable zone. Saltwater contamination has also occurred as a result of the movement of saltwater into defective or improperly cased wells located near saltwater bodies.

Analyses of water quality data suggest that saltwater contamination in the upper permeable zone of the principal artesian aquifer primarily results from a mixing of modern ocean water with aquifer water. However, the data also indicate that in some cases contamination results from a source of salty water other than modern ocean water or else that there has been alteration of the chemical quality of the aquifer water by ion exchange.

Water containing more than 1,500 mg/L of chloride is present throughout the aquifer at Parris Island, Fripp Island, Edisto Beach, and probably other small sea islands southeast of Beaufort. Salty water is present in the lower part of the principal artesian aquifer in Beaufort County, in southern Colleton County, and probably in southern Jasper County.

Slightly salty water (chloride concentration generally between 50 and 100 mg/L) is present in the upper part of the principal artesian aquifer at Hilton Head Island. Salty water is moving laterally towards Hilton Head Island from the northeast and possibly from the Atlantic Ocean, where saltwater may be entering the aquifer along the sea bottom. Also, salty water present in the sediments underlying the upper permeable zone is moving upward into the upper permeable zone of the aquifer in response to heavy pumping at Hilton Head Island. The salty water entering the upper permeable zone is diluted by freshwater recharge. With the present rate of pumping and existing hydraulic gradients, it probably will be many years before the freshwater resources of Hilton Head Island will be grossly contaminated by saltwater. However, increased pumping at Hilton Head Island and to the north and west of the Island would increase the rate of encroachment and lessen the time before the ground-water resources became seriously contaminated.

Estimates of the rate of saltwater movement at hilton Head Island based on regional and local hydraulic gradients range from 140 to 370 feet per year. The lower rate is believed to approximate the rate of regional encroachment, on the assumption that all calculated movement represents encroachment. The higher rate may occur near centers of heavy pumping for a few months each year, but during the remainder of the year the rate is probably lower.

In general the actual depth to a freshwater-saltwater contact is greater than that predicted by the Ghyben-Hertzberg principle. Hubbert's modified version of the Ghyben-Hertzberg equation may under certain conditions give a reasonable approximation of the depth to a freshwater-saltwater contact. However, the only accurate way to define the interface between freshwater and saltwater is through a set of test wells all located at the same site but open to the aquifer at different depths.

The effects of additional development of the ground-water resources on water levels and on saltwater contamination require careful consideration. The following suggests some of the management considerations that would aid in the long-range protection of the ground-water resources of the study area.

The ground-water problems in the study area warrant consideration of comprehensive and positive water management. The success of any planning and management programs, however, will depend upon continued availability of reliable data. The continued collection of pumpage data throughout the area and periodic water-level measurements in the existing network of observation wells will aid in monitoring changes in water levels due to pumping. The periodic collection and analysis of representative water samples from varying depths in the principal artesian aquifer would provide data about the zone of diffusion and the movement of salty water in the aquifer.

Numerous methods have been used to control saltwater encroachment. These include (1) reduction of pumping, (2) redistribution of major pumping centers, (3) water conservation and economical use, (4) artificial recharge, and (5) conjunctive use of water from different sources. The simplest solution would be to reduce pumping, but this may not be possible to any large extent because of existing water demands. However, the use of treated sewage effluent for irrigation use (if acceptable from a health standpoint) might be one way of reducing pumpage. This, combined with water conservation, may be the most economical and practical way of reducing saltwater encroachment in the study area.

Recharge to an aquifer with water pumped from surface-water sources has been used widely in California and to a lesser extent in other parts of the United States. Methods range from collecting storm runoff in pits to construction of channels and pipelines from distant streams to the recharge basins or injection wells. Because recharge would have to be accomplished through injection wells and because there are no nearby freshwater recharge sources in Beaufort County, artificial recharge would be an expensive undertaking.

It might be feasible in a limited area, such as Hilton Head Island, to use water from the Middendorf aquifer for recharge into the upper permeable zone of the principal artesian aquifer to form a hydraulic barrier between the Hilton Head Island wells and the source of salty water. The hydraulic barrier thus generated may prevent salty water from entering the aquifer. The relatively high hydraulic head in the Middendorf aquifer would eliminate the need for any pumping mechanism. A properly constructed and developed well in the Middendorf aquifer might supply a natural recharge flow of about 1 Mgal/d. On the negative side, however, the water from the Middendorf aquifer is high in some mineral constituents and has a high temperature; consequently, the quality of water from the principal artesian aquifer would be adversely affected.

Predicting the changes in water quality and water levels in response to changes in recharge and discharge is one of the most important aspects of ground-water management. This may be accomplished by the use of analytical or computer modeling techniques. Models are designed to establish a reasonable correspondence between their properties and those of the prototype aquifers; they can simulate ground-water flow, storage, recharge, pumping, natural discharge, impervious boundaries, and transport of solutes in ground water. Electric analog and digital computer models have been used for ground-water management studies. In recent years, the electric analog model has been supplanted by the digital computer, which uses essentially the same logic as the analog model. The principal difference is that a digital computer calculates values, whereas an electric analog measures the same values. The computer technique has generally been found more desirable than the electric analog method, mainly because it is more flexible, more convenient, and less expensive.

The usefulness of the digital model as a management tool is well documented in many ground-water reports, and the use and development of such a model should be considered for the study area. The digital model developed by Counts for the Savannah area, which includes part of the present study area, could probably be adapted for use in the entire Lowcountry study area.

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REFERENCE 11

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LOBECO SITE ENVIRONMENTAL ASSESSMENT RESULTS AND PROPOSED REMEDIAL ACTION PLANS FOR AMERICAN COLOR AND CHEMICAL CORPORATION AND TENNECO RESINS, INC.

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4. ENVIRONMENTAL SETTING

4.1 Regional Setting

The Lobeco site is located in Sheldon Township, Beaufort County, South Carolina, approximately one (1) mile north of the Whale Branch of the Coosaw River. The Lobeco site is situated in the lower coastal plain physiographic province which is characterized by low relief, lagoons, tidal swamps and salt marshes.

The Beaufort, South Carolina area is underlain by limestone and unconsolidated sands and clay. The rocks and soils beneath the site range in age from late Cretaceous to recent. The primary aquifer in the region is the Floridan, which is composed of the Santee Limestone and the basal portion of the Cooper Marl. The Santee Limestone is primarily a bioclastic limestone. In the Beaufort area the Floridan is several hundred feet thick and is overlain by the Hawthorn Formation. The Hawthorn is characterized by sand, silt and clay with phosphatic pebbles. In the Beaufort area the Hawthorn is found at depths ranging from approximately 50 feet below ground surface to nearly 80 feet. In the Beaufort area the Hawthorn is typically a low permeability clay which serves as the lower confining layer for the Pamlico Formation. The Pamlico Formation is exposed at the surface throughout most of the region. The Pamlico consists of quartz sand and clay, with some glauconite, broken shells and heavy minerals. In the vicinity of the Lobeco Facility, the Pamlico Formation is approximately thirty (30) to forty (40) feet thick.

4.2 Site Geology

Clastic sediments of the Pamlico and Hawthorn formations were sampled during drilling operations at the Lobeco site. The data point location map is included as Plate 1. A cross-section illustrating site geology is presented as Plate 2.

The Hawthorn Formation was encountered in all three reference borings at depths ranging from 26.0 feet in RB-3 to 38.0 feet in RB-2. Only the upper two (2) to three (3) feet of the Hawthorn beneath the Lobeco site was penetrated by any of these borings. However, based on the boring logs for the two production wells on site the Hawthorn formation is approximately forty (40) to fifty (50) feet thick. Split spoon and Shelby tube samples of the Hawthorn Formation were described as green clay with trace amounts of silt and broken shells.

Overlying the Hawthorn is the Pamlico Formation. The Pamlico ranges in thickness from 26.0 feet in RB-3 to 38.0 feet in RB-2. The formation is generally composed of tan and grey silty, fine sand containing varying amounts of clay, alternating with layers of sandy silts with varying amounts of clay. Grey-green medium sand with broken shells were observed between 22.0 feet in RB-3 and 26.0 feet in RB-2 and L-1.

4.2.1 Abandoned Lagoon

Unconsolidated deposits of the Pamlico Formation were encountered during drilling activities in the Abandoned Lagoon Area. Boring and temporary well locations are shown on Plate 3. The soils are generally

Boring logs for drilling activities conducted during the Lobeco Site Environmental Assessment are included in Appendix A.

4.3 Site Hydrogeology

Topographic relief at the Lobeco facility is 20 feet. Ground surface generally slopes to the south at a rate of 0.005 feet per foot. Local variations in response to cultural features are common.

Ground water at the Lobeco site generally occurs under unconfined conditions. However, the soil types identified during drilling activities in the vicinity of the Old Burn Site suggest the potential for localized confined or semi-confined conditions. In addition, perched ground water was noted in the vicinity of the Old Burn Site. The unconfined aquifer is recharged from precipitation on the site.

Surface water, except in curbed containment areas, enters into a ditch drainage system, which appears to be related to pre-plant agricultural activities. These drainage channels eventually drain into the marshy area near Campbell Creek or pool in shallow depressions at the site before entering into the ground water system or evaporating.

There are no known public or private water wells downgradient of the Lobeco site.

low. The high may be due to assorted permanently magnetized objects, or it may in fact represent an induced magnetic maximum. The absence of a well-defined minimum could be the result of measurement difficulties encountered 5-15 feet north of the maximum where a steep topographic grade caused readings to be somewhat unstable. Maximum F is probably real and likely overlies some sort of metal. Areal extent and depth of the buried objects, however, are less certain than in the cases of maxima A-E and no location rectangle is indicated in Plate 14.

6.5.2 Physical Soils Testing

In addition to the chemical analyses previously described, one undisturbed sample from the top of the Hawthorn Formation and three (3) split-spoon samples from the overlying soils were collected from each of the reference borings. The undisturbed samples were collected to determine the vertical permeability of the lower confining layer and the split-spoon samples were collected for physical characterization.

The vertical permeability test results as well as the physical soils characterization data are included as Appendix D.

The undisturbed samples were collected in accordance with ASTM-D1587. Permeabilities were determined using the procedures outlined in the U.S. Army Corps of Engineers Manual EM 1110-2-1906, Appendix VII, Permeability Tests. Test results indicate vertical permeability ranges from 1.67×10^{-7} cm/sec in boring L-1 to 5.14×10^{-7} in boring RB-2.

REFERENCE 12

South Carolina

State Water Assessment

South Carolina

STATE WATER ASSESSMENT

Report No. 140

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Summary

South Carolina's average streamflow is about 33 billion gallons per day. This water, along with the water stored in surface reservoirs and underground aquifers, must be properly managed to meet the State's current and future water needs. Good water availability data, water quality data, and water use data are necessary for responsible water resource management. In addition, the proper legal and institutional framework must be in place to utilize these data. Currently, the quality and extent of South Carolina's water data base varies considerably with the type and source of the data and the geographic location of the resource. Utilization of these data for planning and management purposes is also difficult.

Water law in South Carolina is relatively undeveloped; lacks a coherent policy in regards to water resource management; and is widely dispersed throughout State and Federal constitutions, statutes, regulations, and common law. The riparian reasonable use doctrine is the basis for surface-water law and is inappropriate in many respects for settling water use conflicts. Some of the more consistent water law concerns include: 1) insecurity of riparian rights; 2) limitations on water use (interbasin transfer); 3) protection of the resource for public interests; and 4) adequate legislation for responsible water management during droughts and other water crises. To date, no law has defined the extent of riparian lands or the authority to make interbasin transfers of water. Except for the Ground Water Use Act of 1969, South Carolina has no statutory or case law delineating ground-water rights.

Examination of water availability data reveals several broad trends. Both surface and ground-water availability correlate with the general physiography and geology of South Carolina. Streams in the Blue Ridge and Upper Coastal Plain Provinces tend to have well-sustained base flows with only moderate variability; streams in the lower Piedmont and Lower Coastal Plain generally have poorly sustained base flows and are highly variable. Ground-water yields in the Blue Ridge and Piedmont Provinces are usually low except along poorly identified fracture zones; however, well yields throughout the Coastal Plain are good to excellent with variable water quality.

The State's surface-water data base is relatively good. However, ground-water data are extremely limited throughout the Blue Ridge and Piedmont, the northern Pee Dee area, and some Upper Coastal Plain counties. This problem is compounded by the lack of coordination among agencies which collect ground-water data and the need to compile and analyze the large quantity of raw data already collected. Only portions of Horry, Beaufort, Jasper, Barnwell, and Aiken Counties have a sufficient data base to permit meaningful ground-water management efforts.

The quality of our waters is relatively good. An estimated 84 percent of the State's major river miles meet Federal water quality goals and 86 percent meet State water quality standards most of the time. The most widespread water quality problem is fecal coliform bacteria contamination with 74 percent of the State's water quality monitoring stations indicating unacceptable levels. This problem has caused the closing of 33 percent of the State's estuarine shellfishing waters. Other water quality problems include low dissolved oxygen concentrations in Coastal Plain streams, high suspended solids levels in Piedmont streams, and elevated nutrient levels and eutrophic conditions in lakes throughout South Carolina.

Between 1970 and 1980, gross water use in South Carolina almost doubled to its present 5,780 mgd. About 437 mgd, or 7.6 percent, of this water is consumed (not returned to available supplies). The largest gross use is for cooling water in the production of thermoelectric power (4,370 mgd or 75.6 percent), followed by self-supplied industry (905 mgd or 15.7 percent) and public supply (380 mgd or 6.6 percent). Ninety-six percent of the State's water needs are supplied by surface waters. Excluding the large use by thermoelectric power plants, surface water still supplies 85 percent of the State's total water needs. The largest consumer of water is self-supplied industry which accounts for 38 percent of total consumption, followed by public supply (24 percent) and agricultural irrigation (13 percent).

Statewide gross water use is projected to increase 48 percent to about 8,550 mgd by 2020. The largest increases are expected in agricultural irrigation and thermoelectric power production. These two uses, particularly irrigation, are also expected to play a significant role in a projected 300 percent increase in consumptive water use. Irrigated cropland is expected to increase from its present 120,000 acres to about 600,000 acres by 2020.

Various regional and local water problems exist, or have the potential to occur, throughout the State. All current and projected surface-water needs may not be adequately met by surface-water supplies during low flows in the Saluda, Catawba-Wateree, and Combahee-Coosawhatchie River Sub-basins. Heavy ground-water withdrawals are causing water level declines in the vicinities of the cities of Florence, Darlington, Sumter, Georgetown, Myrtle Beach, Charleston, and Beaufort, South Carolina and Savannah, Georgia. Projected large increases in ground-water use for agricultural irrigation may strain currently productive aquifer systems and cause water level declines in the counties of Dillon, Marion, Florence, Orangeburg, and Aiken. In addition, without proper management, saltwater could contaminate all coastal aquifer systems.

The Saluda River Sub-basin exhibits the most numerous and widespread water resource problems of all sub-basins in the State. Current surface-water demand periodically exceeds available supplies and rapidly growing water demands coupled with limited surface and ground-water availability indicate potential water use conflicts in the future. Variable and frequently low streamflows in the Saluda River below Lake Greenwood restrict navigation, fish migration, and fish habitat. Surface water quality problems are widespread with high levels of fecal coliform bacteria, nutrients, biochemical oxygen demand, and turbidity the major contributors. Lake Greenwood has been identified as the most eutrophic lake in the State. The Little Saluda River and Reedy River exhibit poor water quality and have been identified as two of the worst water quality problem areas in South Carolina. Hydrogeologic knowledge for most of the sub-basin is at the field data level. In general, ground-water yields in the Saluda River Sub-basin are limited. Ground-water quality problems exist in numerous wells due to high levels of iron, copper, and lead. In the vicinity of Leesville, water from the Tertiary Sands Aquifer System contains naturally-occurring radioactivity at levels in excess of acceptable drinking water standards.

Hydroelectric power comprises about 25 percent of total generating capacity and provides seven percent of all electricity in South Carolina. In 1980, this non-withdrawal use used about 63,200 mgd; more than ten times all withdrawal uses combined. Numerous potential hydropower sites have been identified in the State with most occurring in the Broad River Sub-basin. Although hydroelectric power is important to current and future development in South Carolina, permanent impoundment of low-lying lands and highly fluctuating discharges may adversely impact the environment and some water and land use activities.

Commercial navigation, once existing practically statewide, is now limited to coastal waters. Heavy shoaling in harbors and inlets due to shifting sands and sedimentation requires continuous and costly dredging. In addition, suitable dredge material disposal sites are few and decreasing in number.

The maintenance of sufficient instream flow enhances water quantity and quality and benefits fish and wildlife populations and instream uses such as navigation, hydropower generation, and recreation. Minimal discharges from hydroelectric power facilities on the Saluda and Catawba-Wateree Rivers and heavy irrigation water withdrawals on the Edisto River and tributaries of the Salkehatchie River cause occasional low flows which restrict some water use activities. Projected increases in water use coupled with a general lack of recognition and understanding of minimum flow requirements, may increase instream flow problems in the future.

Large quantities of sediment enter South Carolina's surface waters each year filling navigation channels and lakes. Excessive sedimentation impairs municipal, industrial, and recreational water use; destroys aquatic habitat; and adversely impacts desirable aquatic organisms. Over 18 million tons of soil are eroded each year in South Carolina and contribute to the sedimentation problem. Agriculture, silviculture, mining, and construction activities increase soil erosion. Agriculture contributes about 85 percent of total soil loss. Most erosion in the State occurs in the Piedmont. While "best management practices" have been developed to control erosion caused by several land use activities, implementation is primarily voluntary and adequate legislation to properly control erosion and sedimentation has not been developed.

Large populations of noxious aquatic plants infest about 50,000 acres of rivers and lakes throughout the State and are especially troublesome in Coastal Plain waters. These nuisance weeds are able to out compete desirable native species and can interfere with almost all withdrawal and instream water use activities. Hydrilla, an extremely prolific and difficult to control submersed aquatic plant, was recently discovered in Lake Marion and poses a serious threat to all waters of the State. Control of aquatic weeds in public waters is coordinated and funded through the South Carolina Aquatic Plant Management Council. However, sufficient funds are not available to properly control the spreading aquatic weed problem in South Carolina.

South Carolina's coastal waters are an important and increasingly popular resource for municipal, industrial, and recreational uses. Increased development in coastal areas has resulted in limited available waterfront space, increased point and non-point sources of pollution, limited access points to public waterfront areas, and development in unstable erosion-prone beachfront areas. The South Carolina Coastal Council has developed and implemented a Federally approved Coastal Zone Management Program to protect and manage coastal resources.

Numerous lakes, rivers, and coastal waters provide a wide variety of water-based recreational opportunities with the coastal Grand Strand area being the most popular followed by other coastal areas and the major lakes. The Santee-Cooper Lakes, Lake Murray, and Lake Wylie are the most popular major lakes in the State. Fecal coliform bacteria contamination, high levels of PCB's, extremely low streamflows, aquatic weed infestations, and limited public access restrict recreational use of some public water bodies in the State.

Rivers or portions of rivers with outstanding scenic, recreational, geological, fish and wildlife, historical, or cultural values can be protected under the State Scenic Rivers Program or the National Wild and Scenic Rivers Program. The Chattooga River in Oconee County is the State's only National Wild and Scenic River and a five-mile stretch of the Middle Saluda River in Greenville County is the only State Scenic River. Portions of the Congaree, Little Pee Dee, and Ashley Rivers are eligible for inclusion in the State Scenic Rivers Program, and a portion of the lower Saluda River is under study. The inclusion of an eligible river in the State Scenic Rivers Program is primarily dependent on the voluntary granting of scenic easements by riparian landowners. This factor has probably limited the number of State Scenic Rivers.

Wetlands are important natural areas which help maintain water quality, modify flooding, and act as feeding, nesting, and nursery areas for fish and wildlife. Most wetland areas in South Carolina are in the Coastal Plain and an unknown quantity of these important areas are lost each year due to increased development. Some unique wetland areas have been identified and are protected under the South Carolina Wildlife and Marine Resources Department's Heritage Trust Program. However, the extent of wetland loss, the rate at which it is taking place, and the possible consequences to the State's ecology and economy are not known.

Water use in South Carolina is projected to increase substantially, reducing available supplies and increasing competition. Use of water conservation measures can save water; reduce water, energy, and treatment costs; and reduce water use conflicts. Numerous water saving devices and methods are now available for residential, municipal, agricultural, and industrial water uses.

While 213 communities in South Carolina have identified flood prone areas, 166 of these communities participate in the National Flood Insurance Program. The U.S. Geological Survey, U.S. Army Corps of Engineers, and the Federal Emergency Management Agency provide flood insurance studies to local communities. The Federal Emergency Management Agency monitors construction activities in flood plains to ensure local government compliance with Flood Damage Reduction Ordinances. Most flood related programs in South Carolina are run by Federal agencies and no comprehensive statewide flood-plain management program currently exists. The State government has severely limited authority over flood-plain management and other flood related matters and the need for increased State involvement has not been fully assessed.

Introduction

"On a major low country stream, three proposals are being considered at present.

(a) A municipality anticipates eventually using about one third the flow of a stream for domestic consumption.

(b) A proposed group irrigation project involving upwards of 35,000 acres would need to use a substantial portion of the streamflow.

(c) A farmer owning about 7,500 acres would also like to develop an irrigation program from the same stream.

There may be many other water users similarly situated above these. How can the needs of these interests best be met? By what legal means can each of them be assured a dependable water right to protect his supply? If there isn't enough for all, what rights, if any, are superior to others."

-The Beneficial Use of Water
in South Carolina, 1952

These words, written over thirty years ago (Busby, 1952) and based on an actual situation, could just as easily have been in yesterday's newspaper. The facts may be different, but the questions would be the same. What are our water rights in South Carolina? Can investors in our water resources be assured of an adequate yield for their investment? Who has priority of water use? Many other questions surely come to mind to the large water user. South Carolina is still operating under the same principles of water law that guided our decisions 30 years ago, and a hundred years before that.

You may be assured, however, that although our basic water laws have not changed, our water usage has. In 1955 South Carolina used about 950 million gallons of water per day (mgd). By 1980 the figure had grown six-fold to almost 5,800 mgd, earning the State the dubuous title of the "second fastest growing water use state in the Nation", second only to Florida (Viessman and Demoncada, 1980). During almost the same period (1960-1980), water consumption increased over 200 percent.

South Carolina is not running out of water. The State is faced, however, with the task of supplying rapidly increasing numbers of municipal, industrial, recreational, electric power, and agricultural water users with the required quantity and quality of water at the right time and right place. Moreover, this must be accomplished with an uncodified legal framework which originated under circumstances far different than today's acute demands on our natural resource base. The State can no longer afford to allow our unguided momentum to carry us into the future. Rather, South Carolina must have an established water resource policy and plan, based on current data and backed by adequate laws, to guide our progress through the upcoming decades.

This report represents the first of two phases in the development of a State Water Plan for South Carolina. Phase I is an inventory of South Carolina's water resources. Water quantity and quality, current uses, future demands, and problems and opportunities are assessed. Phase II will develop a State program to address known and potential problems and opportunities.

This report has five major sections. The first is a brief socio-economic and physical environmental overview of South Carolina. The second is a discussion of South Carolina's water law which points out specific problems and advantages in the State's current legal framework. The third is a statewide hydrologic overview addressing water availability and use within the State. The fourth is a detailed hydrologic description which analyzes the water supply and demand for each of the State's fifteen river sub-basins. The fifth section discusses special water resource topics including navigation, water conservation, hydropower production, aquatic weeds, water-based recreation, and scenic rivers.

Many regional and local water resource studies have been completed in South Carolina. Background studies have been completed by the South Carolina Water Resources Commission and the U.S. Department of Agriculture for the Ashley-Combahee-Edisto River Basin and Santee River Basin and both a background study and management plan have been developed for the Pee Dee River Basin. A comprehensive master water plan has been prepared for the Savannah River Basin by the U.S. Army Corps of Engineers. Water quality management plans have been developed for all major river basins by the South Carolina Department of Health and Environmental Control. Ground-water management plans have been developed and implemented by the South Carolina Water Resources Commission in Beaufort, Colleton, Jasper, Horry, and Georgetown Counties and a portion of Marion County. In addition, there have been many studies and plans addressing site-specific water resource concerns. However, a need existed to coalesce these many diverse and often independent studies to provide a better statewide perspective of South Carolina's water resources. This document attempts to meet that need. More specifically, this study attempts to increase the State's water resource management capabilities by:

- Assessing State water law.
- Assessing the surface- and ground-water resources of the State.
- Projecting future water resource use and demands.
- Identifying statewide and regional water resource problems and opportunities.

AUTHORITY

The South Carolina Water Resources Planning and Coordination Act of 1967 contains broad policies and goals with respect to water resource planning, development, and use. The General Assembly found in part:

> ...that it is in the interest of the public welfare that a coordinated, integrated state water resources policy be formulated and means provided for its enforcement, that plans and programs for the development and enlargement of the water resources of the State be devised and promoted and that other activities designed to encourage, promote, and secure the maximum beneficial use and control of such water resources be coordinated by a commission which, in carrying out its functions, shall give proper and adequate consideration to the multiple aspects of the beneficial use and control of such water resources with an impartiality of interest except that which is designed to best protect and promote the public welfare generally (Act 62, Section 2(b), 1967 Acts and Joint Resolutions).

The Act established the South Carolina Water Resources Commission and made that agency responsible for implementing the policies declared in the Act, including the development and coordination of State water policy. In addition, several other State agencies have statutory responsibilities in specific areas of State water policy, including the Department of Health and Environmental Control, the Coastal Council, the Land Resources Conservation Commission, and the Wildlife and Marine Resources Department. Other State and Federal agencies have interests in the State's water resources and have been consulted during the preparation of this document.

CONDUCT OF THE PROJECT

The State Water Assessment was prepared under the general guidance of the South Carolina Water Resources Commission, which is composed of 18 members. Ten of the members are appointed by the Governor for staggered three year terms: three members representing agriculture, three representing industry, three representing municipalities, and one representing saltwater interests. The remaining eight members of the Commission represent the executive offices of various State agencies and institutions: Department of Agriculture, Clemson University, Department of Health and Environmental Control, Department of Highways and Public Safety, Forestry Commission, Development Board, Land Resources Conservation Commission, and the Wildlife and Marine Resources Department.

A State Water Plan Policy Committee was appointed by the Commission to work more directly with the project staff to establish direction and resolve issues. The Committee was composed of four appointed Commissioners and a representative each from the Land Resources Conservation Commission and the Department of Health and Environmental Control. The project staff consisted of a project manager and of water resource professionals and technicians from the staff of the South Carolina Water Resources Commission.

Assisting the Policy Committee and the project staff was a Technical Advisory Committee composed of representatives from the following State and Federal agencies with interests in water resources planning and management:

S.C. Coastal Council
S.C. Wildlife and Marine Resources Department
S.C. Department of Health and Environmental Control
S.C. Land Resources Conservation Commission
Governor's Office
State Development Board
State Forestry Commission
Clarks-Hill Russell Authority
S.C. Department of Agriculture
U.S. Geological Survey
U.S. Army Corps of Engineers
Soil Conservation Service
U.S. Fish and Wildlife

while the Lower Coastal Plain lies between the Surry escarpment and the present coastline (Fig. 5). These latter two regions exhibit moderate to low relief and are marked by several terraces (Brandywine, Coharie, Sunderland, Wicomio, Penholoway, Talbot, Pamlico, and Recent), each representing former sea levels (Cooke, 1936).

Metamorphic and igneous rocks similar in type and age to those in the Blue Ridge and Piedmont underlie the sediments of the Coastal Plain as an irregular surface that dips to the south and southeast (Fig. 7). These rocks include granite, diorite, chlorite, hornblende schist, quartz-feldspar gneiss, and hornblende gneiss of Pre-cambrian to Permian age. Subsurface data indicate several major structural features of the basement rock, the most prominent of which is the Cape Fear Arch. This structure is a southeastward plunging basement anticline with an axis roughly paralleling the North Carolina-South Carolina border and intersecting the North Carolina coast at Cape Fear. Buried saprolite of variable thickness separates the crystalline rock from the overlying sedimentary rocks throughout the Coastal Plain. The saprolite layer in the southwestern portion of the Coastal Plain ranges from 40 to 80 feet thick. Several troughs composed of Triassic sediments have been identified in the crystalline bedrock beneath Coastal Plain sediments. One trough, the Dunbarton Basin, is located beneath the Savannah River Plant in Aiken and Barnwell Counties (Siple, 1967; Marine and Siple, 1974). The sediments in this basin consist of clastic red siltstone, sandstone, and some limestone pebbles and are overlain by Coastal Plain deposits (Fig. 7).

Coastal Plain deposits consist of consolidated and unconsolidated sediments of alluvial and marine origin which thicken from a few feet at the Fall Line to over 4,000 feet at the coast near Beaufort (Fig. 8 and Table 7).

Three formations of late Cretaceous age are recognized over a large part of the Coastal Plain--the Middendorf*, Black Creek, and Peedee Formations.

The Black Creek Formation is composed of two members, the upper Snow Hill Marl member and the lower member which has not been named. The Snow Hill Marl is composed of light gray sand interbedded with dark gray marine clays and some green sands. The lower member is composed of dark gray to black laminated clays with white to gray phosphatic, lignitic, and glauconitic sand. The formation is exposed along Black Creek a few miles above Darlington. Elsewhere in the northwestern Coastal Plain the formation lies buried beneath thin (1 to 30 feet) deposits of Pleistocene age. The Black Creek Formation near Sumter occurs between the elevations of approximately 50 feet above mean sea level to 200 feet below mean sea level. In Orangeburg, the Black Creek Formation lies between approximately 300 to 550 feet below mean sea level. Its maximum thickness elsewhere ranges from about 600 to 800 feet. The formation dips generally to the southeast (Fig. 7).

The Peedee Formation is the youngest of the Upper Cretaceous formations in South Carolina. This formation crops out in Florence, Williamsburg, Horry, and Georgetown Counties with the best exposures along the Pee Dee River. The Peedee Formation consists of dark gray clay interbedded with fine to medium micaceous and glauconitic sand and streaks of hard shelly limestone and siltstone. The top of the formation ranges from about 100 feet below mean sea level in the Orangeburg area to more than 1,600 feet below mean sea level in Beaufort County. The thickness of the formation ranges from a few feet near the updip limit to 600 feet in the Beaufort area. In the Charleston area, data indicate that the thickness is 500 to 700 feet.

Due to limited available data, the Ellenton Formation is of uncertain age and geographical extent. When first described in 1967, this formation was thought to be of Late Cretaceous age based on its stratigraphic position (Siple, 1967a). Subsequent investigations indicate that this formation is possibly of Early Paleocene age, equivolent to deposits of Midway age extending from Aiken County to the coast (David Prowell, U.S. Geological Survey, Atlanta, Georgia, personal communications, February 1983). The Ellenton Formation consists of dark gray to black mica-

* In previous reports of the S.C. Water Resources Commission, the name Tuscaloosa was preferred over that of the Middendorf, principally because the former was the more widely recognized and accepted name and because of inconsistent assumptions offered in support of the latter. However, the type section of the Middendorf Formation located in Chesterfield County, South Carolina does not include lithic units typical of the Tuscaloosa Formation in the southern and western parts of the southeastern Coastal Plain, including in part the Hamburg beds of Sloan (1904, 1908). Therefore, the authors of this report recognize the Middendorf as a distinct formation similar to, but different from, the more widespread Tuscaloosa Formation. Formations and aquifer systems in South Carolina identified as the Tuscaloosa in earlier reports are synonymous to the Middendorf as used in this report. In addition, in down-dip areas near the coast, deposits older than Middendorf (i.e. Early and Late Cretaceous age) are included in the Middendorf for purposes of ground-water analysis.

The Middendorf Formation is composed of light-colored crossbedded kaolinitic sands with lenses of white, tan, red, and purple kaolinitic clays exposed at the surface in South Carolina in Marlboro, Chesterfield, northern Darlington, northern Lee, Kershaw, western Sumter, Richland, northern Calhoun, eastern Lexington, and northern Aiken Counties. The thickness of the Middendorf Formation ranges from a few feet at the Fall Line to 1,500 feet in Beaufort County. The top of the unit occurs at a depth of about 50 to 100 feet below land surface in the northern part of the Coastal Plain to 2,500 feet below land surface in Beaufort County. This indicates a coastward dip and general thickening of the sediments from northwest to southeast across the Coastal Plain.

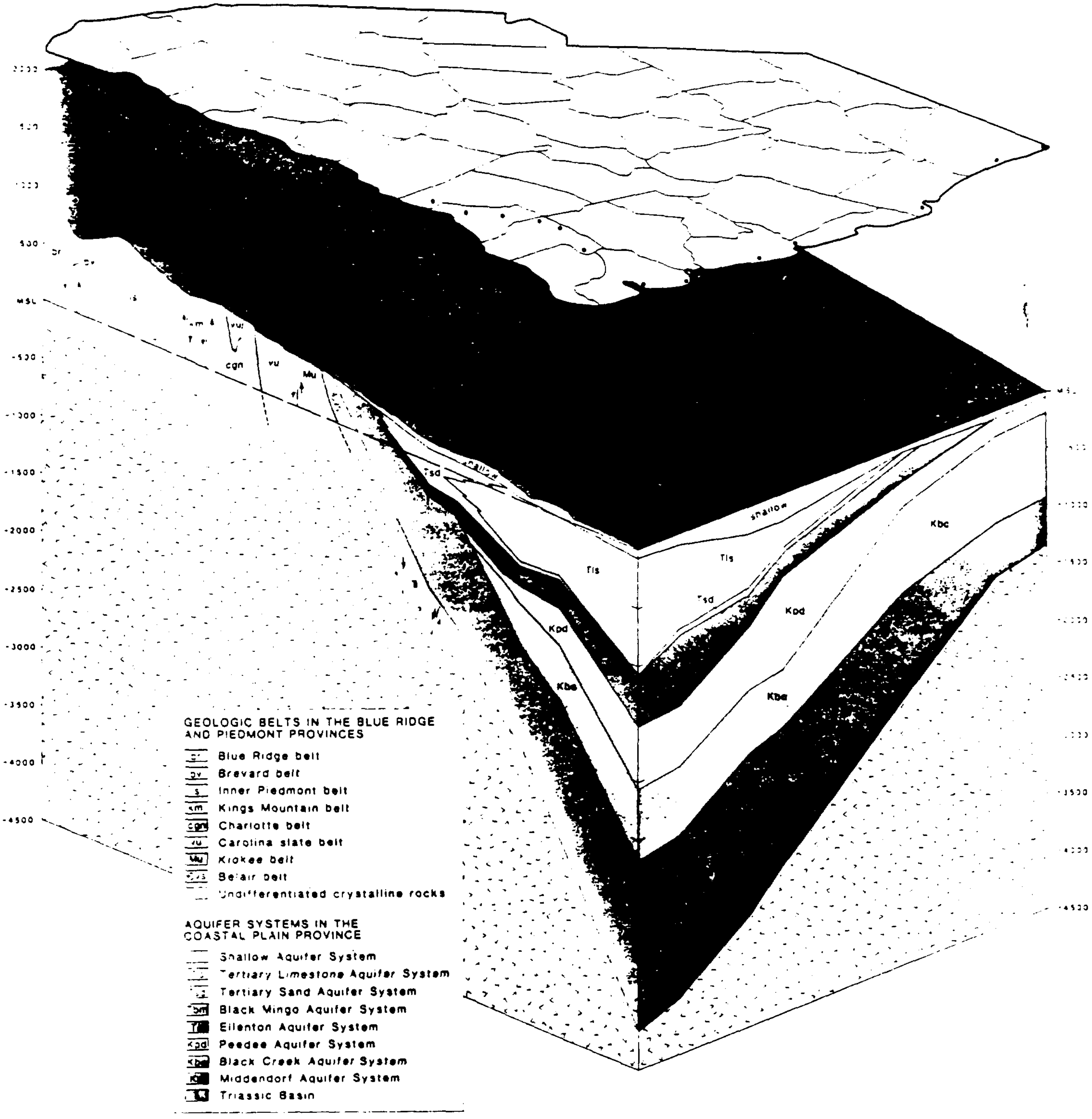

Figure 7.
Generalized structure of formational units and aquifer systems in South Carolina.

Table 7.

Description of geologic formations in the Coastal Plain.

SYSTEM	SERIES	GROUP	FORMATION	DESCRIPTION OF FORMATION	AQUIFER SYSTEM NAME	DESCRIPTION OF AQUIFER POTENTIAL AND WATER CHARACTERISTICS
Quaternary	Recent		Recent	Light-gray and tan fine to coarse lenticular sand and interbedded clay of marine and continental origin.	Shallow Aquifer System (in Lower Coastal Plain)	Water occurs primarily under water-table conditions and semi-confined conditions locally of minor importance as an aquifer. Water may be high in iron, sulfate, or nitrate, but is generally soft. High yields from river terrace deposits may be developed. Usually this unit supplies ground water to shallow (<100 feet) drilled and dug wells primarily in rural areas for domestic use. Minor to limited ground-water source.
Quaternary	Pleistocene		Pamlico Talbot Penholoway Wicomico Sunderland Coharie Brandywine	Light-gray, tan, orange, red and black clay, interbedded with sand and gravel. Deposits form a thin cover over a large portion of the Coastal Plain.	Shallow Aquifer System (in Lower Coastal Plain)	
Tertiary	Pliocene		Waccamaw	Blue-gray to yellow and brown sandy shell marl and fine sand.	Shallow Aquifer System (in Lower Coastal Plain)	Supplies ground water to shallow (less than 100 ft.) wells for domestic use in the rural areas in the northeastern part of the State. Poor to minor ground-water source.
Tertiary	Pliocene		Duplin Marl*	Buff sandy, friable shell marl occurring in isolated patches in lower half of Coastal Plain.	Shallow Aquifer System (in Lower Coastal Plain)	Minor ground-water source because of its limited extent and thickness. Water is moderately hard and may be high in iron.
Tertiary	Miocene		Hawthorne	Hard brittle shale resembling silicified fuller's earth, with fine sandy phosphatic marl and soft limestone.	Shallow Aquifer System (in Lower Coastal Plain)	Because of its low permeability is not considered a major aquifer. However, it does provide sufficient water for domestic purposes and for limited industrial use. Water is hard. Minor ground-water source.
Tertiary	Oligocene		Cooper	Light-brown to grayish-green phosphatic marl, heavily microfossiliferous, with fine grained sand. Basal part may be Jackson in age.	Shallow Aquifer System (in Lower Coastal Plain)	Principally a confining bed. The lower section acts as a poor aquifer in the southeastern part of the State. Water is quite hard and high in iron low in fluoride. Minor ground-water source
Tertiary	Eocene	Jackson	Barnwell	The Barnwell consists typically of deep-red to brown fine to coarse massive sandy clay and clayey sand. It appears to represent a residuum derived from solution of a sandy limestone.	Tertiary Sand Aquifer System	Does not yield large quantities of water. Can be used for domestic needs where the sand is sufficiently coarse and free from silt and clay. Water is soft. Minor ground-water source.
Tertiary	Eocene	Claiborne (Upper)	Castle Hayne Limestone	Buff-grey tough or crumbly fossiliferous limestone underlain by soft fine-grained granular limestone. Equivalent in down-dip areas to the Ocala Formation in extreme southern S.C., along with Georgia and Florida.	Tertiary Limestone Aquifer System	A major source of water in Beaufort and Jasper Counties. Yields of 500 to 2000 gpm. Water is moderately hard, low in iron and chloride. Water from lower part of of aquifer may be high in chloride.
Tertiary	Eocene	Claiborne (Middle)	McBean	The McBean Formation consists of fine to medium grained massive greenish-yellow and red quartz sand, green glauconitic marl, silicified beds of coquina, and clayey sand interbedded with red, brown, ochre, and yellow clay laminae. Littoral to neritic environment gradational with some estuarine or continental.	Tertiary Sand Aquifer System (Tertiary Limestone Aquifer System)	The beds of sands and limestone in the lower part in Aiken and Barnwell Counties are fairly permeable and yield moderate quantities of water to industrial and municipal wells. Water is soft but may be high in iron content. Moderate to major ground-water source.
Tertiary	Eocene	Claiborne (Middle)	Santee Limestone	The Santee limestone is a nearly pure white to creamy-yellow fossiliferous and partly glauconitic limestone containing numerous Bryozoa.	Tertiary Limestone Aquifer System	In the southeastern part of the State yields 500 gpm in eastern Colleton County to 2000 gpm in western Hampton, Jasper, and western Beaufort Counties. Water is moderately hard to hard with pH 7.1-7.9; salt water intrusion is thought to be occurring at places near the coast. Major ground-water source.
Tertiary	Eocene	Claiborne (Middle)	Warley Hill Marl	Fine green to yellow glauconitic sand overlain by yellow to reddish-yellow sandy clay	Tertiary Sand Aquifer System	Minor to poor ground-water source because of its small extent and low permeability.
Tertiary	Eocene	Claiborne (Lower)	Congaree	Well to poorly sorted sand, fuller's earth, brittle siltstone, and light-gray to green shale alternating with thin-bedded fine-grained sandstone.	Tertiary Sand Aquifer System	The Congaree is the basal, and most productive unit of the Orangeburg Group (including the Barnwell, McBean, and Wharly Hill formations, northwest of the Citronelle Scarp). Yields range from 100 to 600 gpm, and the water is generally soft high in iron, low in fluoride with a pH between [illegible] and 7.9
Tertiary	Eocene	Wilcox	Black Mingo	Partly indurated fine white to yellow sand and sugary sandstone or bioclastic limestone. Cement is white and calcareous to siliceous. Underlain by gray to black laminated shales containing numerous macro-fossils in some areas. Basal beds may be Midway in age.	Black Mingo	Yields are uncertain, but some permeable layers may produce up to 200 gpm in Clarendon, Williamsburg and Berkeley Counties. Mainly a confining bed. Water is moderately to very hard and low in iron, chloride, fluoride and the pH is 7.3 to [illegible] Limited to minor ground-water source.
Tertiary	Paleocene	Midway	Ellenton	Dark-gray to black sandy lignitic micaceous clay containing disseminated crystals of gypsum. Medium to coarse sand and gravel.	Ellenton	Geographic distribution not fully mapped. Known to occur from Savannah to Edisto basins and southeast Allendale County. Water is generally high in sulfate and iron. Moderate to major ground-water source.
Cretaceous	Upper Cretaceous	Navarro	Peedee	Dark-green to gray micaceous, glauconitic, argillaceous sand interbedded with impure limestones and massive dark clays. Deposited under open marine conditions probably at depths of not less than 100 fathoms.	Peedee	Several hundred gpm have been reported around the City of Orangeburg. In the Low Country, yields up to 300 gpm have been reported. Water is generally soft, but high in iron and sulfate. Limited to moderate ground-water source.
Cretaceous	Upper Cretaceous	Taylor	Black Creek: Snow Hill Marl	Light-gray sand and dark clays interbedded with green sand and marine clay. Transitional zone between the deeper marine Peedee Formation and the more shallow marine Black Creek deposits.	Black Creek	This is a major aquifer of public and industrial supply within Orangeburg, Florence, eastern Marion, Clarendon, Williamsburg, Horry, and Georgetown Counties. Yields range from 400 to 1100 gpm. Water is soft with an excess of iron. Excessive fluoride is present in the coastal region. Excessive chlorides are present in the lower part of the Black Creek Aquifer System, along the coast. Major ground-water source.
Cretaceous	Upper Cretaceous	Austin	Black Creek: Unnamed	Dark-gray to black laminated lignitic clays interbedded with white to gray phosphatic, glauconitic sand. Deposited in shallow marine estuarine, and paludal environment.	Black Creek	
Cretaceous	Upper Cretaceous	Eagleford to Woodbine	Middendorf (Tuscaloosa)	Gray, buff and red arcosic cross-bedded sand and gravel, interbedded with lenses of white and purple clay and kaolin. Mixed continental and marine environment characterized by fluvial, deltaic, and littoral deposits.	Middendorf (Tuscaloosa)	A potential source of large quantities of water in the coastal plain. The permeability is relatively high and yields up to 3400 gpm can be obtained from individual wells. Water is soft and low in total solids in Aiken, Barnwell, Richland, Sumter, Florence, Marion, and Dillon Counties. In the Low Country area it is covered by 2000 to 2600 ft. of younger formations. The water is higher in total dissolved solids near the Coast, more than 1000 mg/L, and fluoride, more than 4.0 mg/L. In the Coastal regions of the State the water becomes excessively salty. Extensive major aquifer.

* Previously considered as Miocene in age.

Combahee-Coosawhatchie River Sub-basin

GENERAL OVERVIEW

The Combahee-Coosawhatchie River Sub-basin is located in the southern Coastal Plain region of the State. The sub-basin extends approximately 95 miles inland from the Atlantic Ocean and includes all of Beaufort County and portions of Aiken, Allendale, Bamberg, Barnwell, Colleton, Hampton, and Jasper Counties (Fig. 129). The areal extent of the basin is approximately 3,270 square miles, 10.5 percent of State land area.

Population

The 1980 population of the sub-basin was estimated at 139,400, 4.5 percent of the State's total population (Table 119). By the year 2020 the sub-basin population is expected to reach 233,400, an increase of 67.4 percent. The highest rate of population growth during this time period is anticipated for Beaufort County, with a projected increase of 97 percent.

In general, this is a rural area with the exception of Beaufort County which is more urbanized and contains the affluent retirement and resort community of Hilton Head Island.

The major centers of 1980 population in the sub-basin were Hilton Head Island (11,344), Beaufort (8,651), Walterboro (5,914), Barnwell (5,556), Laurel Bay (5,238), Allendale (4,362), Denmark (4,138), Bamberg (3,633), and Hampton (3,086).

Economy

The counties in the region had an average median family income of $12,484 in 1980, which was $4,000 lower than the State average. The per capita income of the region in 1979 ranged from $8,720 in Beaufort County which ranked first among the State's 46 counties, to $4,543 in Allendale County, which ranked 45th. None of the remaining sub-basin counties had a per capita income as high as the State average.

During 1979, the annual average employment of non-agricultural wage and salary workers in the sub-basin totaled 50,500. The percentage breakdown by type of employment was: manufacturing, 27 percent; government, 23 percent; wholesale and retail trade, 19 percent; services and mining, 16 percent; construction, 7 percent; finance, insurance, and real estate, 5 percent; and transportation and public utilities, 4 percent.

In the sectors of manufacturing, mining, and public utilities, the sub-basin counties had a relatively low annual product value of $632 million during fiscal year 1978-79, which was 2.9 percent of the State total.

Agricultural productivity is not as pronounced in this portion of the State. Only Hampton County ranked in the top one-third of South Carolina counties for cash crop receipts from farm marketing in 1979, with a total value of almost $16 million. Of the remaining sub-basin counties, all but Jasper ranked in the top 50 percent of cash crop receipts.

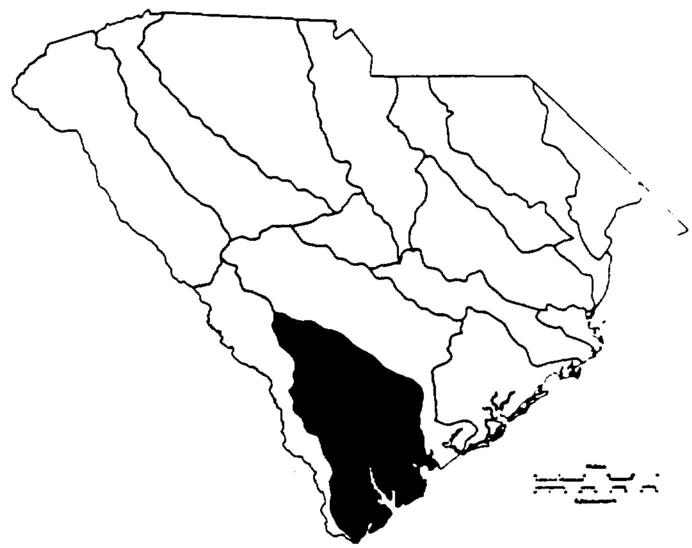

Figure 129.
Location of the Combahee-Coosawhatchie River Sub-basin in South Carolina.

Table 120.
Selected streamflow characteristics at U.S. Geological Survey gaging stations in the Combahee-Coosawhatchie River Sub-basin, South Carolina.

Gaging Station		*Drainage Area*	*Period of Record*		*Average Flow*			*7Q10*[b]	
Number	*Name/Location*	*(mi²)*	*Dates*	*Total Years*	*cfs*	*cfs/mi²*	*90%*[a] *cfs*	*cfs*	*cfs/mi²*
1755	Salkehatchie River near Miley	341	Feb 1951-Present	29	356	1.04	95	33	0.10
1765	Coosawhatchie River near Hampton	203	Feb 1951-Present	29	189	0.93	3.7	0.03	0.0001
1768.75	Great Swamp near Ridgeland	48.8	Oct 1977-Present	3	42.8	0.88	*[e]	*	*

[a] Flow equaled or exceeded 90 percent of the time
[b] Seven day low flow with a 10 year recurrence interval
[c] Minimum daily flow for period of record
[d] Instantaneous maximum flow for period of record
[e] * Indicates statistic not calculated

of 600 acres and a volume of 3,600 acre-feet. These and all other lakes larger than 200 acres are presented in Table 121. The total surface area of all lakes larger than ten acres is about 7,000 acres and total volume is approximately 29,000 acre-feet.

Currently, no hydroelectric power sites exist in the sub-basin and no potential sites have been identified.

The U.S. Army Corps of Engineers has been involved in numerous navigation projects within the sub-basin (Table 122). These projects were concentrated primarily in coastal waters; however, none are currently active.

The Willow Swamp region of Colleton and Bamberg Counties is the site of the only completed Soil Conservation Service flood control project within the sub-basin. It includes 37.1 miles of channel improvement. The Upper New River of Beaufort and Jasper Counties is the site of construction which will include 28 miles of channel improvement. These projects and other problem areas are presented in Table 123 and Figure 132.

Water Quality

The major portion of freshwaters in this sub-basin have Class A water use designations, suitable for primary contact recreation (Fig. 133). All other freshwater bodies are designated Class B. Coastal waters are primarily designated Class SA, indicating saltwaters suitable for harvesting of clams, mussels, and oysters for human consumption. All other tidal waters in this sub-basin are designated Class SB. Water quality limited segments which require advanced treatment of wastewater discharges include all or part of the Coosawhatchie River, Black Creek, Lemon Creek, Buckhead Creek, Inland Creek, Great Swamp and several minor tributary streams (Fig. 134). Water quality in the Combahee-Coosawhatchie Sub-basin is generally adequate for most designated water use activities. However, due to natural conditions, such as drainage from extensive swamplands, high summer water temperatures, and slow moving waters, water bodies throughout this sub-basin experience chronic low dissolved oxygen concentrations.

The Coosawhatchie River exhibits generally satisfactory conditions with lower water quality during portions of the year (S.C. Department of Health and Environmental Control, 1980b). Water quality problems in this river include high mercury and fecal coliform bacteria concentrations and low dissolved oxygen levels. While the source of mercury contamination is unknown, dissolved oxygen and fecal coliform bacteria problems are attributed to natural conditions and/or non-point source pollution. Contraventions of State dissolved oxygen standards in this river often occur during the summer months (U.S. Geological Survey, 1979, 1980, 1981; S.C. Department of Health and Environmental Control, 1980b). A fish kill in July 1980 of about 1,200 eel, bream, and catfish was attributed to low dissolved oxygen concentrations in this river (S.C. Department of Health and Environmental Control, unpublished fish kill records).

The Salkehatchie River has in the past experienced depressed dissolved oxygen levels and elevated fecal coliform bacteria concentrations (S.C. Department of Health and Environmental Control, 1975c). These water quality problems were attributed primarily to non-point sources and some municipal point source discharges. Current assessments, however, indicate that this river has generally good water quality and has exhibited a slight improvement in dissolved oxygen levels during recent years (S.C. Department of Health and Environmental Control, 1980b).

Chemical and physical water quality parameters indicate that water quality in the tidally influenced coastal waters is satisfactory with decreased quality during portions of the year. Problem conditions include high concentrations of metals and fecal coliform bacteria and low dissolved oxygen values. These problem conditions have been attributed primarily to natural conditions and non-point source runoff. Biological data from these coastal waters indicate fair to good conditions with no noticeable trends (S.C. Department of Health and Environmental Control, 1980b). High concentrations of fecal coliform bacteria levels have resulted in the closing of shellfish grounds in waters near Beaufort, Hilton Head Island, and Turtle Island (Fig. 134).

Table 123.
Flood control projects in the Combahee-Coosawhatchie River Sub-basin. South Carolina.

Map No.	*Project/Watershed Name*	*County*	*Responsible Agency*[a]	*Status*
13	Willow Swamp	Colleton/Bamberg	SCS	Completed 1974
14	Upper New River	Beaufort/Jasper	SCS	Under construction
15	Sanders Branch/ Crooked Creek	Hampton	SCS	Terminated
16	Sheldon Watershed	Beaufort	SCS	Terminated
17	Ehrhardt	Bamberg	SCS	Identified problem area
18	North Hilton Head	Beaufort	SCS	Identified problem area

[a] SCS indicates Soil Conservation Service

Sources: U.S. Department of Agriculture. 1980. 1983
U.S. Army Corps of Engineers. 1982c

occurs at a depth of 830 feet in Colleton County and about 1,500 feet near Beaufort. The aquifer is about 300 and 500 feet thick, respectively. Fine grained sediments, such as clay or clayey limestone within the Peedee, function more as confining beds than as aquifers and probably contain mineralized water in coastal Beaufort and southern Colleton and Jasper Counties. The occurrence of freshwater in the Peedee Aquifer System was reported in a well in northern Beaufort County (Siple, 1960). This well has been subsequently filled in and duplicate analyses of freshwater from the Peedee Aquifer have not been obtained.

The top of the Black Mingo Aquifer System in Hampton and Colleton Counties occurs at a depth of approximately 600 feet, and in Beaufort County at depths of 860 to 1,100 feet. The thickness of sediments is about 400 feet. Wells thought to be screened in the Black Creek or Ellenton Aquifer Systems have natural flows of 50 to 250 gpm of good quality water in Hampton and Colleton Counties. In Beaufort and Jasper Counties, the water-bearing properties of the Black Mingo System are not known.

The Tertiary Limestone Aquifer System is the main source of ground water in the sub-basin. More than 4,000 wells approximately 50 to 250 feet deep tap this aquifer system and provide over 80 percent of the ground water used in this area. The thickness of the Tertiary Limestone Aquifer System ranges from 400 feet in Hampton and Colleton Counties to more than 900 feet in Beaufort County, and probably more than 1,000 feet in southern Jasper County.

The Tertiary Limestone Aquifer System in the southern coastal counties was differentiated by Hayes (1979) into two permeable zones, the Upper Unit and the Lower Unit, separated by a zone of low permeability. The Lower Unit is about 30 feet thick in Beaufort and Colleton Counties. In Jasper County, the thickness and water bearing characteristics of the Lower Unit are unknown. The transmissivity of the Lower Unit in northern Colleton and Hampton Counties is estimated to range from 500 to 5,000 ft^2/day. Wells drilled into the Lower Unit are usually open to the Upper Unit. The Upper Unit of the Tertiary Limestone Aquifer System is the major source of ground water in the sub-basin. Wells which tap this unit range from 50 feet deep in the vicinity of Beaufort to more than 200 feet deep in Jasper County. The hydraulic properties of this unit vary considerably. The permeability of the aquifer system as a whole decreases from southwest (Jasper County) to the northeast (southern Colleton County) where the Upper Unit is absent.

The large volume of water pumped from the Tertiary Limestone Aquifer System by the City of Savannah has lowered water levels in the aquifer from the original potentiometric surface of 10 to 35 feet above mean sea level in 1880, to approximately 150 feet below mean sea level in 1980. The decline of water levels has changed or reversed the original direction of ground-water movement from a direction toward Port Royal Sound to one toward the center of pumpage at Savannah. Continued dewatering of the Tertiary Limestone Aquifer System will affect the area near the cone of depression, centered at Savannah, by causing compaction of overlying confining beds and possibly land-surface collapse.

The Shallow Aquifer System (Hawthorne, Duplin, and Pleistocene sediments) occurs discontinuously throughout the sub-basin. Wells less than 25 feet to about 100 feet deep tap these sediments. The hydrologic characteristics of the Shallow Aquifer System are unknown; however, this system is an important source for domestic water supplies in coastal areas.

Water Quality

In general, water quality from all aquifer systems in the northern extremes of the sub-basin is good and suitable for most uses. However, as these systems down dip toward the coast, water quality generally deteriorates. High water temperatures, chlorides, and dissolved solids in the deep-lying Middendorf and Black Creek Aquifer Systems make these systems undesirable sources of ground water in the southern portion of the sub-basin. Brackish water in the Peedee Aquifer System also discourages use of this ground-water source. The Black Mingo Aquifer System exhibits occasional high iron concentrations which affect the taste and use of this water in some areas of the sub-basin.

The most utilized aquifer system in the sub-basin is the Tertiary Limestone Aquifer System. The concentration of major chemical constituents varies among wells. Hardness is usually below 140 mg/L, total dissolved solids below 200 mg/L, and pH ranges from 7.5 to 8. Chloride concen-

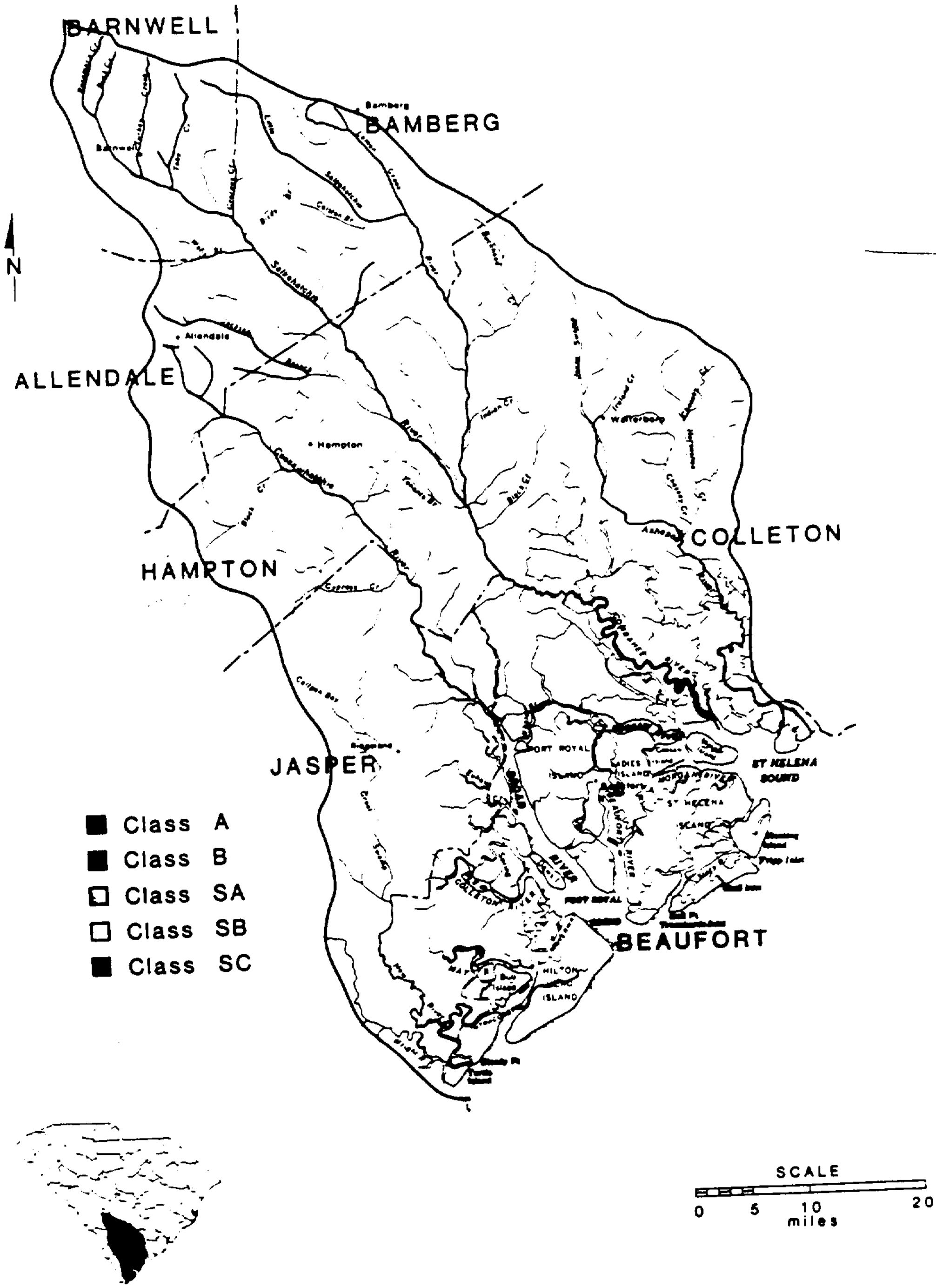

Figure 133.
Surface-water quality classifications in the Combahee-Coosawhatchie River Sub-basin, South Carolina (S. C. Department of Health and Environmental Control, 1980a).

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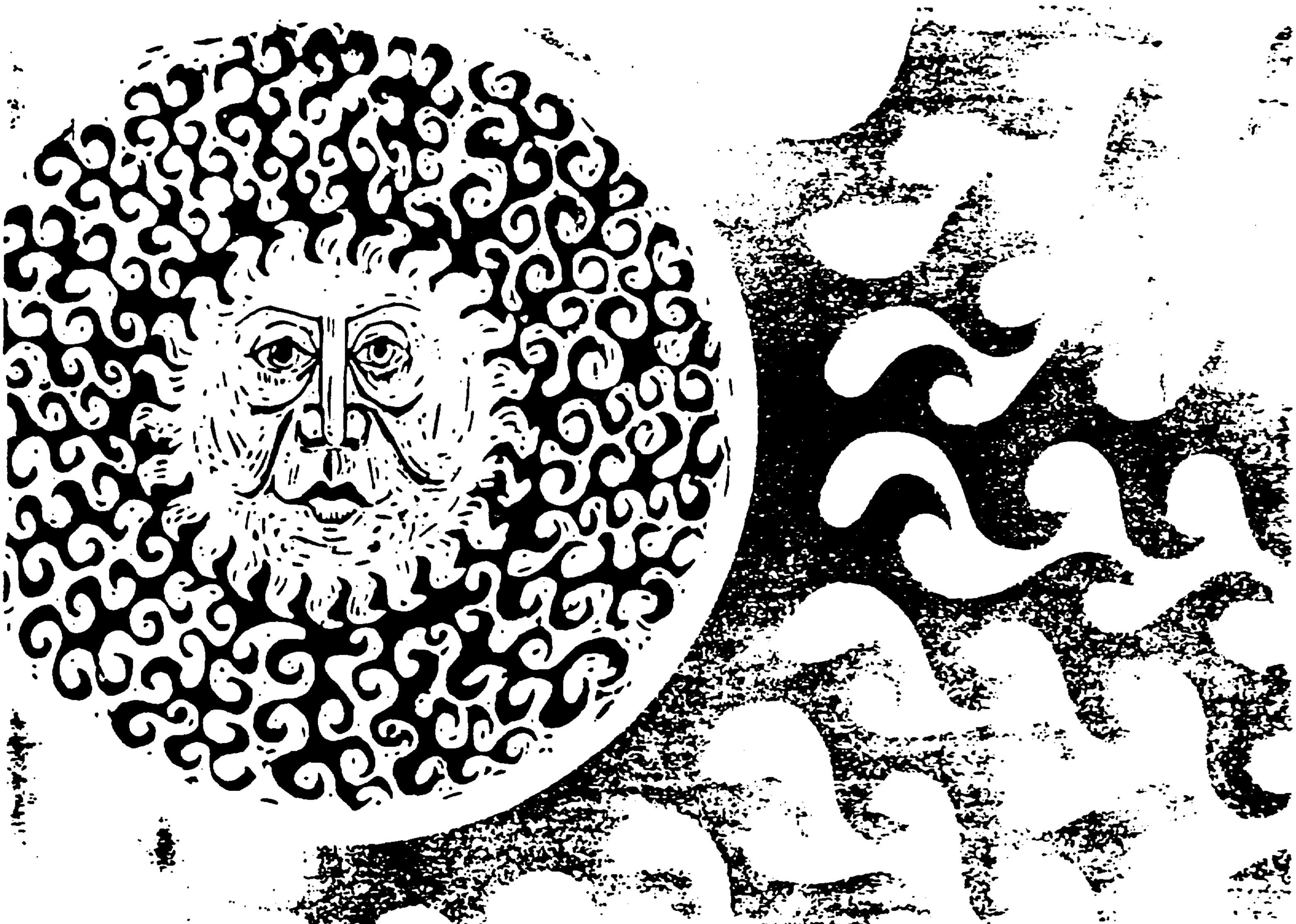


LIMATIC ATLAS OF THE UNITED STATES

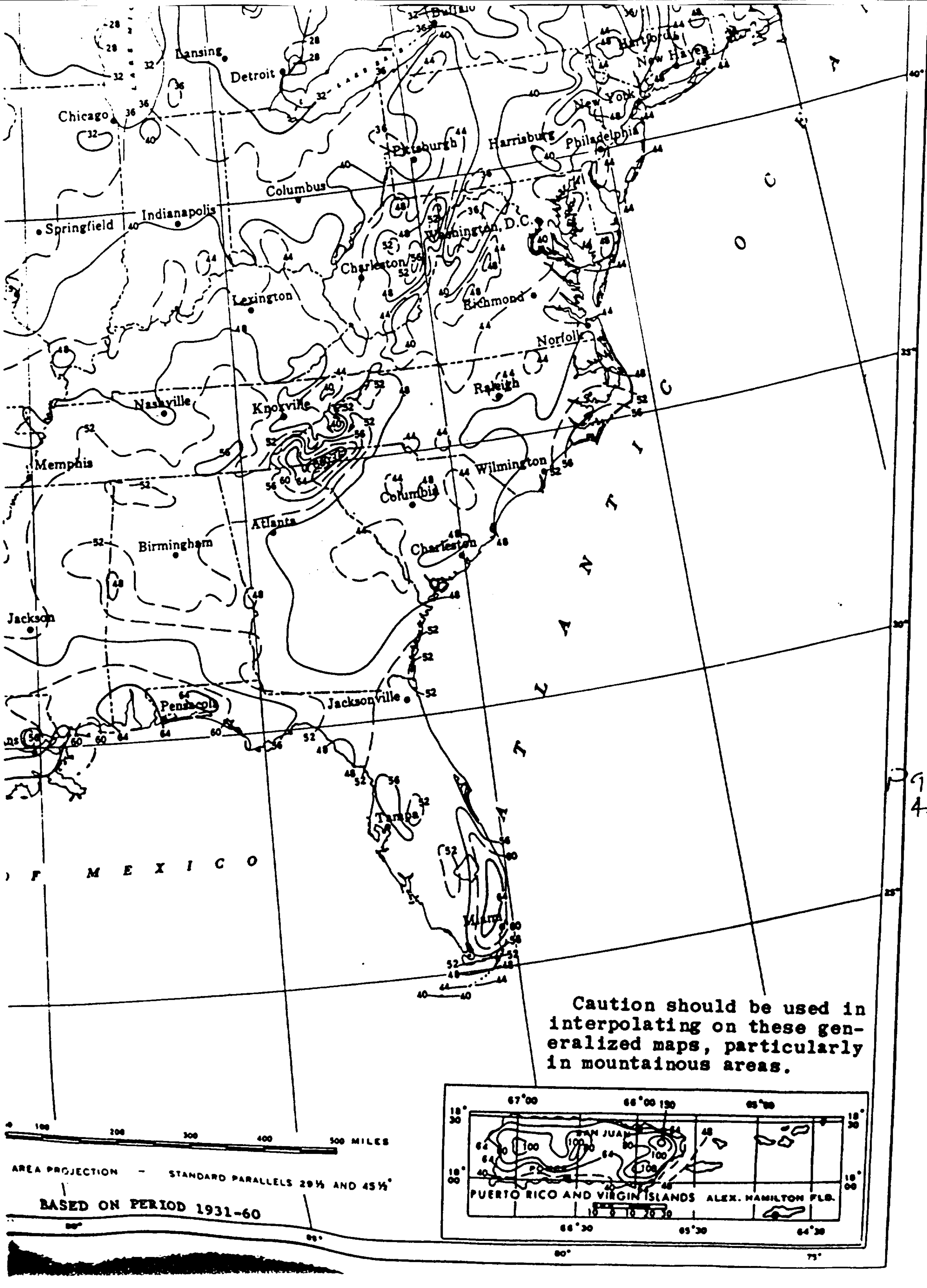
U.S. DEPARTMENT OF COMMI
C. R. Smith, Secretary

ENVIRONMENTAL SCIENCE SERVICES ADMII
Robert M. White, Administrator

ENVIRONMENTAL DATA SERVICE
Woodrow C. Jacobs, Director

JUNE 1968

REPRINTED BY THE
NATIONAL OCEANIC AND ATMOSPHERIC ADM
1983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Lexington
Richmond
Norfolk
Raleigh
Nashville
Knoxville
Memphis
Wilmington
Columbia
Atlanta
Birmingham
Charleston
Jackson
Jacksonville
Pensacola
Tampa
Miami
O C E A N
A T L A N T I C
F M E X I C O
Caution should be used in interpolating on these generalized maps, particularly in mountainous areas.
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AREA PROJECTION - STANDARD PARALLELS 29½ AND 45½°
BASED ON PERIOD 1931-60
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PONCE
PUERTO RICO AND VIRGIN ISLANDS
ALEX. HAMILTON FLD.
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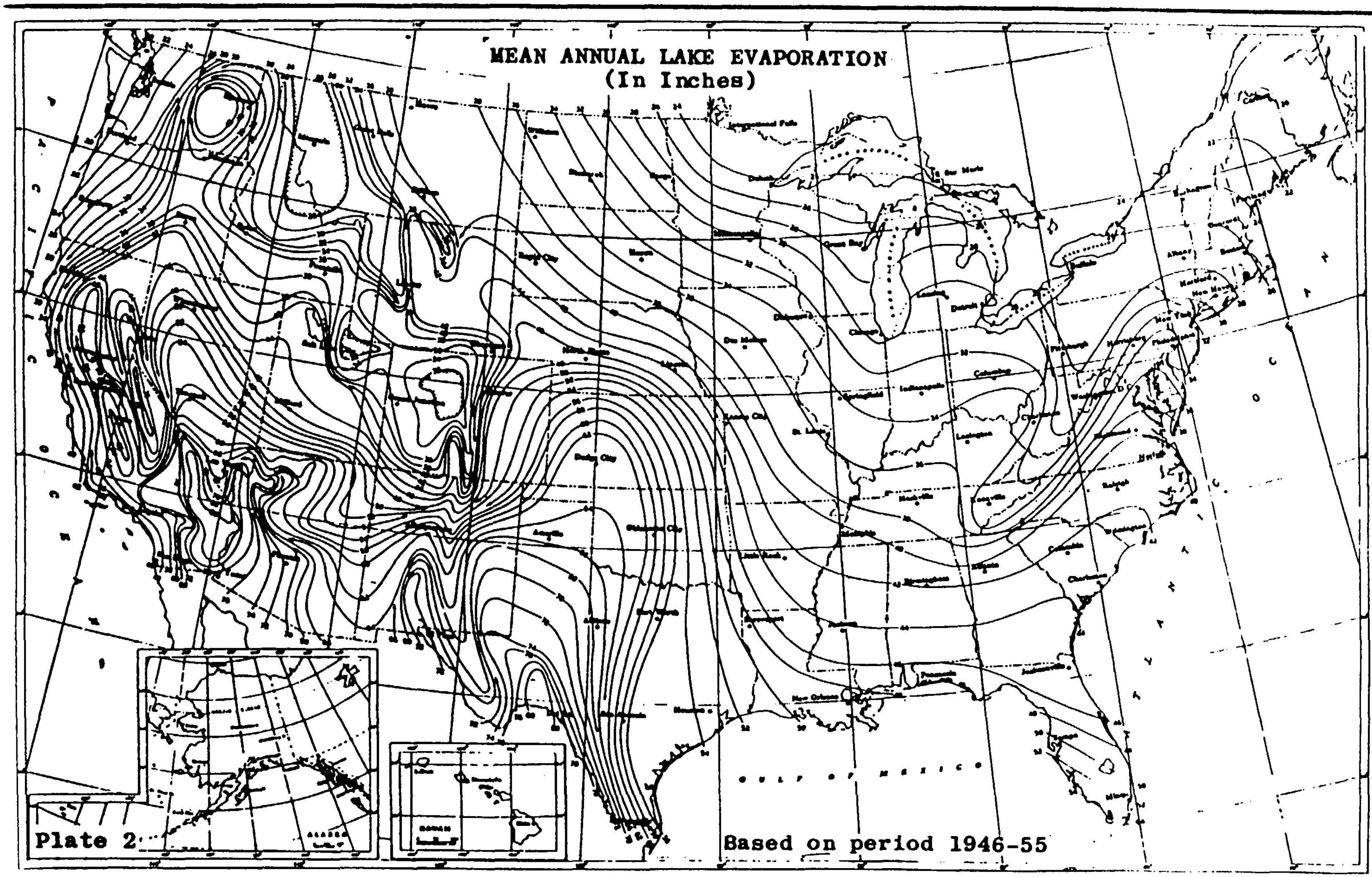

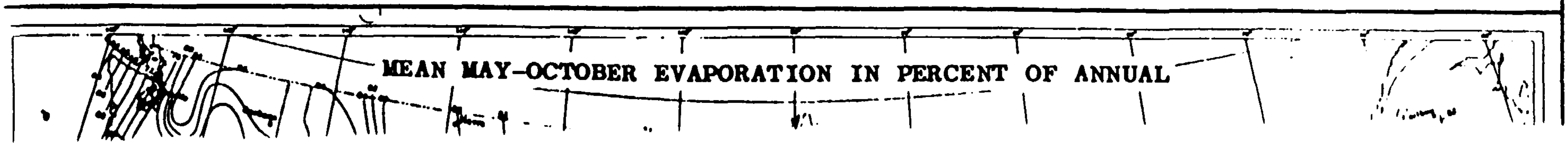

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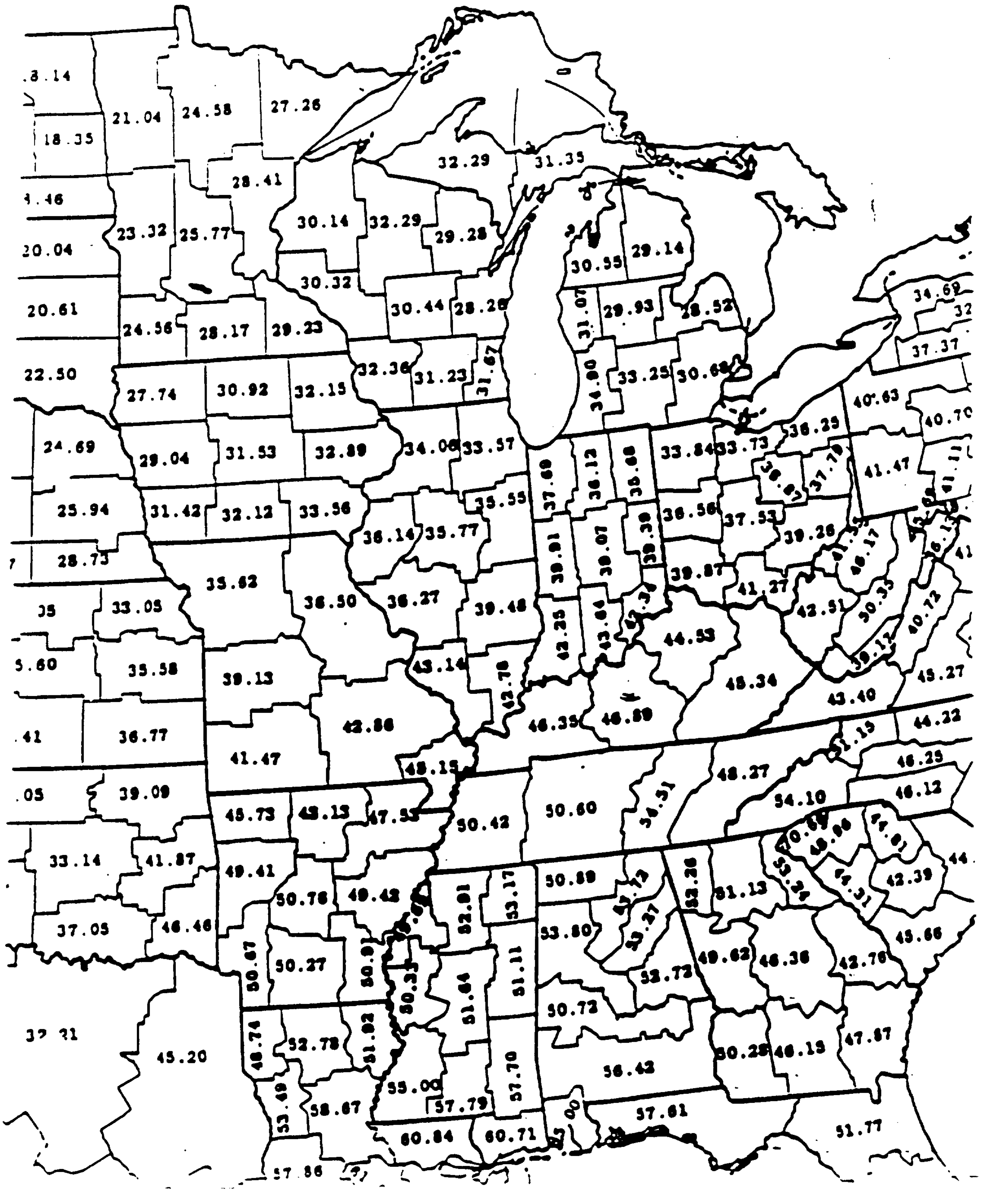

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WEATHER BUREAU
U.W. Reichelderfer, Chief

REFERENCE 14

TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

Prepared by
DAVID M. HERSHFIELD
Cooperative Studies Section, Hydrologic Services Division
for
Engineering Division, Soil Conservation Service
U.S. Department of Agriculture

REFERENCE 14

DEPARTMENT OF COMMERCE
[illegible] H. Hodges, Secretary

WEATHER BUREAU
F. W. Reichelderfer, Chief

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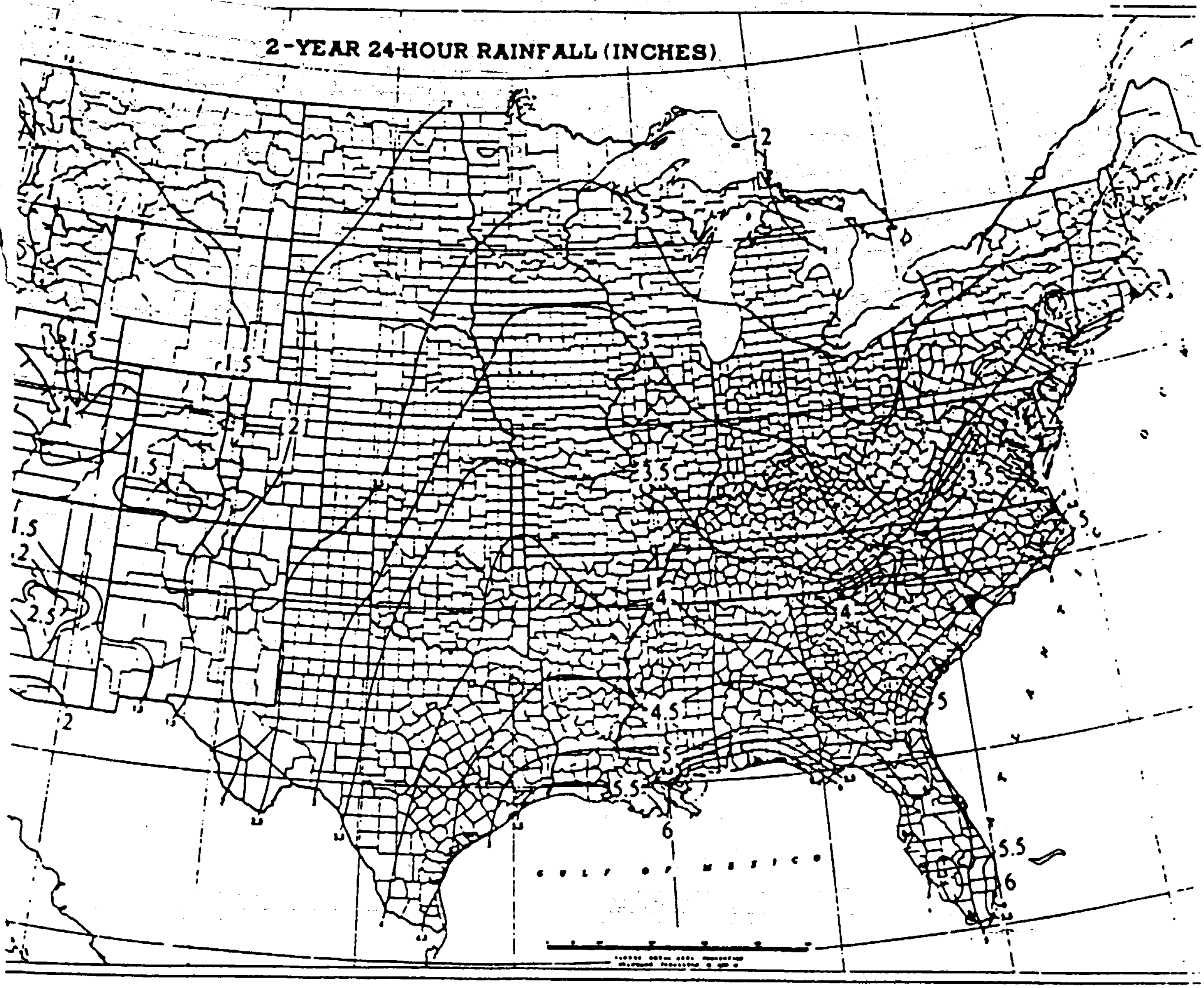
2-YEAR 24-HOUR RAINFALL (INCHES)
GULF OF MEXICO

SOIL SURVEY OF

Beaufort and Jasper Counties South Carolina

REFERENCE 15

United States Department of Agriculture
Soil Conservation Service

In cooperation with
South Carolina Agricultural Experiment Station and
South Carolina Land Resources Conservation Commission

Typical pedon of Williman loamy fine sand, 13 miles northwest of Beaufort, 3.6 miles south of Sheldon, 2,400 feet northwest of railroad crossing at Coosaw, 850 feet north of Seaboard Coastline Railroad, 175 feet west of farm road on edge of woods:

A1—0 to 5 inches; very dark gray (10YR 3/1) loamy fine sand; moderate medium granular structure; very friable; many fine and medium roots; many fine uncoated sand grains; very strongly acid; clear smooth boundary.

A21—5 to 15 inches; dark grayish brown (10YR 4/2) loamy fine sand; common medium faint grayish brown (10YR 5/2) and few fine distinct light brownish gray mottles; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine pores; very strongly acid; gradual smooth boundary.

A22—15 to 26 inches; light brownish gray (10YR 6/2) loamy fine sand; many coarse faint light yellowish brown (2.5Y 6/4), common fine distinct strong brown, and few fine prominent yellowish red mottles; weak medium subangular blocky structure; very friable; few fine and medium roots; few fine pores; common fine uncoated sand grains; very strongly acid; gradual wavy boundary.

B1g—26 to 30 inches; light brownish gray (10YR 6/2) fine sandy loam; common medium distinct strong brown (7.5YR 5/6) and light yellowish brown (2.5YR 6/4), and common fine prominent yellowish red mottles; weak medium subangular blocky structure; friable; few fine and medium roots; few fine pores; common fine uncoated sand grains; very strongly acid; clear wavy boundary.

B21tg—30 to 47 inches; gray (10YR 5/1) sandy clay loam; common medium distinct strong brown (7.5YR 5/6) and brownish yellow (10YR 6/8), and common fine prominent yellowish red mottles; weak medium subangular blocky structure; friable; few fine and medium roots; thin patchy clay films in old root channels and on faces of peds; some peds bridged with light brownish gray loamy fine sand; few medium streaks of light gray fine sand; very strongly acid; gradual wavy boundary.

B22tg—47 to 59 inches; light brownish gray (10YR 6/2) sandy clay loam; many medium faint pale olive (5Y 6/3), common fine distinct strong brown, and few fine prominent yellowish red mottles; weak medium subangular blocky structure; friable; few fine roots; thin patchy clay films in old root channels and on faces of some peds; few fine streaks of light gray fine sand; few fine flakes of mica; very strongly acid; clear wavy boundary.

B31g—59 to 73 inches; light brownish gray (10YR 6/2) sandy clay loam; many medium prominent yellowish red (5YR 4/8), common medium distinct yellowish brown (10YR 5/6), and common medium faint pale olive (5Y 6/4) mottles; massive; friable; common dark reddish brown pebbles of ironstone, 1 to 2 cm in size; few fine streaks of light gray fine sand; few fine flakes of mica; very strongly acid; clear wavy boundary.

B32g—73 to 80 inches; light brownish gray (2.5Y 6/2) sandy clay loam; common medium distinct strong brown (7.5YR 5/6), brownish yellow (10YR 6/6), and greenish gray (5GY 6/1), and few medium prominent yellowish red (5YR 4/6) mottles; massive; friable; few fine streaks of light gray fine sand; few fine flakes of mica; very strongly acid; gradual wavy boundary.

Cg—80 to 90 inches; light brownish gray (2.5Y 6/2) fine sandy loam; many coarse distinct greenish gray (5GY 6/1) and brownish yellow (10YR 6/6), and few fine yellowish red mottles; massive; friable; pockets of loamy fine sand and sandy clay loam; weakly stratified; few fine flakes of mica; very strongly acid.

The thickness of the solum ranges from 55 to more than 90 inches. Reaction is extremely acid to strongly acid in the A and B horizons, and it is very strongly acid to neutral in the C horizon.

The A horizon is 22 to 38 inches thick. The A1 or Ap horizon is 5 to 13 inches thick. It is dark gray, very dark gray, or black. Where values are less than 3.5, thickness is less than 10 inches. The A2 horizon is 9 to 32 inches thick. It is dark grayish brown, gray, grayish brown, light brownish gray, light gray, or light yellowish brown. Mottles in shades of gray, yellow, and brown are in some pedons. Texture of the A horizon is loamy fine sand, loamy sand, or fine sand.

The B1g horizon, where present, is 3 to 6 inches thick. It is gray, grayish brown, or light brownish gray and has few to many mottles in shades of yellow, brown, and red. Texture is fine sandy loam or sandy loam.

The B2tg horizon is 8 to 42 inches thick. The upper part is gray, grayish brown, or light brownish gray and has few to many mottles in shades of gray, yellow, brown, and red. The lower part is gray, light gray, light brownish gray, or pale olive and has few to many mottles in shades of gray, yellow, brown, and red. Texture of the B2tg horizon commonly is sandy clay loam but includes fine sandy loam and sandy loam.

The B3g horizon is 4 to 38 inches thick. It has dominant gray colors and has common to many mottles in shades of gray, olive, yellow, brown, and red. Texture is fine sandy loam or sandy clay loam.

The C horizon is light gray, light brownish gray, light olive gray, greenish gray, very pale brown, or pale brown. It commonly is loamy fine sand but includes sandy clay loam, fine sandy loam, loamy sand, fine sand, and sand.

Yemassee series

The Yemassee series consists of deep, somewhat poorly drained, moderately permeable soils that formed in thick loamy Coastal Plain sediment on the lower marine terraces. These nearly level soils are on low ridges. The water table is within 1 to 1.5 feet of the surface for about 4 months during most years. Slopes are generally less than 1 percent.

Yemassee soils are geographically associated with the Bertie, Coosaw, Deloss, Tomotley, and Williman soils. Bertie soils are on higher ridges and are moderately well drained. Coosaw soils are on intermediate ridges, are somewhat poorly drained, and have an A horizon that is 20 to 40 inches thick. Deloss soils are in depressions and drainageways, are very poorly drained and have a thick, dark colored surface layer. Tomotley soils are in low areas and are poorly drained. Williman soils are in low areas, are poorly drained, and have an A horizon that is 20 to 40 inches thick.

Typical pedon of Yemassee loamy fine sand, 2.5 miles north of Dale, 1,750 feet north of the junction of South Carolina Secondary Highway 238 and South Carolina Secondary Highway 43, 100 feet east of South Carolina Secondary Highway 43:

Ap—0 to 8 inches; dark gray (10YR 4/1) loamy fine sand; weak medium granular structure; very friable; many fine and medium roots; strongly acid; clear smooth boundary.

A2—8 to 15 inches; light yellowish brown (2.5Y 6/4) loamy fine sand; few fine distinct yellowish brown and few fine faint light brownish gray mottles; weak medium subangular blocky structure; very friable; common fine and medium roots; common fine pores; strongly acid; clear wavy boundary.

B1—15 to 19 inches; pale brown (10YR 6/3) fine sandy loam; common medium distinct yellowish brown (10YR 5/6), common medium faint light brownish gray (10YR 6/2), and few medium prominent yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; few fine and medium roots; common fine pores; strongly acid; clear wavy boundary.

B21tg—19 to 35 inches; light brownish gray (10YR 6/2) sandy clay loam; common medium distinct yellowish brown (10YR 5/4), few medium prominent red (2.5YR 4/6), and common fine distinct strong brown mottles; weak medium subangular blocky structure; friable; few fine roots; common fine pores; thin patchy clay films in old root channels and on faces of some peds; few thin vertical streaks of light gray fine sand; very strongly acid; gradual wavy boundary.


2 085 000 FEET
265 000 FEET
SEABOARD
LINE
Halfmoon Island
WHALE
BRANCH

REFERENCE 16

National Water Summary 1984

Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources

United States Geological Survey
Water-Supply Paper 2275

National Water Summary 1984

Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources

By United States Geological Survey

United States Geological Survey
Water-Supply Paper 2275

DEPARTMENT OF THE INTERIOR
DONALD PAUL HODEL, Secretary

U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

UNITED STATES GOVERNMENT PRINTING OFFICE: 1985

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Page 7, San Luis Drain to Kesterson National Wildlife Refuge, San Joaquin Valley, Calif. (Photograph by S. J. Deverel.)

Page 47, Analyst operating automated wet chemical analyzer for nitrogen at U.S. Geological Survey's Denver Central Laboratory. (Photograph by D. E. Reed.)

Page 117, Old pump, east of Brighton, Colo. (Photograph by D. E. Reed.)

INTRODUCTION TO NATIONAL WATER SUMMARY 1984

By David W. Moody and Edith B. Chase

The initial volume in the annual National Water Summary series (U.S. Geological Survey, 1984) introduced a chronology of hydrologic and water-related events to document their importance to human activities and also outlined a number of water issues of concern to the Nation. This second volume, *National Water Summary 1984—Hydrologic Events, Selected Water-Quality Trends,* and *Ground-Water Resources,* continues the chronology of events and presents additional information on several issues discussed in the 1983 volume. The 1984 *National Water Summary* is organized in three parts.

The first part, "Hydrologic Conditions and Water-Related Events, Water Year 1984," provides a synopsis of the hydrologic conditions and water-related events that occurred during the 1984 water year (October 1, 1983-September 30, 1984). Streamflow variations are compared to precipitation, temperature, and upper-air atmospheric pressure for the four seasonal quarters of the year to relate surface-water flows to climatic conditions.

The second part, "Hydrologic Perspectives on Water Issues," contains two sections. In the section titled "Water-Quality Issues," the occurrence of sediment, dissolved solids, nutrients, and pesticides in the Nation's streams are discussed. Recently compiled information is used to show the distribution and trends of these constituents and to relate them to various natural sources and human activities. The occurrence and sources of nitrate in ground water also are discussed. The section entitled "Water-Availability Issues" provides hydrologic explanations for changes in ground-water levels in several areas of the country.

The articles in this part of the report complement a number of other reports, published during the past year, which provide information on the water quality of the Nation's rivers. The 1982 *National Fisheries Survey* (Judy and others, 1984), cosponsored by the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency, provides an assessment of biological conditions in a statistical sample of river segments throughout the United States. The U.S. Environmental Protection Agency also sponsored an evaluation of the progress of water-pollution control efforts (Association of State and Interstate Water Pollution Control Administrators, 1984), an overview of nonpoint-source pollution (U.S. Environmental Protection Agency, 1984a), and the 1982 *National Water Quality Inventory* (U.S. Environmental Protection Agency, 1984b). Other recent studies that examine water resources from a national perspective include the 14th annual report of the U.S. Council on Environmental Quality (1983), the Conservation Foundation's (1984) *State of the Environment* report, and the Office of Technology Assessment's (1984) *Protecting the Nation's Groundwater from Contamination.*

The third and final part of the report, "State Summaries of Ground-Water Resources," summarizes for each State, the District of Columbia (combined with Maryland), Puerto Rico, the U.S. Virgin Islands, the Trust Territory of the Pacific Islands, Saipán, Guam, and American Samoa, the distribution, characteristics, and uses of principal aquifers. (The term "State" as used throughout the report is all inclusive of these geographic areas.) Each summary contains maps that show the location of aquifers and major areas of ground-water withdrawals and tables that describe the characteristics of the aquifers and present data on ground-water withdrawals. These descriptions of ground-water resources were prepared by the U.S. Geological Survey offices in each State.

Technical terms used in the report are defined in the Glossary. Selected references are given at the end of each article and State summaries to supplement the information provided. Numerous references are made to the National Drinking-Water Regulations; as an aid to the reader, these regulations follow the Glossary. A conversion table of water measurements and a geologic age chart also are provided for the reader's convenience.

ACKNOWLEDGMENTS

National Water Summary reports, because of their scope, are necessarily the work of many individuals. The coordinators of the 1984 *National Water Summary* wish to acknowledge the assistance of water-resources organizations in each State for their review of the descriptions of State ground-water resources and the assistance of the following Federal agencies, who provided unpublished data and advice in preparing parts of this report:

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Tennessee Valley Authority
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation
U.S. Bureau of Land Management
U.S. Coast Guard, National Response Center
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Soil Conservation Service

The authors of individual articles and State ground-water summaries are identified within the report. Richard H. Johnson, John S. McLean, Andrew

M. Spieker, and Lindsay A. Swain coordinated the preparation of the State summaries. David A. Aronson, Bruce L. Foxworthy, Kenneth J. Lanfear, Perry G. Olcott, Robert S. Roberts, and Michael Turtora reviewed the text and illustrations. Janet N. Arneson coordinated the assembly of the manuscript. Although individual credit is not feasible for all reviewers, graphic specialists, and typists who participated in the preparation and publication of this report, their cooperation and many contributions are gratefully acknowledged. Overall preparation of the 1984 *National Water Summary* was directed by David W. Moody, John N. Fischer, and Edith B. Chase.

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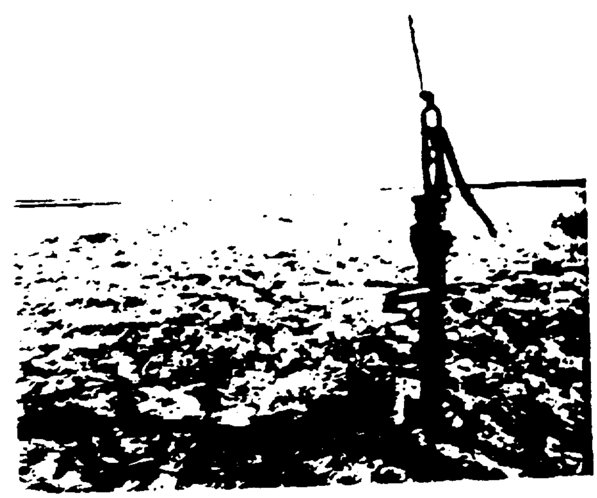
State Summaries of Ground-Water Resources



INTRODUCTION TO STATE SUMMARIES OF GROUND-WATER RESOURCES

By Ralph C. Heath

The "State Summaries of Ground-Water Resources" part of the 1984 *National Water Summary* contains descriptions of the occurrence, use, and general quality of the ground-water resources of each State, the District of Columbia (combined with Maryland), Puerto Rico, the U.S. Virgin Islands, and the Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa. (Hereafter, the term "State" is used for all geographic areas.) Each summary contains the following components:

- General setting—Highlights of the physiographic, hydrologic, and geologic framework of the ground-water system.
- Principal aquifers—A description of location, geology, and use of the aquifers.
- Ground-water withdrawals and water-level trends—A description of the location and purpose of major ground-water withdrawals and the trends in water levels.
- Ground-water management—A description of ground-water related laws and regulations and an identification of management agencies.
- Selected references—A listing of relevant reports on ground-water resources.
- Table 1, Ground-water facts—A tabulation of ground-water withdrawals for various uses in relation to total water withdrawals. (Not included with the Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa.)
- Table 2, Aquifer and well characteristics—A listing of important characteristics of the principal aquifers and of the water-supply wells drilled in the aquifers. (Table 1 in Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa.)
- Figure 1, Principal aquifers—A map showing geographic distribution of the principal aquifers.
- Figure 2, Areal distribution of major ground-water withdrawals and trends in ground-water levels—A map showing areas of withdrawals, hydrographs showing the long-term water level trends of aquifers, and a tabulation of areas of withdrawals and use of the water.

In the State summaries, common ground-water terms are used, and reference is made, without explanation, to basic ground-water principles. Some of those terms and principles are described briefly in the glossary at the end of the report. Additional discussions of basic ground-water terms and principles and of the general features of ground-water occurrence in the United States are found in Heath (1983, 1984).

IMPORTANCE OF GROUND WATER TO THE NATION

Ground water is available in at least small amounts at nearly every point on the Earth's surface, making it one of the most widely available of all natural resources. It serves as the only, or the dominant, source of drinking water for most rural areas, as the largest source of water for irrigation and other purposes in arid and most semiarid regions, and as an important source of water for urban, industrial, and supplemental irrigation purposes in humid areas. The importance of ground water in the United States is shown graphically in figure 67. Nationwide, ground-water withdrawals in 1980 (excluding those for thermoelectric power) range from less than 1 percent of the total water withdrawal in the District of Columbia to 85 percent of that in Kansas. In 10 States, ground water represents more than one-half of the total withdrawal.

By far the largest use of ground water is for irrigation. States with the largest ground-water use are those in the western part of the conterminous United States—Arizona, California, Idaho, Kansas, Nebraska, and Texas—where irrigated agriculture is a major activity. In the eastern part of the country, States that use large amounts of ground water for irrigation include Arkansas, Florida, Louisiana, and Mississippi.

The importance of fresh ground water to the different States readily can be seen by comparing ground-water withdrawals to total fresh surface-and ground-water withdrawals (table 9). Total withdrawals, as given in water use reports, usually include thermoelectric power withdrawals mainly for condenser and reactor cooling and related purposes. Because water used for thermoelectric power must be available in very large quantities, 99 percent of it is obtained from surface-water sources, of which 30 percent is from saline surface-water bodies. Thus, the inclusion of thermoelectric power in total withdrawals tends to obscure the relative importance of ground and surface water for other uses, such as for public supplies, irrigation, and industrial usage (exclusive of thermoelectric power). For this reason, the ground-water facts table in each State summary shows total withdrawals including and excluding thermoelectric power.

DELINEATION OF PRINCIPAL AQUIFERS IN THE STATE SUMMARIES

In each State summary, the aquifers that are developed most intensively for water supplies are identified, and their areal extents are shown on a map (fig. 1 in each summary). Areas in many of the States, and especially those that occupy parts of the Atlantic and Gulf Coastal Plains, are underlain by two or more aquifers separated by confining beds. In most instances, the maps show the uppermost of these multiple aquifers, although the maps for some States delineate the most-used aquifers. The relative vertical positions of the aquifers and of the intervening confining beds are indicated on cross sections or in block diagrams which show schematically the arrangement of the aquifers and confining beds along vertical slices through the Earth's

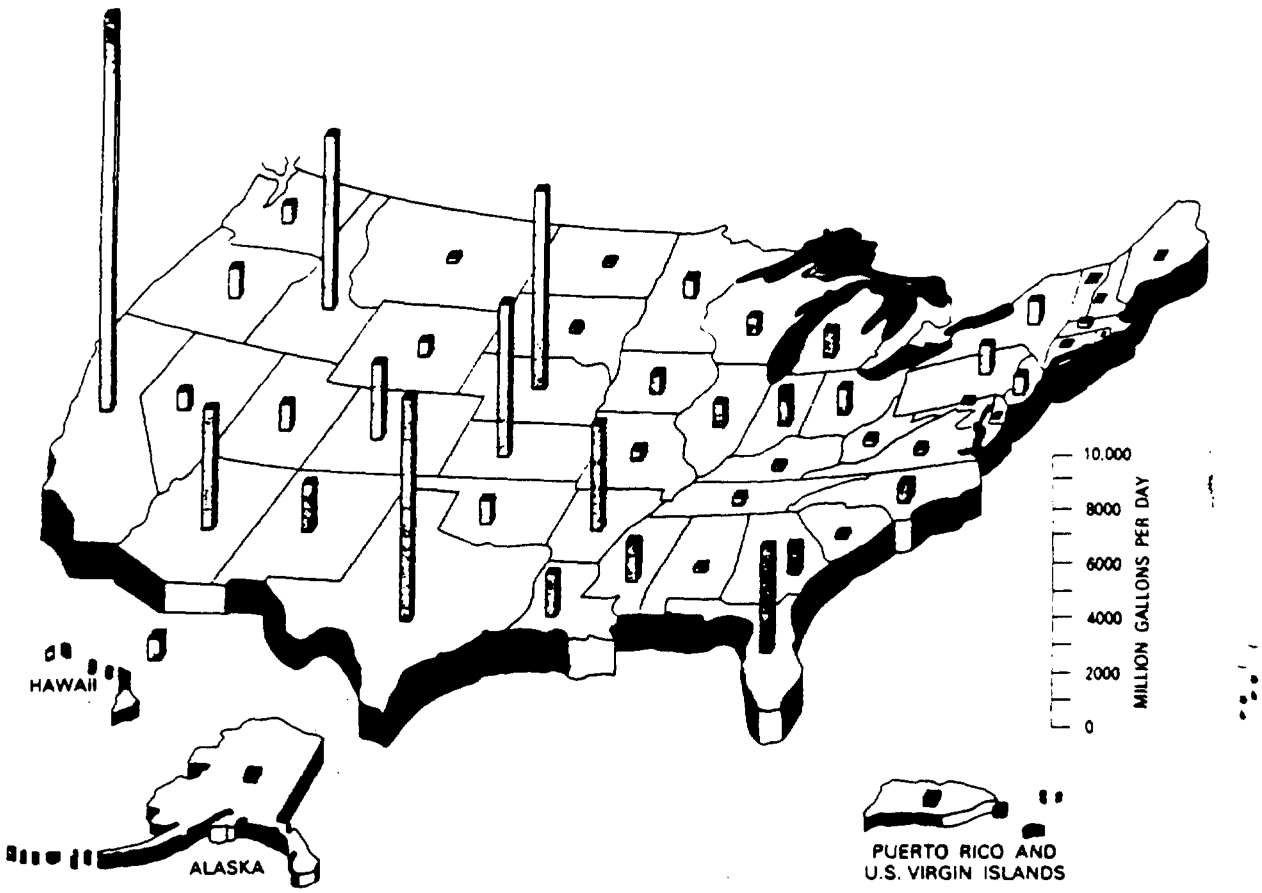


Figure 67. Ground-water withdrawals in 1980 for the United States, Puerto Rico, and U.S. Virgin Islands. (Source: Modified from Solley and others, 1983.)

crust. To help the reader visualize the aquifer distribution in relation to land forms, figure 1 also has a small map showing the physiographic divisions of the State.

The relative vertical positions of the aquifers in each State also are indicated in a table of aquifer and well characteristics (table 2 in each summary). Thus, it will be useful to refer to this table while scanning the aquifer map and the cross section or block diagram.

In some areas, an aquifer occurring in the same geologic formation is identified by one name in one State and by another in an adjacent State. In preparing this report, attempts were made to resolve these differences in names; however, several remain. Where appropriate, the corresponding name(s) of the aquifer in the adjacent State is given in the table 2 "Remarks" column to aid in understanding aquifer nomenclature.

The importance of an aquifer as a source of water may change from one State to another because of changes in demands for freshwater, variations in ground-water quality, and differences in the hydrogeologic characteristics of the aquifer. The differences may be of such magnitude that an aquifer that serves as a principal source of supply in one State may not be intensively developed in a neighboring State. For these reasons, the aquifer boundaries depicted in figure 1 of each State summary may not match at State boundaries.

RESPONSE OF AQUIFERS TO WITHDRAWALS

A map showing the location of major withdrawals and, through the use of symbols, the magnitude of the withdrawals, is given for each State (fig. 2 in each summary). Also included in this figure are hydrographs that show, in some cases, the effects of climatic changes and, in others, the long-term effect of withdrawals on ground-water levels; the hydrograph data are the annual greatest depth to water. A list of the withdrawal points, the name of the aquifer, and the principal uses of withdrawals also is provided.

Changes in the position of the water level in wells reflect changes in the amount of ground water in storage in aquifers, and, where these changes are due to withdrawals, they also may reflect changes in flow direction. Thus, the measurement of the position of the water levels in wells is an important part of most ground-water investigative programs. These water-level measurements are most readily understandable in the form of hydrographs as given in the State summaries and in the form of water-level maps, which can be used to determine directions of flow. The hydrographs included in the State summaries were selected, in most instances, to show the effect of withdrawing ground water from the most intensively developed aquifers.

Table 9. Summary of fresh ground-water withdrawals as a percentage of total fresh surface- and ground-water withdrawals for all categories of use and for specific categories of use, by State

[Data rounded to two significant figures. Data not included for Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa. Mgal = million gallons. Sources: State data from table 1 in respective State summary, *National Water Summary 1984*; total data from Solley, Chase, and Mann, 1983]

State	Total surface- and ground-water withdrawals per day (Mgal)	Percentage of population served by ground water	Ground-water withdrawals per day (Mgal)	Ground-water withdrawals as a percentage of total fresh surface- and ground-water withdrawals for— All categories of use[1]	Specific categories of use: Public supply	Rural supply: Domestic	Rural supply: Livestock	Industrial self-supplied[1]	Irrigation
Alabama	8,700	52	290	3 (14)	28	100	34	0.6 (4)	30
Alaska	220	69	49	22 (26)	43	99	0	9 (11)	0
Arizona	7,300	65	4,200	58 (57)	54	100	82	72 (88)	58
Arkansas	33,000	50	4,300	13 (81)	42	100	36	1 (55)	86
California	38,000	46	14,600	39 (38)	46	93	41	54 (89)	39
Colorado	16,000	15	2,800	18 (18)	8	36	18	2 (1)	19
Connecticut	1,300	32	150	11 (20)	17	100	18	3 (10)	8
Delaware	140	60	82	59 (57)	38	100	100	68 (73)	63
District of Columbia	340	0	.8	.2 (.4)	0	0	0	.6 (57)	0
Florida	7,300	90	3,800	52 (69)	86	100	66	27 (82)	53
Georgia	6,700	48	1,200	18 (52)	29	100	61	8 (57)	66
Hawaii	1,700	95	710	41 (37)	90	90	96	73 (20)	93
Idaho	18,000	88	6,300	35 (35)	94	96	42	95 (95)	25
Illinois	18,000	49	980	5 (24)	27	97	100	1 (10)	100
Indiana	14,000	32	1,200	11 (30)	41	90	18	8 (18)	98
Iowa	3,200	82	900	28 (81)	81	100	100	13 (71)	84
Kansas	6,600	49	5,600	85 (89)	48	86	43	35 (77)	92
Kentucky	4,600	31	180	4 (22)	13	91	5	2 (25)	6
Louisiana	12,000	69	1,800	14 (27)	44	100	70	5 (12)	47
Maine	850	57	80	9 (10)	19	98	59	5 (5)	3
Maryland	1,400	30	175	13 (17)	9	100	54	6 (18)	54
Massachusetts	2,500	33	320	13 (28)	24	100	58	6 (30)	28
Michigan	15,000	43	530	4 (18)	17	100	77	1 (3)	37
Minnesota	3,100	75	670	22 (48)	52	100	85	5 (20)	88
Mississippi	2,900	93	1,500	54 (82)	18	100	77	21 (61)	35
Missouri	6,900	34	470	7 (34)	22	74	26	2 (39)	75
Montana	11,000	54	200	2 (2)	39	94	38	20 (52)	1
Nebraska	12,000	82	7,100	59 (73)	77	100	80	3 (85)	67
Nevada	3,600	50	710	20 (20)	40	94	31	30 (45)	17
New Hampshire	380	60	65	17 (21)	48	98	25	5 (6)	0
New Jersey	2,900	45	730	25 (37)	40	100	67	10 (20)	73
New Mexico	3,900	89	1,800	47 (47)	90	97	50	25 (98)	44
New York	7,900	35	970	12 (28)	23	89	65	4 (11)	46
North Carolina	8,100	55	770	10 (20)	12	100	85	6 (17)	30
North Dakota	1,000	62	110	11 (11)	54	100	40	.3 (25)	37
Ohio	13,000	42	740	6 (32)	27	90	60	2 (16)	36
Oklahoma	1,700	41	960	56 (61)	28	83	12	23 (35)	84
Oregon	6,800	61	1,100	17 (17)	29	87	27	15 (16)	14
Pennsylvania	16,000	44	1,000	6 (16)	16	100	88	4 (15)	14
Puerto Rico	1,100	26	246	22 (35)	22	42	50	3 (21)	34
Rhode Island	170	24	37	22 (21)	15	100	50	36 (36)	9
South Carolina	5,800	42	210	4 (21)	22	100	55	1 (5)	27
South Dakota	690	77	330	48 (48)	68	94	88	54 (55)	33
Tennessee	10,000	51	460	5 (21)	40	100	17	2 (11)	51
Texas	16,000	47	9,700	61 (62)	46	84	49	23 (24)	70
Utah	4,300	63	770	18 (18)	66	90	80	14 (16)	10
U.S. Virgin Islands	6	42	1.1	18 (18)	12	100	0	0 (0)	0
Vermont	340	54	45	13 (50)	35	85	62	2 (35)	19
Virginia	5,600	41	370	7 (30)	17	100	10	2 (24)	29
Washington	8,200	71	750	9 (9)	37	78	67	15 (15)	4
West Virginia	5,600	53	220	4 (22)	27	95	13	3 (18)	8
Wisconsin	5,900	70	580	10 (46)	48	100	96	1 (15)	97
Wyoming	5,300	54	540	10 (11)	33	92	21	34 (76)	8
Total or percentage	380,000	51	88,000	23 (38)	35	97	55	6 (26)	40

[1]Number in parentheses was calculated excluding thermoelectric power.

These hydrographs represent only a small sample of those available from the U.S. Geological Survey and State ground-water agencies. The response of water levels in aquifers to ground-water withdrawals is described in detail in the 1983 *National Water Summary* (U.S. Geological Survey, 1984, p. 36–45).

Estimates of well yields for each aquifer are given in table 2 of each State summary. These yields are the amounts of water per minute that can be obtained when an effort is made to design and construct wells to obtain large supplies of water, such as are needed for agricultural, public supply, or industrial uses. For most aquifers, they do not represent the average yield of all wells, which may include many small-yield rural domestic wells. A range of yields reflects the effect of areal differences in aquifer thickness or composition. The yields listed in the "May exceed" column are obtainable where conditions are especially favorable; for example, where an aquifer has its greatest thickness or is most permeable. All yields represent the rates at which individual wells can be pumped continuously for long periods. They do not, however, include the possible influence of interference from nearby wells and do not indicate the "safe" or sustained yields of the aquifer.

GROUND-WATER MANAGEMENT

The Nation's freshwater needs are met by withdrawals from streams, lakes, reservoirs, and ground-water systems. Trends in water developments over the last 30 years show that the use of ground water for all purposes, exclusive of thermoelectric power, has been increasing at a faster rate than has the use of surface water for the same purposes. Several factors may cause this trend to continue or accelerate in the future. First, the most cost-effective surface reservoir sites already have been developed (U.S. Geological Survey, 1984, p. 33) and the sustained yields of existing reservoirs are decreasing due to sedimentation. Second, the cost of storage at the remaining reservoir sites is becoming increasingly expensive. And third, public opposition is increasing to reservoir construction because of potential environmental damages. Thus, the development of alternative ground-water supplies and the protection of ground-water quality are management issues of critical importance.

Discussion of the quality of ground water is limited in this report to identifying the natural condition of the water in those instances where it influences the use of the water. For the most part, data are available to assess the common constituents that influence the quality of the Nation's ground water. However, much less is known about ground-water constituents that occur naturally in trace concentrations and about the degree and extent of contamination by human activities. Investigations by Federal and State agencies, universities, and other groups are underway to address these technical aspects of ground-water management.

To ensure that the Nation's future water demands are met, it is important that an infrastructure exists within each State to utilize the technical information and manage the ground-water resources. To achieve these ends, many States have enacted ground-water laws and regulations and have established organizations to implement them. A description of these management initiatives constitutes the final section of each State summary.

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SOUTH CAROLINA
Ground-Water Resources

Fresh ground water is available in most of South Carolina. Although it provides only about 4 percent of total water used in the State, it serves 42 percent of the population, or about 1.33 million people. Most large withdrawals of ground water are obtained from Coastal Plain aquifers in the southeastern two-thirds of the State. Ground-water withdrawals in 1980 for various uses and related statistics are given in table 1.

Table 1. Ground-water facts for South Carolina

[Withdrawal data rounded to two significant figures and may not add to totals because of independent rounding. Mgal/d = million gallons per day; gal/d = gallons per day. Source: Lonon and others, 1983]

Population served by ground water, 1980	
Number (thousands)	1,330
Percentage of total population	42
From public water-supply systems:	
Number (thousands)	530
Percentage of total population	17
From rural self-supplied systems:	
Number (thousands)	800
Percentage of total population	25
Freshwater withdrawals, 1980	
Surface water and ground water, total (Mgal/d)	5,800
Ground water only (Mgal/d)	210
Percentage of total	4
Percentage of total excluding withdrawals for thermoelectric power	21
Category of use	
Public-supply withdrawals:	
Ground water (Mgal/d)	82
Percentage of total ground water	40
Percentage of total public supply	22
Per capita (gal/d)	155
Rural-supply withdrawals:	
Domestic:	
Ground water (Mgal/d)	57
Percentage of total ground water	28
Percentage of total rural domestic	100
Per capita (gal/d)	71
Livestock:	
Ground water (Mgal/d)	6
Percentage of total ground water	3
Percentage of total livestock	55
Industrial self-supplied withdrawals:	
Ground water (Mgal/d)	46
Percentage of total ground water	22
Percentage of total industrial self-supplied:	
Including withdrawals for thermoelectric power	1
Excluding withdrawals for thermoelectric power	5
Irrigation withdrawals:	
Ground water (Mgal/d)	15
Percentage of total ground water	7
Percentage of total irrigation	27

GENERAL SETTING

South Carolina is located in three physiographic provinces (fig. 1)—the Coastal Plain province, which occupies approximately the southeastern 63 percent of the State; the Piedmont province, which occupies roughly 35 percent of the State; and the Blue Ridge province, which occupies about 2 percent of the State (Fenneman, 1938). Coastal Plain deposits consist of consolidated and unconsolidated sediments of continental and marine origin that thicken from a few feet at the Fall Line to more than 4,000 feet (ft) at the southern tip of the State. The Piedmont and Blue Ridge provinces are underlain by metamorphosed sedimentary, volcanic, and igneous rocks. Most of the area is mantled by a layer of chemically weathered bedrock called saprolite, which ranges in thickness from a few feet to about 100 ft, but generally is less than 50 ft thick.

Recharge to the ground-water system in South Carolina is from precipitation. Statewide average annual precipitation is slightly more than 48 inches (in.) (Snyder and others, 1983) and ranges from an average of 46 in. in part of the central area of the State to 80 in. in the Blue Ridge province. Ground-water recharge ranges from less than 1 in. in parts of the Piedmont-Blue Ridge to about 15 in. in parts of the Coastal Plain.

PRINCIPAL AQUIFERS

Principal aquifers in South Carolina consist of unconsolidated to partly consolidated sediments of the Coastal Plain province and igneous and metamorphic rocks of the Blue Ridge and Piedmont provinces. The aquifer names commonly used in South Carolina are, for the most part, synonymous with the names of geologic formations that contain the principal water-bearing materials. The aquifers are described below and in table 2; their areal distribution is shown in figure 1.

COASTAL PLAIN AQUIFERS

The formations of the Coastal Plain consist of unconsolidated or partly consolidated sediments, including sand, gravel, clay, limestone, marl, coquina, and shale. Many of the formations of the Coastal Plain are excellent aquifers that are able to store and transmit large quantities of water.

Shallow Aquifer

A shallow aquifer occurs throughout the Coastal Plain but is not mapped in figure 1. In general, the aquifer consists of deposits that range in age from Cretaceous to Holocene, is less than 100 ft thick, and contains water under unconfined conditions, although semiconfined conditions may be present locally. The aquifer is used mostly for domestic and other small supplies, but, in some areas, such as North Myrtle Beach where very permeable beds of coquina are present, yields can exceed 500 gallons per minute (gal/min). Water quality is extremely variable, as are yields, but the aquifer is a valuable resource in many areas, particularly for rural domestic use. Recharge is from local rainfall; therefore, water levels tend to fluctuate seasonally.

Table 2. Aquifer and well characteristics in South Carolina

[Ft = feet; gal/min = gallons per minute; mg/L = milligrams per liter. Sources: Reports of the U.S. Geological Survey and several State agencies]

Aquifer name and description	Well characteristics: Depth (ft) Common range	Yield (gal/min) Common range	Yield (gal/min) May exceed	Remarks
Coastal Plain aquifers:				
Shallow aquifer: Sand, gravel, and coquina. Unconfined. (Not shown in fig. 1).	20 - 100	5 - 10	500	Tapped mostly for domestic use. Variable water quality with local problems. Concentrations of iron greater than 1 mg/L, and pH less than 5.5 in many areas.
Floridan aquifer system: Fossiliferous limestone. Confined.	80 - 250	100 - 300	2,000	Principal aquifer in southern South Carolina. Saltwater encroachment a potential problem. Water predominantly calcium bicarbonate type except in coastal areas where it is salty.
Tertiary sand aquifer: Fine to course quartzose sand. Confined to unconfined.	100 - 300	50 - 200	700	Interfingers with limestone in southern Barnwell County. Concentrations of dissolved solids less than 50 mg/L near recharge areas; water predominantly a sodium bicarbonate type downdip except near the coast where it is salty.
Black Creek aquifer: Thinly laminated sand and clay lenses. Confined.	200 - 700	50 - 400	900	Principal source of ground water in Horry and Georgetown Counties (Myrtle Beach area). Water predominantly calcium carbonate type with concentrations of iron greater than 3 mg/L near recharge areas, a sodium bicarbonate type downdip, and salty in northeast Horry County and along southern coast. Equivalent to Cretaceous aquifer in North Carolina.
Middendorf aquifer: White and gray sand and gravel. Confined.	200 - 2,000	200 - 700	2,000	Most intensively used in the upper Coastal Plain. Concentrations of dissolved solids are less than 50 mg/L; concentrations of iron greater than 1 mg/L in the upper Coastal Plain. Water predominantly sodium bicarbonate type downdip, and salty in northeast Horry County. Equivalent to Cretaceous aquifer in North Carolina.
Piedmont and Blue Ridge aquifers: Fractured igneous and metamorphic rocks and saprolite. Confined to unconfined.	50 - 300	10 - 30	300	Small yields and areal variability limit large-scale use. Water quality variable in dissolved solids and major constituents.

Floridan Aquifer System

The Floridan aquifer system in South Carolina includes parts of some Miocene formations, but the principal water-bearing units are the Santee and Ocala Limestones of Eocene age. These formations consist of creamy-white to yellow fossiliferous limestone. Typically, the upper part of each unit, particularly the Ocala Limestone, contains extensive loosely cemented shell deposits. These limestones are the facies equivalents of the Eocene sands of the Tertiary sand aquifer. The Floridan aquifer system extends over a wide triangle in the southern part of South Carolina (fig. 1). It is capable of yielding as much as 2,000 gal/min of water suitable for public supply, but common yields range from 100 to 300 gal/min.

Tertiary Sand Aquifer

The Tertiary sand aquifer includes permeable parts of the Congaree, the Warley Hill, the McBean, and the Barnwell Formations, listed in ascending order. The water-bearing sands have limited extent and are present mostly in the upper part of the Coastal Plain between the Savannah and Congaree Rivers. Well yields range from 50 to 200 gal/min but may exceed 700 gal/min.

Black Creek Aquifer

The Black Creek aquifer, of Cretaceous age, ranges in thickness from a few feet in updip areas to about 400 ft in coastal areas. The Black Creek aquifer is the most important source of ground water in Horry and Georgetown Counties. Wells in the two-county area yield 50 to 400 gal/min but may exceed 900 gal/min. The quality of the water in the Black Creek aquifer in Horry and Georgetown Counties generally is acceptable for drinking water except for fluoride concentrations of as much as 7 milligrams per liter (mg/L), chloride concentrations that exceed the 250 mg/L national drinking-water regulation (U.S. Environmental Protection Agency, 1982a, b) in some areas, and dissolved-solids concentrations of as much as 1,800 mg/L in some areas. The large fluoride concentrations in the water are believed to be caused by shark teeth in the Black Creek Formation (Zack, 1980). Saltwater is present in parts of the Black Creek aquifer but is not precisely

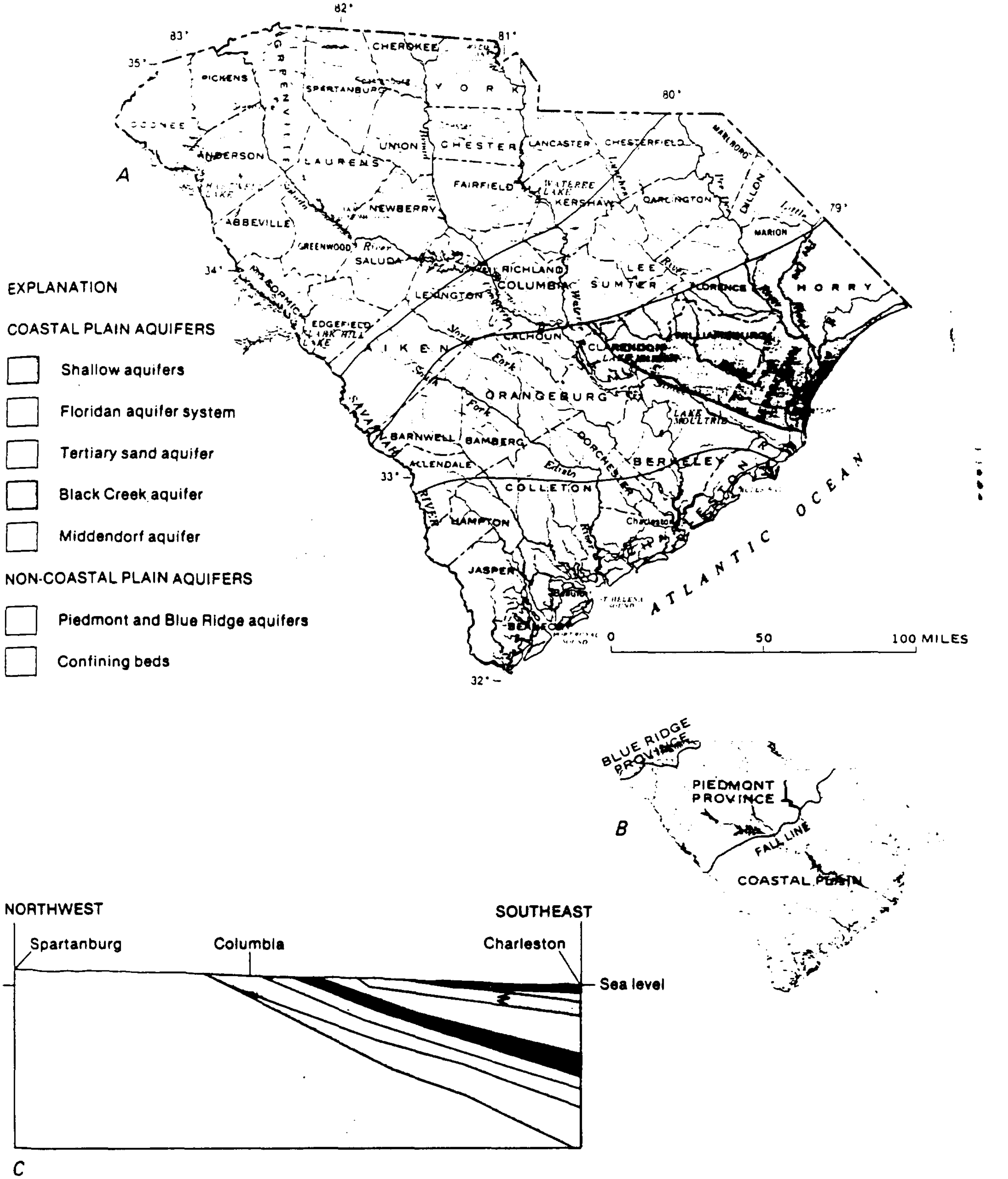

Figure 1. Principal aquifers in South Carolina. *A*, Delineations indicating the most widely used aquifers. *B*, Physiographic diagram and divisions. *C*, Generalized cross section. (See table 2 for a more detailed description of the aquifers. Sources: *A*, *C*, Compiled by W. R. Aucott from U.S. Geological Survey files. *B*, Fenneman, 1938; Raisz, 1954.)

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REPORT OF

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CONSULTANTS

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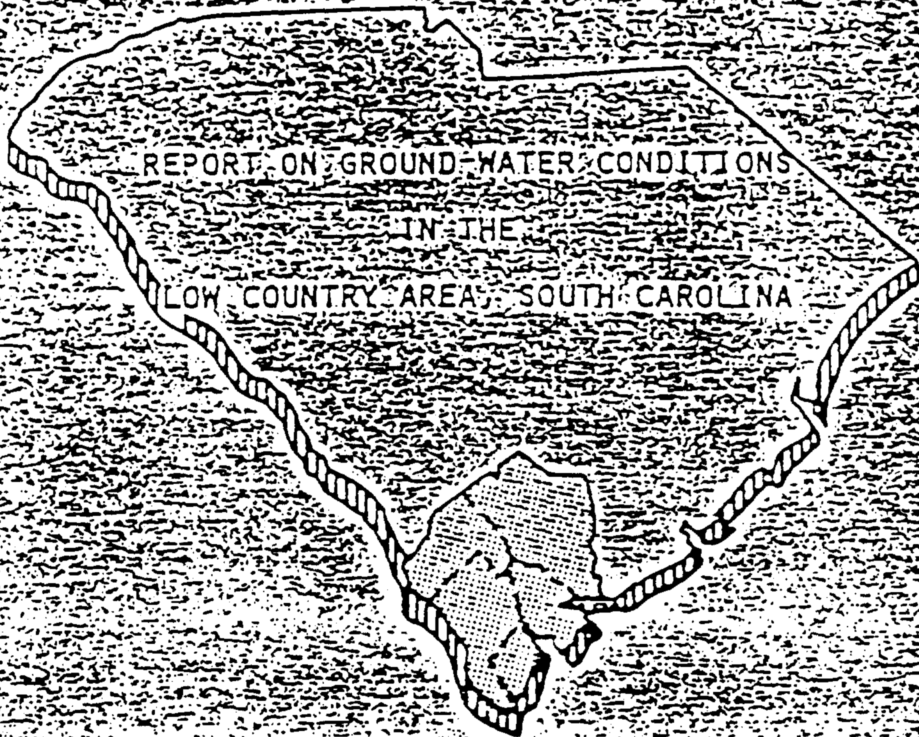
REPORT ON GROUND-WATER CONDITIONS IN THE LOW COUNTRY AREA, SOUTH CAROLINA



BY

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SOUTH CAROLINA WATER RESOURCES COMMISSION

REPORT NUMBER 132

December, 1979

REPORT ON GROUND-WATER CONDITIONS

IN THE

LOW COUNTRY AREA, SOUTH CAROLINA

A Capacity Use Investigation

by

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REPORT ON
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ABSTRACT

The Low Country Capacity Use Investigation was initiated by the S. C. Water Resources Commission (SCWRC) in 1973 at the request of legislative and local officials in the four-county area. As required by the S. C. Ground Water Use Act of 1969, the SCWRC must report on ground-water problems in a capacity use study area. The results of a technical ground-water investigation, made by the U. S. Geological Survey (WRD) in cooperation with the SCWRC, are contained in SCWRC Report Number 9 entitled, "The Ground-Water Resources of Beaufort, Colleton, Hampton, and Jasper Counties, South Carolina". Therefore, this report and SCWRC Report Number 9 are submitted to fulfill the requirement of the Act, and to make the findings of the investigation available to the public.

Ground water is the most important source of water supplies in the Low Country area. Six major aquifer systems have been identified. From the surface downward, these are: (1) the Hawthorn-Recent, (2) the Tertiary Limestone, (3) the Black Mingo, (4) the Peedee, (5) the Black Creek, and (6) the Tuscaloosa Aquifer Systems. Approximately 50 million gallons per day (Mgd) of ground water are withdrawn daily from these aquifer systems. The largest withdrawals, approximately 33 Mgd, are from the Tertiary Limestone Aquifer. In the adjacent Savannah area, approximately 75 Mgd to 90 Mgd of ground water are being pumped from this aquifer system for industrial and municipal water supplies.

There are several major ground-water problems that are occurring now in the Low Country area, and other problems that are likely to become major problems unless a comprehensive management program is initiated. Documented problems include:

(1) Regional water-level declines (loss of artesian pressure) throughout large areas of the Low Country and adjacent counties in Georgia.

(2) Salt-water contamination of the Tertiary Limestone Aquifer in the coastal area, primarily in Beaufort County.

(3) Local well interference, where water levels have been lowered below some pump intakes.

(4) Interaquifer transfer, resulting in artesian pressure losses and(or) water quality impairment.

(5) Inadequate requirements relating to well location, spacing, construction, and abandonment.

(6) No requirements for proper water-use, well-construction, and hydraulic data reporting.

Potential problems include:

(1) Subsidence of the land surface (compaction subsidence) caused by excessive, concentrated ground-water withdrawals,

(2) Local dewatering of the Tertiary Limestone Aquifer,

(3) Land-surface subsidence and collapse, if certain conditions are created by improperly-planned well location and spacing, or by dewatering operations, and

(4) Ground-water pollution of aquifers within the Hawthorn-Recent and in the Tertiary Limestone Aquifer Systems.

There are several administrative problems that have a bearing on an effective ground-water management program. These are:

(1) Technical data acquisition and technology transfer.

(2) Uncoordinated water resources development, and

(3) Economics and financing of ground-water management.

An assessment of these technical and administrative problems indicates that:

- The major technical problems are related to ground-water withdrawals from the Tertiary Limestone Aquifer.
- Many of the problems are interrelated, and the solution of one problem would permit the solution of another problem.
- There is no local, state, or federal regulation which is capable of providing appropriate remedies for all of these ground-water problems.
- A ground-water management program is urgently needed that will provide for the proper development of the ground-water resources, and aid in eliminating some of the current problems.
- ***The uses of ground water in the Low Country area have developed to a degree which requires coordination and regulation. Therefore, it is recommended that the Low Country area, which includes all of Beaufort, Jasper, Colleton, and Hampton Counties and Edisto Island in Charleston County, be declared a capacity use area.***

If the Low Country area is declared a capacity use area, the SCWRC would have the authority to promulgate regulations concerning the drilling of wells and the withdrawal of ground water in the capacity use area. The following ground-water management methods are needed to protect the aquifers and ground-water users in the Low Country area.

1. *Coordinated water-supply planning.*

The major problem in the Low Country is uncoordinated pumpage, a water-supply management problem. In the past, ground-water development activities have been undertaken without proper consideration of existing ground-water withdrawals, both on a local and on a regional scale. Ground-water withdrawals from the Tertiary Limestone Aquifer in the Low Country area and the adjacent Savannah area now exceed a daily average of 110 Mgd. Throughout the Low Country area as a whole, greater ground-water withdrawals from this aquifer can be made. However, a comprehensive ground-water management program is needed to insure that the proper planning precedes additional pumpage from this important aquifer. This program must consider existing and future water-supply needs of both the Low Country and the adjacent Savannah area. Therefore, it is recommended that officials in South Carolina and Georgia establish a formal Interstate Ground Water Committee. With the proper coordination of ground-water management programs, existing water-supply problems could be realistically addressed. More importantly, emerging or possible future water-supply problems could be addressed before the problems become serious.

2. *Regulations to limit ground-water withdrawals in areas where the supply is limited or where the movement of poor-quality water is degrading a fresh-water aquifer.*

In some areas, it will become necessary to limit the quantity of ground water withdrawn from the Tertiary Limestone Aquifer in order to protect the aquifer from salt-water contamination. Currently, the most critical area is in southwestern Beaufort County where salt water is slowly moving into this aquifer. With the proper management of this aquifer, greater quantities of ground water can be withdrawn without immediate danger to fresh water. However, it is especially important that additional ground-water withdrawals be carefully planned, and that wells be properly designed and constructed.

3. *Regulations related to well spacing, well construction and abandonment.*

The proper location and construction of wells, and proper well-abandonment procedures are ground-water management methods, or "tools", that can be successfully employed in preventing excessive water-level declines, inter-aquifer transfer, salt-water contamination, and other problems outlined in this report.

4. *Regulations related to proper testing of aquifers during well-construction operations, and the proper reporting of this information.*

Certain types of information must be collected prior to, during, and after well-construction operations in order to insure the proper development (utilization) of ground-water resources. Prior to issuing a water use permit, the SCWRC would evaluate the effects of a proposed ground-water withdrawal in order to avoid or minimize adverse effects on the aquifer or existing users.

5. *Best Practical Management of Ground-Water Systems.*

In order to protect existing ground-water users, measures should be instituted that would provide for the best practical management of a ground-water system. Such measures would include careful consideration and evaluation of well placement, proper well spacing, and the establishment of "optimum practical" pumping rates and pumping water levels.

6. *Water Conservation and Alternative Water-Source Selection.*

Water users and prospective water users would be required to use the water of lowest quality available that is suitable, or can feasibly be made suitable, for a particular purpose. If necessary, water users would be required to utilize water-conservation measures where necessary to protect an aquifer or other water users. The selection of these water-management measures would be made on the basis of the best available technical information.

7. *Proper Ground-Water Monitoring.*

One of the most important ground-water management "tools" is the continual collection of ground-water data, including water levels, water quality, geophysical and well-construction data, and water-use information. Without these technical data, a ground-water management program can not be effective. Accordingly, it is recommended that the Regional Office of the SCWRC be maintained to collect and evaluate these data on a continuing basis. These data will insure that the proper technical assistance can be rendered to existing and prospective ground-water users.

Although ground-water problems are emphasized in this report, this report should not be used to suggest that ground water is an undependable resource. To the contrary, the ground-water resources of the area can sustain much greater development. Artesian aquifers in the Black Mingo, Black Creek, and Tuscaloosa Aquifer Systems are capable of supplying large quantities of good-quality water in much of Hampton and Colleton Counties, and possibly in northern Jasper and Beaufort Counties. The Tertiary Limestone Aquifer is also capable of supplying much greater quantities of water, providing wells are properly located and constructed.

The S. C. Ground Water Use Act of 1969 must be regarded as a ground-water management "tool" which can be utilized to insure the proper development and management of ground-water resources. If many of the ground-water management measures outlined in this report are not initiated, and ground-water problems become critical, certain management options may not be available over the long term.

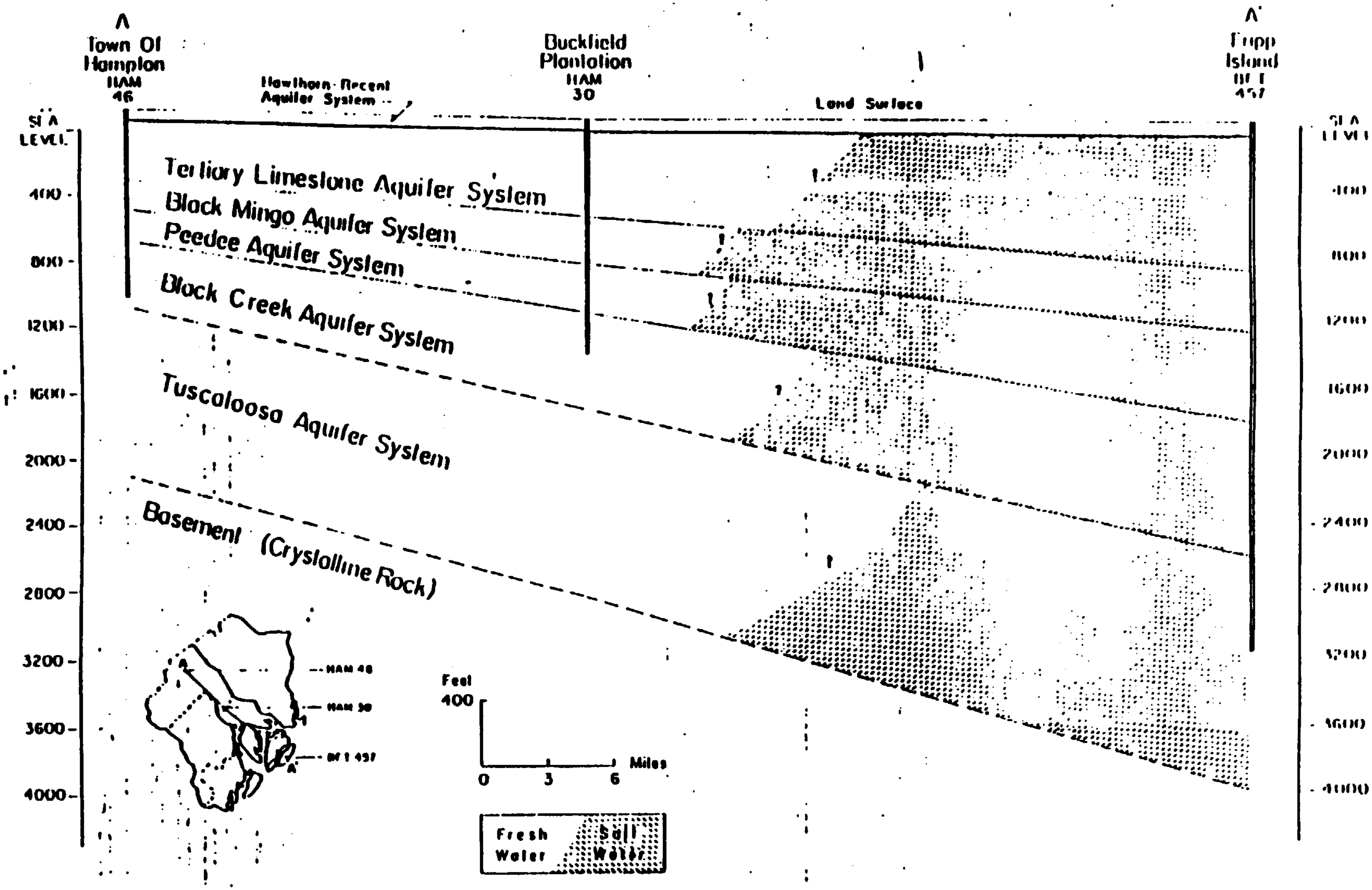

FIGURE 3. GENERALIZED HYDROGEOLOGIC CROSS-SECTION OF THE LOW COUNTRY AREA

geologic unit (or 'formation') boundaries. This parallelism of water-bearing zones and geologic units is important in understanding and 'mapping' hydrogeologic units throughout the Low Country area.

Using information from project test holes, other test holes, and water wells, the Tertiary Limestone Aquifer has been subdivided, for the purposes of this report, into two major hydrogeologic units in the Low Country area (see figs. 7 and 8). The delineation of these hydrogeologic units was based on lithologic, geophysical, and water-bearing (hydrologic) characteristics and current-meter tests run in selected test holes. These data were then correlated with lithologic and geophysical data in wells where current meter data were unavailable. These two hydrogeologic units consist of (1) an *Upper Hydrogeologic Unit* that contains an upper permeable zone delineated by Hayes (1979); and (2) a thick *Lower Hydrogeologic Unit* that is partly water-bearing but has relatively low permeability compared to the Upper Unit. Based on current-meter tests, Hayes (1979) identified a lower permeable zone near the base of the Lower Hydrogeologic Unit that is water-bearing but has a low permeability compared to the upper permeable zone. data?

The division of the Tertiary Limestone Aquifer into two major hydrogeologic units is done informally for the purpose of this report as an aid in explaining the water-bearing properties, use, and water-quality characteristics of this aquifer system. The division of a limestone aquifer system on the basis of permeable and impermeable 'zones' is a well-accepted practice in limestone hydrology where sufficient hydraulic (permeability) data are available. However, in the case where insufficient data exist (such as in Jasper County where few wells penetrate below the upper part of the Tertiary Limestone Aquifer System), it is rather difficult to discuss 'permeable' zones. Thus, we prefer to call this lower part of the Tertiary Limestone Aquifer the Lower Hydrogeologic Unit.

The Upper Hydrogeologic Unit is composed primarily of the upper part or unit of the Santee Limestone, but it also contains limestones of Oligocene and Miocene age, mainly in southwestern Beaufort County. As pointed out by Hayes, few wells in Jasper County penetrate below the Upper Unit; *thus, the hydrogeologic properties of the Lower Hydrogeologic Unit of the Tertiary Limestone Aquifer are unknown in Jasper County.*

As shown in figures 7 and 8, most of the Tertiary Limestone Aquifer is composed of the Lower Hydrogeologic Unit. Thus, permeable zones (aquifers) constitute a small part of the total thickness of the Tertiary Limestone Aquifer. *Although the Lower Unit is water-bearing in many places, the Upper Unit generally has a greater overall permeability and will yield much greater quantities of ground water to wells.*

According to Hayes (1979), the upper permeable zone is not present in southern Colleton County, and wells withdraw ground water from the Lower Hydrogeologic Unit. Therefore, in figure 7 (which is modified from Hayes' figure 3) we have extended the Upper Hydrogeologic Unit into southern Colleton County, but not the upper permeable zone.

and no water wells are known that are open only to the lower permeable zone in the Lower Hydrogeologic Unit.

The Lower Hydrogeologic Unit is not a single hydrogeologic unit. It is a thick complex unit that is composed of both aquifers and confining beds. However, the water-bearing zones (aquifers) within the Lower Unit are relatively thin and not as permeable as those in the Upper Unit. Prolific aquifers do not occur in the Lower Unit because these rocks are primarily 'impure' limestone or marl. Therefore, water-bearing solution cavities in this unit are not as thick and laterally extensive as those in the Upper Unit. Consequently, the large well yields that can be obtained from the Upper Unit (especially from the Upper permeable zone) in many areas generally cannot be obtained from the Lower Unit.

Lower Permeable Zone.--Currently the hydrogeologic characteristics of this zone are poorly known. Since no wells are known to be open only to this zone, additional knowledge must be obtained from current-meter and downhole sample tests before reasonable interpretations of the hydrogeology of this zone can be made.

As shown in several multi-zone test wells, aquifers in the Lower Unit contain saline formation water in the coastal parts of the Low Country (see, for example, fig. 6). Chloride and dissolved solids generally increase with depth in these zones; therefore, drilling a well deeper into the Lower Unit of the Tertiary Limestone Aquifer in these areas will not obtain better quality water.

Inland from the coastal area in northern Beaufort County and in Hampton and Colleton Counties, Lower Unit aquifers contain fresh water. However, as previously mentioned, water-quality data on these aquifers are poor, especially in Jasper County. Presumably, fresh water could be obtained from Lower Unit aquifers, at least in northern Jasper County.

In some areas of Hampton and Colleton Counties and possibly in northern Beaufort County, potentiometric head (or 'artesian pressure') of aquifers in the Lower Hydrogeologic Unit is believed to be greater than the potentiometric head of the Upper Unit. This belief is based on the fact that increases in artesian pressure were noted as some test holes penetrated deeper; and the potentiometric head of the Upper Unit has been reduced as a result of ground-water withdrawals. Thus, in some areas, it may be possible to obtain flowing artesian wells by tapping aquifers in the Lower Unit, whereas shallower wells completed in the Upper Unit no longer flow. In some cases, if a well penetrates and is uncased through both the Upper and Lower Units, ground water could flow upward from a Lower Unit aquifer and into the lower-head Upper Unit. This probably would also occur in open-hole wells drilled in much of Jasper County where the potentiometric head of the Upper Unit has been substantially reduced as a result of large ground-water withdrawals from this unit at Savannah (see fig. 14). It must be emphasized that hydraulic data on Lower Unit aquifers is so limited that upward movement of ground water from the Lower Unit is more speculation than documented fact.

A comparison of the potentiometric map (fig. 12) with an 1880 potentiometric map constructed by Warren (1944) indicates an overall water-level decline of approximately 185 feet at the center of the cone of depression at Savannah (fig. 13). Figure 13, a net water-level decline map, shows the approximate total net decline of water level in the Tertiary Limestone Aquifer since 1880. This map indicates that ground-water withdrawals, primarily from the Upper Unit, in the Savannah-Low Country area have lowered water levels from 70 to 100 feet in the southern portion of Jasper County and from 30 to 50 feet in southwestern Beaufort County. Water levels in Hampton, northern Jasper, northern Beaufort, and Colleton Counties have declined nearly 10 feet.

In an area surrounding the City of Walterboro, water-level declines have been about 10 to 30 feet. In this area, Hayes (1979) suggested that the upper permeable zone of the Upper Hydrogeologic Unit is absent or very thin and most wells withdraw water from the Lower Hydrogeologic Unit. According to Hayes, the lower permeability of the Lower Hydrogeologic Unit combined with the volume of water being withdrawn in the vicinity of Walterboro probably accounts for the greater water-level declines near Walterboro.

The decline of water levels in the Tertiary Limestone Aquifer has changed the original direction of ground-water movement which was generally toward Port Royal Sound, as indicated from a map constructed by Warren (1944). The 1976 potentiometric map (fig. 12), like earlier maps, shows how the heavy pumpage at Savannah has displaced the original configuration of the potentiometric contours and has shifted the direction of ground-water movement from Port Royal Sound toward the center of pumpage at Savannah. The effects of these water-level declines are discussed in the following section.

RECHARGE-DISCHARGE RELATIONSHIPS

The Upper Hydrogeologic Unit of the Tertiary Limestone Aquifer in the Low Country is recharged primarily from precipitation in the outcrop area, mainly in southern Allendale, Bamberg, and Orangeburg Counties; by vertical leakage from overlying aquifers; and by some upward leakage from underlying Lower Unit aquifers. *Both Nuzman (1972) and Hayes (1979) estimated that recharge from the outcrop areas amounted to about 45 Mgd.*

There are many areas where recharge takes place by vertical downward leakage from the overlying shallow aquifers in the Hawthorn-Recent Aquifer System. Hayes estimated that this leakage amounts to 5 to 10 Mgd within the boundaries of the study area. The most prominent area of downward leakage is centered near the Marine Corps Auxiliary Air Station (MCAAS) on Port Royal Island (fig. 12). In this area, downward leakage is significant and water levels in the Upper Hydrogeologic Unit (-25 feet msl) are higher than those normally occurring in the surrounding area. Siple (1960b) suggested that these comparatively high water levels in the aquifer resulted from downward leakage through the overlying confining beds which, in this of other fresh-water aquifers or saline-water aquifers for a particular purpose, requiring conjunctive use of surface-and ground-water resources, plugging and abandonment of wells, and other factors. As outlined previously in this report, the control of salt-water contamination of an aquifer may be fairly simple or extremely complicated. The primary factor in the control of salt-water contamination is the control of hydraulic gradient which is related directly to ground-water withdrawals.

CONCLUSIONS AND RECOMMENDATIONS

After careful consideration of the data collected during the Low Country Capacity Use Investigation, and data collected by the SCWRC, USGS, and others prior to this investigation, the following conclusions and recommendations are submitted to the Commission for consideration.

Surface water is currently not utilized to a large extent for water supplies in the Low Country area. Since most streams in the coastal area either contain salty water or have insufficient fresh-water discharge, there are few withdrawal uses of fresh water from these streams. Thus, several water users have had to resort to interbasin transfers from the Savannah or Edisto Rivers. Approximately 5 Mgd are withdrawn from the Savannah River and transported via canal to the Beaufort area by the Beaufort-Jasper Water Authority; and approximately 75 Mgd are withdrawn from the Edisto River and transported via underground tunnels to the Charleston area by the Charleston Water Works.

Ground water is by far the most important source of water supplies for public, rural-domestic (private), industrial, and agricultural supplies in the Low Country area. This ground water is obtained from six major aquifer systems that are now supplying or are capable of supplying from small to large ground-water supplies. These are, from the surface downward, (1) shallow aquifers within the Hawthorn Formation and unnamed Pleistocene deposits, included in the Hawthorn-Recent Aquifer System in this report; (2) the Tertiary Limestone Aquifer; (3) the Black Mingo Aquifer System; (4) the Peedee Aquifer System; (5) the Black Creek Aquifer System; and (6) the Tuscaloosa Aquifer System.

In order of their current utilization for ground-water supplies, the most important are the Tertiary Limestone, the Black Creek, the Black Mingo, and the Tuscaloosa Aquifer Systems. The Tertiary Limestone Aquifer is currently the most heavily developed aquifer system throughout the area as a whole. Aquifers within the deeper artesian aquifer systems are primarily utilized in Hampton and Colleton Counties, and to a much lesser extent in coastal Beaufort County. The Peedee Aquifer System is not known to yield large quantities of ground water to wells in the area; and if used at all, it is probably developed with overlying or underlying aquifer systems. Shallow aquifers occur in some areas in the Hawthorn Formation and (or) Pleistocene deposits and are tapped by small-diameter, shallow wells used primarily for rural-domestic supplies in Jasper County and in some areas of Beaufort County; however, these shallow aquifers are relatively thin, laterally discontinuous, and relatively untapped. The major functions of these shallow sediments are as a confining bed over the underlying Tertiary Limestone Aquifer, and as a source of recharge by the process of downward leakage.

The estimated total ground-water withdrawals in the four-county area is an average of about 50 Mgd. However, much of this total includes ground water withdrawn for commercial and agricultural irrigation, and only a fraction of the flowing artesian wells in the area have been properly inventoried. Thus, the total ground-water withdrawals during certain periods could easily range from about 30 Mgd to as much as 70 Mgd. It is believed that most of the flowing artesian wells that have been inventoried in Hampton and Colleton Counties tap the Black Mingo Aquifer System. However, in some areas, these wells tap water-bearing (permeable) zones in the middle and lower parts of the Tertiary Limestone Aquifer.

The largest ground-water withdrawals (approximately 35 Mgd) in the Low Country area are from the Tertiary Limestone Aquifer. This aquifer is the most economical source of large quantities of good-quality water throughout much of the area. Present information indicates that there is no alternative source of good quality ground water in much of Beaufort County and the southern portions of Jasper and Colleton Counties. Deeper artesian aquifers are utilized to some extent in Hampton and Colleton Counties, primarily by industries and municipalities. However, in Beaufort and southern Colleton Counties, these deeper aquifers either contain mineralized water; are not as productive; or they occur at greater depths and their utilization is not as economical as that of the Tertiary Limestone Aquifer. *Therefore, the Tertiary Limestone Aquifer is almost exclusively utilized as a source of fresh-water supplies in much of the Low Country.* The largest withdrawals from this aquifer (25 Mgd) are in Beaufort County, where approximately 10 to 15 Mgd are used for commercial and agricultural irrigation. The Tertiary Limestone Aquifer is also extensively (many wells) but not heavily utilized throughout the remainder of the Low Country area. In the Savannah area, approximately 75 to 90 Mgd of ground water are withdrawn from the Tertiary Limestone Aquifer by 21 water users, mainly for industrial and public water supplies. Contacts with Georgia and USGS ground-water officials indicate a lack of accurate water-use reporting, and to date they have not conducted a thorough water-use inventory. Thus, pumpage from the Tertiary Limestone Aquifer in Chatham County alone may periodically exceed 90 Mgd.

There are several major problems occurring now in the Low Country area, and others that are likely to become serious if the ground-water resources are not properly managed. These problems have been categorized as 'technical' and 'administrative' in this report, but their separation has been primarily to facilitate orderly discussion. They are, in fact, closely interrelated.

As summarized in this report, the major technical problems are related to ground-water withdrawals from the Tertiary Limestone Aquifer. Documented problems that are directly related to these withdrawals include (1) regional water-level declines (loss of artesian pressure) throughout large areas of the Low Country and adjacent counties in Georgia, (2) progressive salt-water contamination of this aquifer in parts of the coastal area, (3) local well interference where water levels are lowered below some pump intakes, (4) interaquifer transfer resulting in local artesian pressure losses in wells and water quality impairment. Potential problems that could result from improper well design, location, and spacing include (1) subsidence of the land surface, which has occurred in the Savannah area, (2) local dewatering of the Tertiary Limestone Aquifer, and (3) land-surface subsidence and collapse if certain conditions are created.

The problems are related to varying degrees, and the solution of one problem would permit the solution of another problem. *The one factor common to all of the problems is hydraulic gradient, which is related to ground-water withdrawals.* Of course, some of these problems have been more serious in some areas than in others. As summarized in this report, the 'seriousness' of a ground-water problem ranges from loss of a ground-water supply to little more than aggravation. Recognizing that the degree of 'seriousness' of a water problem is highly subjective, we have tried to evaluate the degree of seriousness on the basis of technically-documented facts rather than speculation.

Ground-water pollution of shallow aquifers has occurred in some areas and locally poses a potential threat to the Tertiary Limestone Aquifer. Several cases of ground-water pollution have been intensively investigated by the SCDHEC, and other cases are being investigated at the present time. The final results of these investigations have not been released by the SCDHEC. Therefore, we have not speculated in this report on the results of these investigations.

The major problem in the Low Country area is unregulated, uncoordinated pumpage. Closely linked to the 'technical' problems associated with this pumpage are several 'administrative' problems. In effect, there is no ground-water management in the Low Country area.

At the present time, almost anyone can drill a well pretty much where they wish and pump how much they wish. There is essentially no control on well depths and type of well construction. There are no controls on amount of ground-water pumpage, water levels, and well location and spacing. The only existing controls on well location or construction are for wells utilized for public drinking-water supplies. These requirements pertain primarily to the quality (potability) of ground water which must meet certain minimum drinking-water standards established by the U. S. Environmental Protection Agency.

There are no requirements, or minimal requirements for collecting and reporting certain technical data to a state agency. Many types of data should be submitted prior to any well-construction activity so that a prospective withdrawal can be evaluated as to its possible effects on existing water users or on the aquifer.

Other types of hydrogeologic data should be collected and submitted to the proper authority, either during or immediately after well-construction operations. These requirements are important for several reasons: (1) In many cases, the collection of proper data by a prospective water user, his consultant, or well-drilling contractor prior to beginning a proposed withdrawal will save a prospective water user hundreds or perhaps even thousands of dollars for an unnecessary expense. (2) The collection of proper hydrogeologic data during well-construction operations would save the well owner money; it would insure protection for the well owner and well-drilling contractor should questions arise concerning the adequacy of well-construction in obtaining the desired quantity and quality of ground water. (3) Accumulated hydrogeologic and well-construction data will be properly stored and evaluated so it can be utilized by the water users, consultants, future water users, well-drilling contractors, or any other individual requesting the information. (4) The continual evaluation of these data by state hydrologists would insure that ground-water knowledge of the area is accumulated for utilization by the general public, prospective water users, and others.

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As required by the S. C. Ground Water Use Act, an assessment has been made of existing methods to solve or minimize water-use problems short of declaring a capacity use area. These ground-water management methods consist of both regulatory and voluntary methods.

There is no local, state, or federal law or regulation which is capable of providing appropriate remedies for the ground-water use and management problems outlined in this report. Contacts with local government agencies indicate a lack of authority, funding, personnel, and technical expertise to carry out a ground-water managment program. There have been no substantiative changes in state or federal law since completion of our first capacity-use report that merit detailed review in this report, because none that we know of would be unnecessarily duplicative of authorities granted to the SCWRC by the S. C. Ground Water Use Act.

In connection with voluntary ground-water management methods, it would indeed be a fortunate circumstance if all ground-water users and potential ground-water users in both South Carolina and Georgia, and others involved in designing and constructing wells, could agree on proper ground-water development and management methods. While 'voluntary' sounds good (and indeed proper coordination among various ground-water users would be ideal), it has not been done in the past. However, we believe it must be done in the future.

One aspect of 'voluntary' ground-water managment is a sound technical assistance program, and the SCWRC, SCDHEC, and USGS are committed, in our opinion, to providing the best technical assistance possible in assisting existing and prospective ground-water users. Indeed, these technical assistance efforts have in the past prevented many problems. However, the State can only do so much in terms of technical assistance; and the State can not and should not be reasonably expected to provide all services that logically must be provided by the water user or potential water user. Thus, *our conclusion regarding voluntary ground-water management methods is that they could not possibly provide solutions to all of the problems and potential problems identified in this report.*

A ground-water management program is urgently needed in the Low Country that will provide for the orderly development of the ground-water resources, and aid in eliminating some of the current problems, or preventing them from becoming worse; and in preventing future water-use conflicts, waste, and overdevelopment. We believe the following specific recommendations are needed to help solve or, at least, alleviate the problems arising from the development of the ground-water resources and are herein submitted for consideration by the Commission.

Declaration of a Capacity Use Area: which would include all of Beaufort, Jasper, Hampton, and Colleton Counties, and Edisto Island (Charleston County). Recommended boundaries of the proposed Low Country Capacity Use Area are shown on figure 20.

Much consideration has been given to recommending the declaration of a larger capacity use area to include recharge areas of the Tertiary Limestone Aquifer in adjacent Allendale, Bamberg, and southern Orangeburg Counties. There would be several advantages to doing this in regard to ground-water management. However, there are several reasons, both technical and administrative, why we do not recommend the declaration of a larger capacity use area at this time: (1) With the technical data presently available on these recharge areas, we do not feel that ground-water development from the Tertiary Limestone Aquifer in Allendale, Bamberg, and southern Orangeburg Counties 'significantly' affects artesian pressures of this aquifer in the Low Country area at this time. We are now in the process of refining hydrogeologic data in these areas, and we believe that through a good technical assistance program, potential problems can be avoided. In addition, the high-capacity wells in these areas are primarily completed in deeper artesian aquifers. Ground-water development from these deeper aquifers should have little effect on the overlying Tertiary Limestone Aquifer, unless interaquifer transfer becomes a problem. (2) Administratively, with the current level of funding for our Capacity Use Program, funding and personnel constraints would limit the effort needed to manage a larger capacity use area. (3) The current needs of ground-water management efforts in the Low Country area, especially in the coastal area, are so great that a large area could not be managed without additional funding and manpower. Therefore, the recommended boundaries are somewhat of a compromise between good ground-water management practices and current administrative constraints. However, we believe our recommendations are adequate to provide for proper ground-water management.

Although not specifically required by the S. C. Ground Water Use Act for this report, we would recommend that the following ground-water management methods be instituted if a capacity use area is declared. If the Low Country area is declared a capacity use area, we would recommend adoption of the same type of ground-water management regulations that have been promulgated for the Waccamaw Capacity Use Area. Copies of these regulations, which were approved on June 22, 1979, are available from the SCWRC upon request.

1. *Regulations to limit ground-water withdrawals in areas where the supply is limited or where it has been documented that the movement of poor quality water is degrading a fresh-water aquifer:*

As discussed and illustrated in this report, there is no question that in some areas it will become necessary to limit the quantity of ground water withdrawn from the Tertiary Limestone Aquifer in order to protect the aquifer from further salt-water contamination, and (or) to protect water users. The State of Georgia has already established pumpage limitations in the Savannah area of Chatham County, and Georgia officials are not permitting additional ground-water withdrawals in that area.

2. *Regulations related to well spacing, construction, and abandonment; proper testing of aquifers during well-construction operations; and the proper reporting of all such data:*

Reasonable application of these ground-water management "tools" would be of enormous benefit in preventing further salt-water contamination, and interaquifer transfer; and in preventing needless expenditures for unnecessary ground-water or surface-water development activities. By controlling well spacing and design, excessive water-level declines can often be prevented, thus decreasing the threat of salt-water contamination by lateral encroachment and intrusion, upconing, and interaquifer transfer. Improper well abandonment may not be completely stopped by requiring well-abandonment permits, but it can at least be reduced in the most critical areas. The proper reporting of hydrogeologic data will enable the ground-water data base to be refined and expanded so as to insure the most reliable information.

3. *Ground-water monitoring program:* A ground-water monitoring program is needed to measure continuing changes in water levels and water quality. Long-term records of these measurements, correlated with accurate water-use and other data, provide the most reliable information on the capacity of aquifers to sustain long-term withdrawals. The SCWRC test wells completed during phase I of the Low Country Capacity Use Investigation are available for future monitoring. However, it is estimated that a minimum of an additional 20 properly constructed multi-aquifer test wells will be necessary to establish an adequate ground-water monitoring network in the coastal area of the Low Country. These test wells would be in addition to test wells needed for special studies in local areas.

4. *Water conservation measures:* Each ground-water user should be encouraged to limit ground-water development activities to actual needs, and to make concerted efforts to reduce water requirements as much as technically and economically feasible. The State of Georgia has already done so in the Savannah area, encouraging water-requirement reduction and the recycling of water.

5. *Water users should be required to use the water of lowest quality available that is, or can feasibly be made, suitable for a particular purpose.* For example, for certain water uses that do not require drinking-water quality, a ground water of lower quality could be utilized and thus conserve higher-quality ground water.

6. *Measures should be instituted that would provide for the best practical management of the ground-water system and cause the least interference with existing water users.* Such measures would include careful consideration of well or well-field placement, proper well spacing, and the establishment of "optimum practical" pumping rates and pumping water levels. In short, prior to permitting a certain withdrawal, the water user should be required to consider the best location for a well, which may not necessarily be his most economic location. One area in particular which this is already critical is in southwestern Beaufort County (specifically on Hilton Head Island). The concentration of extremely large-capacity wells without proper spacing and depth control that are to be completed in the Tertiary Limestone Aquifer should be prohibited. Again, prohibition of future ground-water withdrawals from this aquifer, even in coastal Beaufort County, is unrealistic and not supported by the technical data. We are recommending careful consideration of these withdrawals. For example, if it is shown that two properly-spaced lower capacity wells can replace one large-capacity well, then this would be the proper alternative.

7. *If a capacity use area is declared, we would recommend that no well in coastal Beaufort County (especially southeast of the Coosaw River), regardless of capacity or purpose, should be drilled without first obtaining a permit from the SCWRC under the provisions of Section 49-5-40(a)(2) of the Ground Water Use Act.* The primary concern is not necessarily the quantity that may be withdrawn through a small-diameter well, but the possible contribution to salt-water contamination if the well were improperly constructed. If a reasonable need could not be shown, and the proper well-construction criteria could not be adherred to then the well should not be permitted.

8. *Measures for proper monitoring:* There are some areas, southwest of the Broad River for example, where prospective water users wishing to install a large-capacity well or well field should bear the cost of one or more observation wells if it is deemed necessary. For example, if a water user wished to locate a large-capacity well in close proximity (within 2,000 feet) of a known fresh-salt-water interface (or a suspected interface), he should be required to install a minimum of one salt-water monitor well. The State of S.C. should not be expected to do this; we have neither the funding, equipment, nor the personnel budget to do so. Obviously, the greater the quantity of ground-water use requested, the greater the need for monitoring. It is entirely possible, or even probable, that one relatively inexpensive small-diameter (four inch) test well may save a prospective water user from an unnecessary large expense.

Two other recommendations should be considered, and are strongly recommended whether or not a capacity use area is declared.

1. *Maintain the SCWRC Regional Office in Beaufort, South Carolina:* This office will serve the proposed Low Country Capacity Use Area (if declared) as well as Allendale, Bamberg, and Barnwell Counties. The duties of personnel assigned to this office will include carrying out the administrative responsibilities necessary to manage the proposed capacity use area (if declared) as well as carrying out a comprehensive ground-water research and technology transfer program to assist existing and prospective ground-water users. The ground-water program conducted from this office will be directed towards providing an adequate ground-water research program consisting of the collection and evaluation of basic hydrogeologic data pertaining to the occurrence, movement, availability, and chemical quality of ground water. As such data become available, they will be interpreted and evaluated and reported immediately by direct oral communication, and letter-type reports; and these data will be published by the SCWRC on a regular basis.

2. *Establish a formal Interstate Ground-Water Committee composed of representatives from South Carolina and Georgia:* Insomuch as the impact of ground-water withdrawals does not stop at state boundaries, a technical ground-water committee, composed of hydrologists from South Carolina and Georgia, should be created immediately. Because both Georgia and South Carolina rely heavily on the Tertiary Limestone Aquifer in the Low Country-Savannah area, several problems involving water rights are becoming more apparent as the demand for ground water increases. A Technical Ground-Water Committee could serve as a source of communication whereby joint efforts could be made by qualified ground-water personnel to seek practical solutions to present technical problems and future water-supply needs of the area.

It should be re-emphasized that the ground-water resources of the Low Country area, as a whole, can sustain much greater development. Deep artesian aquifers below the Tertiary Limestone Aquifer in Hampton County, much of Colleton County, and possibly in northern Beaufort and Jasper Counties are capable of supplying much greater quantities of fresh, good-quality ground water to properly constructed wells. If the ground-water resources of the Tertiary Limestone Aquifer are properly managed, this aquifer system is also capable of additional development. As mentioned in the "Introduction", this report, as required by a State law, has concentrated on problems that require the application of proper ground-water management. *Therefore, it would be erroneous and totally misleading for this report to be utilized to suggest that ground water is an undependable resource.* On the other hand, we hope that we have not left the reader with the impression that the problems are not serious. *To the contrary, without proper management, ground-water management options now available may not be available in the short term and certainly not over the long term.*

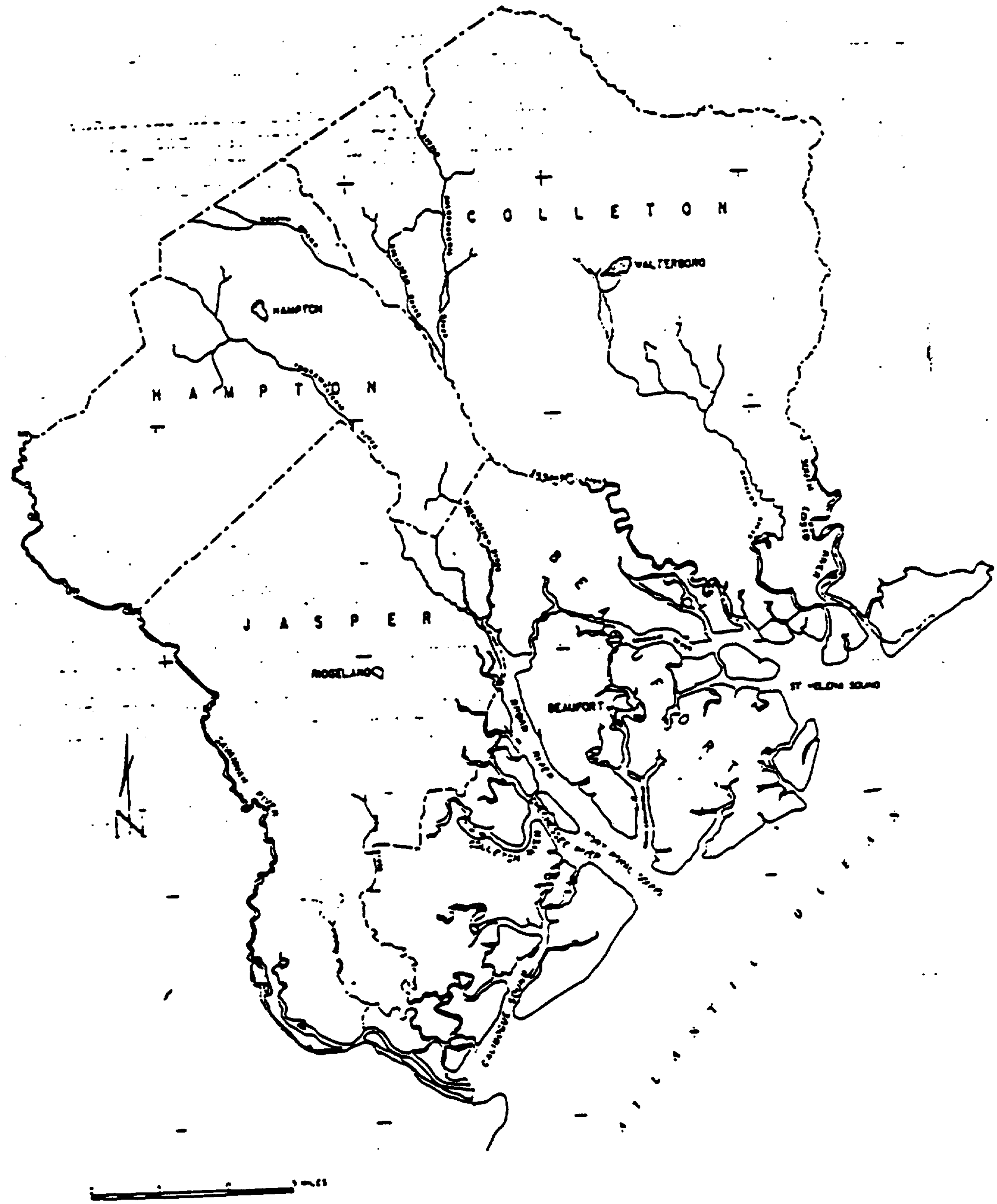

FIGURE 2[illegible]. BOUNDARY OF PROPOSED LOW COUNTRY CAPACITY USE AREA.

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REFERENCE 19

GROUNDWATER

R. Allan Freeze/John A. Cherry

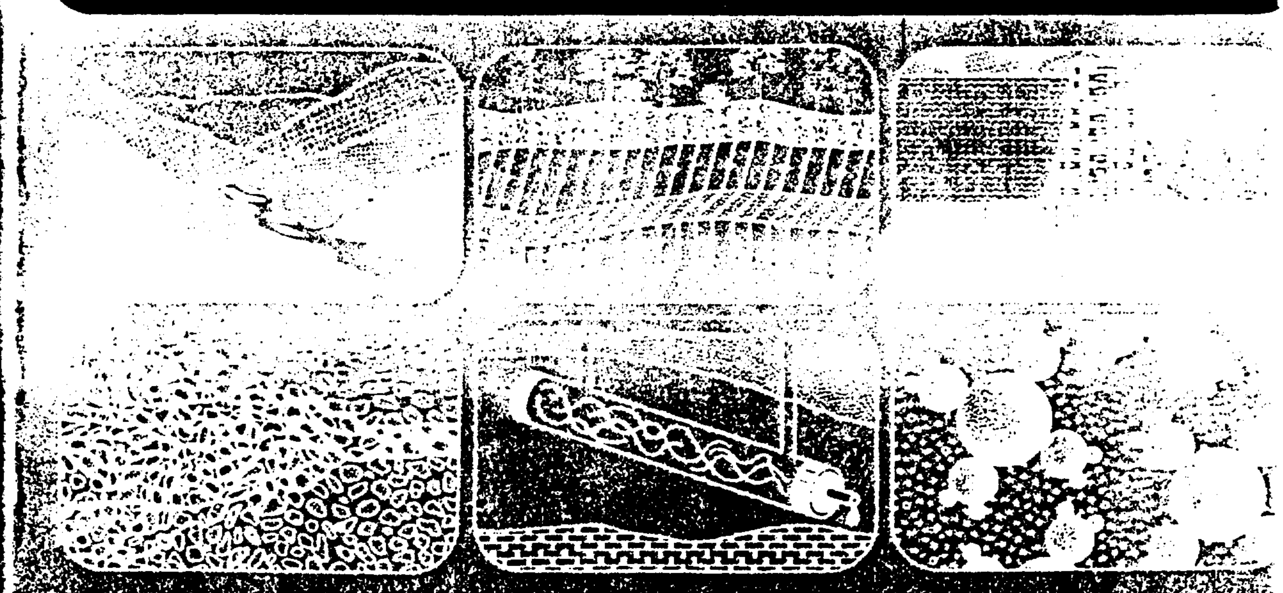

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Table 2.2 Range of Values of Hydraulic Conductivity and Permeability

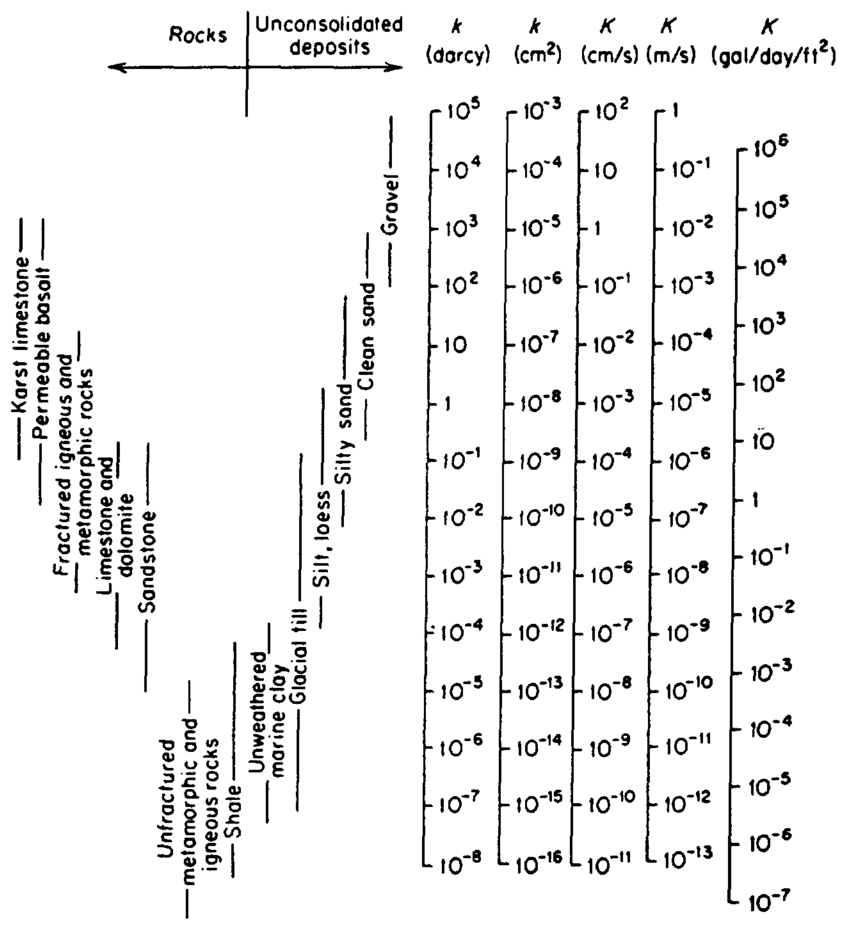


Table 2.3 Conversion Factors for Permeability and Hydraulic Conductivity Units

	Permeability, k*			Hydraulic conductivity, K		
	cm²	ft²	darcy	m/s	ft/s	U.S. gal/day/ft²
cm²	1	1.08×10^{-3}	1.01×10^{8}	9.80×10^{2}	3.22×10^{3}	1.85×10^{9}
ft²	9.29×10^{2}	1	9.42×10^{10}	9.11×10^{5}	2.99×10^{6}	1.71×10^{12}
darcy	9.87×10^{-9}	1.06×10^{-11}	1	9.66×10^{-6}	3.17×10^{-5}	1.82×10^{1}
m/s	1.02×10^{-3}	1.10×10^{-6}	1.04×10^{5}	1	3.28	2.12×10^{6}
ft/s	3.11×10^{-4}	3.35×10^{-7}	3.15×10^{4}	3.05×10^{-1}	1	6.46×10^{5}
U.S. gal/day/ft²	5.42×10^{-10}	5.83×10^{-13}	5.49×10^{-2}	4.72×10^{-7}	1.55×10^{-6}	1

*To obtain k in ft², multiply k in cm² by 1.08×10^{-3}.

NUS CORPORATION A.

REFERENCE 20

TELECON NOTE

CONTROL NO. F4-8904-54	DATE: December 13, 1989	TIME: 1140
DISTRIBUTION: American Color andChemical/Venture Chemical File		
BETWEEN: Mr. Henry Walker	OF: Dickenson Well Drilling & Pump Service	PHONE: (803) 524-2274
AND: James Miller, NUS Corporation J.M.		

DISCUSSION:

Called Henry Walker, a local water well driller, and asked about aquifer use within 4 miles of Lobeco Products, Inc. Mr. Walker stated that about 95% of the groundwater supply for this area is obtained from the Tertiary Limestone aquifer. The wells completed within this unit are normally about 80 feet deep. All other groundwater supplies are obtained from shallow (18-25 feet below land surface) wells screened in the surficial aquifer.

REFERENCE 21

Table 6. Household, Family, and Group Quarters Characteristics: 1990

[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	Householder living alone: Total	Householder living alone: 65 years and over: Total	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
The State	3 370 160	1 258 044	928 206	710 089	178 204	329 838	281 347	109 012	88 912	2.68	3.18	116 543	44 134	72 409
COUNTY														
Abbeville County	23 216	8 780	6 560	5 003	1 248	2 220	2 070	1 093	871	2.64	3.14	646	209	437
Aiken County	119 250	44 883	33 450	26 436	5 814	11 433	10 113	3 814	2 984	2.66	3.13	1 690	1 272	418
Allendale County	10 646	3 791	2 720	1 581	976	1 071	986	472	343	2.81	3.43	1 076	1 044	32
Anderson County	143 558	55 481	41 495	33 272	6 474	13 986	12 579	5 865	4 721	2.59	3.04	1 638	931	707
Bamberg County	15 891	5 587	4 118	2 733	1 160	1 469	1 359	663	498	2.84	3.41	1 011	112	899
Barnwell County	19 996	7 100	5 369	3 836	1 274	1 731	1 586	713	536	2.82	3.31	297	236	61
Beaufort County	79 634	30 712	22 854	18 433	3 602	7 858	6 286	2 215	1 710	2.59	3.01	6 791	261	6 530
Berkeley County	127 656	42 386	34 083	28 025	4 619	8 303	6 657	1 785	1 384	3.01	3.38	1 120	937	183
Calhoun County	12 645	4 487	3 396	2 507	705	1 091	1 004	511	387	2.82	3.34	108	88	20
Charleston County	278 920	107 069	73 392	53 579	16 142	33 677	28 434	7 982	6 232	2.61	3.16	16 119	1 923	14 196
Cherokee County	44 009	16 456	12 353	9 366	2 343	4 103	3 757	1 708	1 388	2.67	3.15	497	241	256
Chester County	32 052	11 448	8 658	6 231	2 006	2 790	2 574	1 306	1 036	2.80	3.31	118	118	-
Chesterfield County	38 197	14 047	10 571	7 807	2 233	3 476	3 193	1 516	1 190	2.72	3.21	380	370	10
Clarendon County	28 212	9 544	7 414	5 121	1 895	2 130	1 984	1 008	740	2.96	3.45	238	217	21
Colleton County	34 095	12 040	9 220	6 803	1 934	2 820	2 583	1 248	956	2.83	3.31	282	220	62
Darlington County	60 797	21 999	16 684	11 939	3 908	5 315	4 855	2 158	1 758	2.76	3.24	1 054	829	225
Dillon County	28 819	9 887	7 423	4 936	2 090	2 464	2 264	1 052	848	2.91	3.47	295	224	71
Dorchester County	80 968	28 213	22 317	18 165	3 247	5 896	4 805	1 537	1 241	2.87	3.25	2 092	1 717	375
Edgefield County	18 107	6 424	4 904	3 702	922	1 520	1 408	644	510	2.82	3.31	268	165	103
Fairfield County	21 860	7 467	5 698	3 977	1 395	1 769	1 634	798	558	2.93	3.45	435	407	28
Florence County	111 645	40 217	30 175	21 639	6 947	10 042	8 773	3 495	2 850	2.78	3.27	2 699	1 662	1 037
Georgetown County	46 097	16 275	12 536	9 557	2 436	3 739	3 354	1 502	1 156	2.83	3.31	205	165	40
Greenville County	311 951	122 878	87 897	69 531	14 856	34 981	30 345	11 110	9 075	2.54	3.05	8 216	3 104	5 112
Greenwood County	57 937	22 730	16 300	12 396	3 188	6 430	5 745	2 557	2 094	2.55	3.06	1 630	686	944
Hampton County	18 125	6 322	4 766	3 420	1 117	1 556	1 438	721	566	2.87	3.41	66	64	2
Horry County	140 400	55 764	40 450	32 537	6 273	15 314	12 434	4 152	3 258	2.52	2.97	3 563	752	2 811
Jasper County	15 221	5 298	4 033	2 749	1 027	1 265	1 152	541	396	2.87	3.38	266	126	140
Kershaw County	43 190	15 810	12 214	9 080	2 029	3 596	3 221	1 393	1 101	2.73	3.17	409	384	25
Lancaster County	54 117	19 778	15 313	11 677	2 750	4 465	3 983	1 874	1 516	2.74	3.16	399	265	134
Laurens County	55 423	20 660	15 584	11 889	2 929	5 076	4 611	2 187	1 745	2.68	3.16	2 669	1 648	1 021
Lee County	18 284	6 054	4 683	3 073	1 361	1 371	1 277	610	470	3.02	3.53	153	132	21
Lexington County	166 222	61 633	47 274	38 622	6 607	14 359	11 622	3 599	2 920	2.70	3.10	1 369	1 198	161
McCormick County	7 501	2 731	2 054	1 481	471	677	620	315	230	2.75	3.25	1 367	1 361	6
Marion County	33 634	11 766	8 899	6 852	2 635	2 867	2 662	1 284	1 025	2.86	3.39	265	242	23
Marlboro County	28 677	10 163	7 513	4 910	2 145	2 650	2 441	1 156	898	2.82	3.38	684	590	94
Newberry County	32 406	12 314	9 005	6 706	1 848	3 309	3 066	1 604	1 291	2.63	3.15	766	288	478
Oconee County	57 050	22 358	16 875	13 891	2 235	5 483	4 922	2 093	1 664	2.55	2.98	444	406	38
Orangeburg County	81 133	28 909	21 565	14 879	5 576	7 344	6 565	2 920	2 296	2.81	3.33	3 670	816	2 854
Pickens County	86 388	33 422	24 159	20 278	2 932	9 263	7 138	2 862	2 371	2.58	3.02	7 506	672	6 834
Richland County	259 629	101 590	67 604	48 859	15 453	33 986	28 866	7 361	5 972	2.56	3.15	26 091	11 144	14 947
Saluda County	16 046	5 824	4 485	3 511	748	1 339	1 231	658	524	2.76	3.20	311	201	110
Spartanburg County	220 739	84 503	62 663	48 679	11 099	21 840	19 014	8 058	6 539	2.61	3.07	6 061	3 806	2 255
Sumter County	95 063	32 723	25 673	19 121	5 480	7 050	6 221	2 530	2 017	2.91	3.34	7 574	1 345	6 229
Union County	30 109	11 407	8 519	6 277	1 829	2 888	2 696	1 402	1 163	2.64	3.13	228	221	7
Williamsburg County	36 660	12 108	9 380	6 442	2 484	2 728	2 585	1 309	1 004	3.03	3.56	155	155	-
York County	127 895	47 006	35 908	28 381	5 962	11 098	9 204	3 602	2 921	2.72	3.14	3 602	1 180	2 422
PLACE AND COUNTY SUBDIVISION														
Abbeville city, Abbeville County	5 674	2 282	1 546	973	501	736	685	359	303	2.49	3.11	104	104	-
Aiken city, Aiken County	19 245	7 749	5 341	4 139	1 025	2 408	2 132	872	712	2.48	3.05	627	582	45
Allendale town, Allendale County	4 356	1 566	1 110	562	479	456	417	201	152	2.78	3.40	54	22	32
Anderson city, Anderson County	24 819	10 509	6 645	4 428	1 895	3 864	3 497	1 750	1 479	2.36	3.03	1 365	680	685
Andrews town	3 050	1 024	767	526	211	257	238	130	108	2.98	3.58	-	-	-
Georgetown County	3 038	1 019	764	523	211	255	236	129	108	2.98	3.58	-	-	-
Williamsburg County	12	5	3	3	-	2	2	1	-	2.40	3.33	-	-	-
Arcadia Lakes town, Richland County	899	360	275	251	22	85	70	27	19	2.50	2.87	-	-	-
Arial CDP, Pickens County	2 604	998	765	637	94	233	208	96	79	2.61	3.02	-	-	-
Atlantic Beach town, Horry County	446	189	119	50	62	70	60	15	9	2.36	2.98	-	-	-
Aynor town, Horry County	470	182	136	106	28	46	40	23	22	2.58	2.96	-	-	-
Bamberg town, Bamberg County	3 564	1 332	952	603	306	380	349	180	136	2.68	3.28	279	76	203
Barnwell city, Barnwell County	5 157	1 916	1 371	909	399	545	487	206	161	2.69	3.25	98	98	-
Batesburg town	4 058	1 470	1 103	699	349	367	331	183	152	2.76	3.21	24	-	24
Lexington County	3 673	1 354	999	648	303	355	320	176	147	2.71	3.19	24	-	24
Saluda County	385	116	104	51	46	12	11	7	5	3.32	3.44	-	-	-
Beaufort city, Beaufort County	9 367	3 807	2 624	1 885	622	1 183	1 032	423	353	2.46	3.00	209	207	2
Belton city, Anderson County	4 646	1 932	1 358	1 027	274	574	536	298	251	2.40	2.92	-	-	-
Belvedere CDP, Aiken County	6 123	2 245	1 754	1 438	258	491	428	144	112	2.73	3.14	10	-	10
Bennettsville city, Marlboro County	9 329	3 451	2 451	1 530	790	1 000	936	462	389	2.70	3.32	16	15	1
Berea CDP, Greenville County	13 283	5 382	3 892	3 008	641	1 490	1 242	384	329	2.47	2.91	252	252	-
Bethune town, Kershaw County	405	165	115	98	13	50	48	35	32	2.45	3.06	-	-	-
Bishopville town, Lee County	3 430	1 307	915	515	354	392	376	203	178	2.62	3.24	130	113	17
Blacksburg town, Cherokee County	1 907	770	526	347	145	244	233	122	110	2.48	3.07	-	-	-
Blackville town, Barnwell County	2 688	915	675	378	258	240	228	115	82	2.94	3.52	-	-	-
Blenheim town, Marlboro County	191	79	51	36	14	28	26	16	13	2.42	3.08	-	-	-
Bluffton town, Beaufort County	738	284	208	182	42	78	67	[illegible]	[illegible]	[illegible]	[illegible]	-	-	-

South Carolina Department of Health and Environmental Control

Water Pollution Control

PERMIT

TO DISCHARGE WASTEWATER IN ACCORDANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

THIS CERTIFIES THAT

Venture Chemicals, Inc.

has been granted permission to discharge wastewater from a facility located at

Lobeco, South Carolina, Beaufort County

to receiving waters named

Campbell Creek to Whale Branch to Coosaw River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976) and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."

James A. Joy, Jr., P.E.

DIRECTOR, DIVISION OF INDUSTRIAL & AGRICULTURAL WASTEWATER
BUREAU OF WATER POLLUTION CONTROL

Issued: MAY 23 1985 Expires: JUN 30 1990

Effective: JUL 1 1985 Permit No.: SC0000914

MAY 28 1985

materials, a method for containment, a description of training, inspection and security procedures, and emergency response measures to be taken in the event of a discharge to surface waters or plans and/or procedures which constitute an equivalent BMP. Sources of such discharges may include materials storage areas; in-plant transfer, process and material handling areas; loading and unloading operations; plant site runoff; and sludge and waste disposal areas. The BMP plan shall be developed in accordance with good engineering practices, shall be documented in narrative form, and shall include any necessary plot plans, drawings, or maps. The BMP plan shall be maintained at the plant site and shall be available for inspection by EPA and Permit Issuing Authority personnel.

7. If this permit requires continuous measuing of the pH of the effluent, the permittee shall maintain the pH of such effluent within the range set in the permit, except excursions from the range are permitted subject to the following limitations:

   a. The total time during which the pH values are outside the required range shall not exceed 7 hours and 26 minutes in any calendar month; and,

   b. No individual excursion from the range of pH values shall exceed 60 minutes.

8. The permittee shall notify the Agency at least 30 days before the intended manufacture of a new product or use of a new raw material. If such new product or raw material is to enter the wastewater stream, approval shall be obtained from the Agency before beginning operations, and the permit may be modified to include monitoring requirements and/or limits for the new chemical.

9. The discharge is to occur only on outgoing tide and is not to enter the stream less than ½ hour after tidal outflows begin. It is to be terminated early enough during the tidal cycle that the plume of the discharge is washed completely into Whale Branch. Adequate monitoring and timing equipment, with recording, must be maintained to show that the discharge meets the above.

10. Ultimate oxygen demand (UOD) is defined for this permit as 1.5 times 5-day BOD plus 4.5 times total ammonia. UOD is to be reported as pounds per tidal cycle, with BOD_5 and ammonia composited over one complete tidal cycle (about 12 consecutive hours).

11. The permittee shall monitor all parameters consistent with conditions established by this permit on the first Wednesday of every calendar month, unless otherwise approved by the Department. Additional monitoring necessary to meet the frequency requirements of this permit (Part I.A.- Effluent Limitations and Monitoring Requirements) shall be performed by the permittee.

12. Waste activated sludge, after drying, shall be disposed of in an Agency approved landfill as authorized by the Department.

13. The Company shall carry out monitoring, with results reported with Discharge Monitoring Reports, for the following:

a. Quarterly:

2-amino-9,10-anthracenedione	Dichloromethane(methylene chloride)
aniline	Diphenylhydrazine
9,10-anthracenedione	formaldehyde
arsenic	mercury
benzene	1,1'-sulfonyl bis(4-chloro)benzene
cadmium	1,2,3-trichlorobenzene
copper	

b. Weekly, until questions about sources are resolved, then quarterly:

PCB's

The permit may be reopened to revise monitoring or to add limits if so indicated by analyses.

14. Toxicity shall be measured using Mysidopsis bahia in accordance with the U.S. Environmental Protection Agency document, Methods for Measuring the Acute Toxicity of Effluent to Aquatic Organisms or other method approved by this office; testing shall be conducted annually during February, June and October. Toxicity shall not occur at less than an effluent concentration of 66 percent. Reports are to be submitted no later than 30 days after completion of tests, except that a violation is to be reported within 5 days after completing the test. Revision of these requirements may be made administratively after 1 year, if appropriate after review of all biological information required by the permit.

15. The Company shall develop and submit a program to improve effluent quality and thereby eliminate adverse effects in Campbell Creek and receiving waters. Study plans shall be submitted for approval for each aspect of the program. The program shall include:

a. Monthly effluent toxicity tests on oyster larvae, consisting of 48-hour static tests, to begin in May, 1985.

b. A survey of oyster spat recruitment in Campbell Creek, along with control stations, during June or July of each year, beginning in 1985.

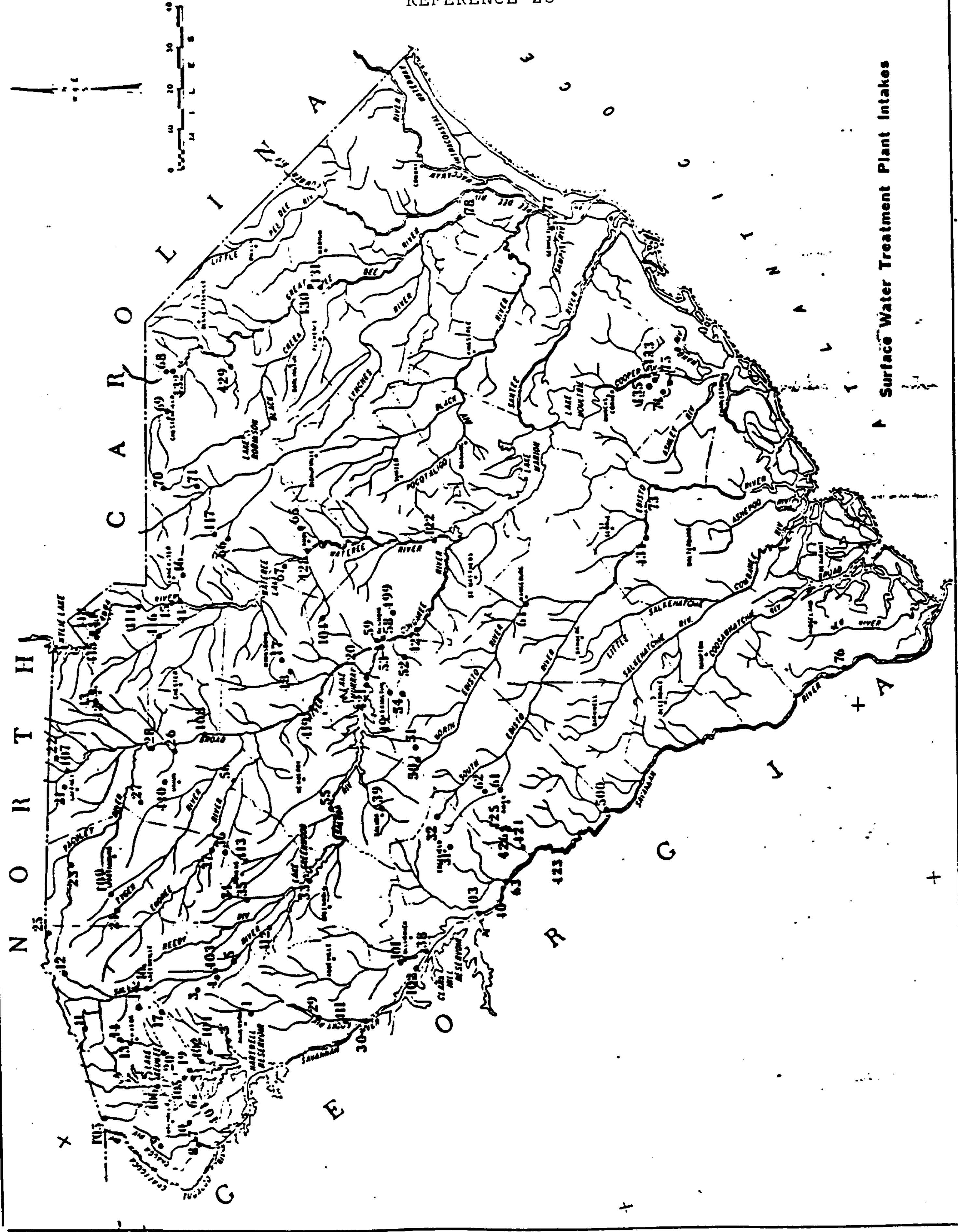
c. A study plan to reduce discharge toxicity, to be submitted by May 31, 1985. The study is to evaluate methods of reduction, including chlorine-related toxicity, and to develop an engineering report proposing any needed facilities. The chlorine toxicity evaluation is to be submitted by September 30, 1985, and the overall report of evaluation and recommendations by October 31, 1985. The reports are to include schedules for placing proposed systems into operation, and an approved schedule shall become a part of this permit.

d. A complete macroinvertebrate assessment of Campbell Creek, along with control stations, to be conducted annually in November or December, beginning in 1985.

e. The South Carolina Department of Health and Environmental Control and the permittee acknowledge that the methods of testing and evaluating as defined in paragraphs a. and b. above are new requirements not heretofore imposed by the Agency on any permittee in South Carolina. Amendments to or modifications of testing methodology and or frequency may be necessary as experience is gained and effluent quality is improved; and, after a year of monitoring, the requirements may be revised administratively as indicated by the biological evaluations.

16. The company shall perform analyses of oysters for organics (volatiles and acid and base/neutral extractables) and metals (arsenic, cadmium, chromium, copper, lead, and nickel) each year in September and report the results to DHEC within 45 days after sampling. Samples shall be taken from the mouth of Campbell Creek, near the confluence of Huspah Creek and Whale Branch, and from the mouth of Haulover Creek.

REFERENCE 23



Surface Water Treatment Plant Intakes

NUS CORPORATION AND — *TELECON NOTE*

REFERENCE 24

CONTROL NO. F4-8904-54	DATE: December 14, 1989	TIME: 1020

DISTRIBUTION: American Color and Chemical/Venture Chemical File

BETWEEN: Mr. George Nelson	OF: Low Country District, SC Dept. of Health & Env. Control	PHONE: (803) 522-9097

AND: James Miller, NUS Corporation J.M.

DISCUSSION:

Called George Nelson, who is familiar with tidal flow in the Lobeco area (see attached memorandum), for flow reversal information in Campbell Creek and associated water bodies. Mr. Nelson stated that flow reversals are common in these water bodies because there is very little, if any, freshwater input involved. The reversals occur in the Coosaw River, the Broad River, Whale Branch, and in all tributaries that are hydrologically interconnected. The area at the mouth of Huspa Creek is a tidal node, and tidal water from both sections of Whale Branch backs up into Huspa Creek during each flood tide.

South Carolina Department of Health and Environmental Control

Lobeco file

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

Low Country District
Environmental Quality Control
149 Ribaut Square
Beaufort, S.C. 29902
(803) 524-9760

July 14, 1988

M E M O R A N D U M

TO: Andy Yasinsac

FROM: George Nelson

RE: Lobeco Products - your letter of 7-8-88 to Granquist - Tidal Flow

Please keep in mind that the tidal flow for Port Royal Sound, St.Helena Sound and Calibogue Sound is different from most other estuaries in the state. Ours have very little or no fresh water flow into them so that the flushing action is decreased. Even though the tidal velocities are high the water remains in the system for a longer period of time. I suggest we require Lobeco to demonstrate what the true dilution is based on residence time if you don't have that information already.

This concern becomes even more critical when one remembers that they apparently have authorization to use the wastewater treatment facility for incidental spills(see attached). How much of this occurs and of what magnitude we don't know as they apparently don't have to keep records. I dont't think we have any records of Lobeco Products reporting any spills in the past 2 1/2 years.

I don't believe that their biological plant can do more than dilute some of the material on hand. I think it would be prudent for the Department to require them to keep records of spills even though enforcement may be impracticable.

cc: Russ Sherer
Sandra Hursey

ermine if flood insurance is available in this community, your insurance agent, or call the National Flood Insurance 1, at (800) 638-6620.

REFERENCE 25

APPROXIMATE SCALE

1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

BEAUFORT
COUNTY,
SOUTH CAROLINA
(UNINCORPORATED AREAS)

PANEL 25 OF 163

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
450025 0025 D

MAP REVISED:
SEPTEMBER 29, 1986

Federal Emergency Management Agency

#25
9-29-86

OVERSIZED

DOCUMENT

ENDANGERED AND THREATENED SPECIES

REFERENCE 27

U.S. FISH AND WILDLIFE SERVICE

REGION 4 - ATLANTA

ATTACHMENT A

TABLES
&
FIGURES

TABLE 1 (PART 1 OF 3)

SELECTED ANALYTICAL DATA
BACKGROUND
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater		
	W-1 (4-6 ft.)	W-2 (10-12 ft.)	W-1 (14-16 ft.)	W-1 (38-40 ft.)	W-1	W-1	W-2
VOLATILES							
VINYL CHLORIDE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRANS-1,2-DICHLOROETHENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROFORM	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROTOLUENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROBENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,4-DICHLOROBENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,3-DICHLOROBENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
DICHLOROBROMOMETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,1-TRICHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CARBON TETRACHLORIDE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROPROPANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CIS-1,3-DICHLOROPROPENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)

ND None Detected
- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 1 (PART 2 OF 3)

SELECTED ANALYTICAL DATA
BACKGROUND
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater		
	W-1 (4-6 ft.)	W-2 (10-12 ft.)	W-1 (14-16 ft.)	W-1 (38-40 ft.)	W-1	W-1	W-2
TRICHLOROETHENE	-	-	-	-	ND(<0 010)	ND(<0 010)	ND(<0.010)
TRICHLOROFLOURMETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,2-TRICHLOROETHANE	-	-	-	-	ND(<0 010)	ND(<0.010)	ND(<0 010)
BENZENE	-	-	-	-	ND(<0.010)	ND(<0 010)	ND(<0.010)
TRANS-1,3-DICHLOROPROPENE	-	-	-	-	ND(<0 010)	ND(<0.010)	ND(<0.010)
2-CHLOROETHYL VINYL ETHER	-	-	-	-	ND(<0.010)	ND(<0 010)	ND(<0 010)
BROMOFORM	-	-	-	-	ND(<0.010)	ND(<0 010)	ND(<0 010)
TETRACHLOROETHENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0 010)
1,1,2,2-TETRACHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0 010)
TOLUENE	-	-	-	-	ND(<0 010)	ND(<0.010)	ND(<0 010)
CHLOROBENZENE	-	-	-	-	ND(<0 010)	ND(<0 010)	ND(<0 010)
CHLORODIBROMOMETHANE.	-	-	-	-	ND(<0 010)	ND(<0.010)	ND(<0.010)
ETHYLBENZENE	-	-	-	-	ND(<0 010)	ND(<0.010)	ND(<0 010)
METHYLBROMIDE	-	-	-	-	ND(<0 010)	ND(<0.010)	ND(<0.010)
METHYLCHLORIDE	-	-	-	-	ND(<0 010)	ND(<0.010)	ND(<0.010)
METHYLENE CHLORIDE	-	-	-	-	ND(<0 010)	ND(<0 010)	ND(<0.010)
TOTAL XYLENE	-	-	-	-	ND(<0 010)	ND(<0 010)	ND(<0 010)

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 1 (PART 3 OF 3)

SELECTED ANALYTICAL DATA
BACKGROUND
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater		
	W-1 (4-6 ft.)	W-2 (10-12 ft.)	W-1 (14-16 ft.)	W-1 (38-40 ft.)	W-1	W-1	W-2
POLYCHLORINATED BIPHENYLS							
AROCHLOR 1248	-	-	-	-	-	ND(<0 001)	ND(<0.001)
TOTAL POLYCHLORINATED	-	-	-	-	-	-	-
METALS							
CADMIUM	-	-	-	-	-	ND(<0.005)	ND(<0 005)
CHROMIUM	-	-	-	-	-	ND(<0.01)	ND(<0 01)
LEAD	-	-	-	-	-	ND(<0.04)	ND(<0 04)
MERCURY	-	-	-	-	-	ND(<0 0002)	ND(<0 0002)
OTHER							
TOTAL ORGANIC CARBON	-	-	-	-	21	5	9
CHLORIDE	-	-	-	-	79	15	13.4
SAMPLING DATE	03/11/86	03/12/86	03/11/86	03/12/86	03/12/86	03/22/86	03/22/86

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 6 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
STRESSED VEGETATION
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil	Groundwater	
	D-1 (1-2ft.)	D-1	D-2
VOLATILES			
VINYL CHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRANS-1,2-DICHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CHLOROFORM	ND(<0 100)	ND(<0 010)	ND(<0.010)
CHLOROTOLUENE	ND(<0 100)	ND(<0.010)	-
1,2-DICHLOROBENZENE	ND(<0 100)	ND(<0.010)	ND(<0.010)
1,4-DICHLOROBENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,3-DICHLOROBENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
DICHLOROBROMOMETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1,1-TRICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CARBON TETRACHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROPROPANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CIS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRICHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRICHLOROFLOURMETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1,2-TRICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
BENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRANS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
2-CHLOROETHYL VINYL ETHER	ND(<0.100)	ND(<0.010)	ND(<0.010)
BROMOFORM	ND(<0.100)	ND(<0.010)	ND(<0.010)
TETRACHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1,2,2-TETRACHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TOLUENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CHLOROBENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN ON MARCH 26 AND MARCH 27 OF 1986

TABLE 6 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
STRESSED VEGETATION
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil	Groundwater	
	D-1 (1-2ft.)	D-1	D-2
CHLORODIBROMOMETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
ETHYLBENZENE	ND(<0.100)	ND(<0.010)	0.013 ●
METHYLBROMIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
METHYLCHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
METHYLENE CHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TOTAL XYLENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
POLYCHLORINATED BIPHENYLS			
TOTAL POLYCHLORINATED	-	ND(<0.001)	-
METALS			
CHROMIUM	3.3 ●	ND(<0.01)	ND(<0.01)
LEAD	3.8 ●	ND(<0.04)	ND(<0.04)

ND None Detected

\- Material not analyzed for or data were not available for inclusion

NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN ON MARCH 26 AND MARCH 27 OF 1986

● **Sample parameter is an observed release**

TABLE 2 (PART 1 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil							
	L-1 (1 ft.)	L-9 (2-3 ft.)	L-1 (2.5 ft.)	L-3 (2.5 ft.)	L-28 (3-4 ft.)	L-10 (3.5-4 ft.)	L-3 (4 ft.)	G&E-3 (4-5 ft.)
VOLATILES								
CHLOROTOLUENE	-	ND(<0.100)	-	-	-	ND(<0.100)	-	-
TRICHLOROETHENE	-	ND(<0.100)	-	-	-	ND(<0.100)	-	-
ACID & BASE NEUTRALS								
1,2,4-TRICHLOROBENZENE	-	-	-	-	-	-	-	24.0 ●
NAPHTHALENE	-	-	-	-	-	-	-	12.0 ●
POLYCHLORINATED BIPHENYLS								
AROCHLOR 1248	-	-	-	-	250 ●	-	-	-
TOTAL POLYCHLORINATED BIPHENYLS	112 ●	140 ●	108 ●	39 ●	-	17 ●	122 ●	6750 ●
METALS								
CADMIUM	-	-	-	-	-	-	-	ND(<0.5)
CHROMIUM	-	-	-	-	-	-	-	46 ●
LEAD	698 ●	-	500 ●	42 ●	-	-	90 ●	2286 ●
MERCURY	19 ●	-	4.3 ●	0.63 ●	-	-	1.9 ●	13
OTHER								
CHLORIDE	-	-	-	-	-	-	-	-
SAMPLING DATE	03/18/86	03/21/86	03/18/86	03/18/86	04/03/86	03/21/86	03/18/86	01/13/86

ND None detected
SZ Saturation Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN
● **Sample parameter is an observed release**

TABLE 2 (PART 2 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil							
	G&E-4 (4-5 ft.)	G&E-5 (4-5 ft.)	L-13 (4-6.5 ft.)	L-2 (4.5 ft.)	G&E-1 (5-6 ft.)	L-3 (6 ft.)	L-24 (6-6.5 ft.)	G&E-4 (6-7 ft.)
VOLATILES								
CHLOROTOLUENE	-	-	ND(<0.100)	-	-	-	ND(<0 100)	-
TRICHLOROETHENE	-	-	ND(<0.100)	-	-	-	ND(<0.100)	-
ACID & BASE NEUTRALS								
1,2,4-TRICHLOROBENZENE	ND(<0.330)	ND(<0.330)	-	-	54.0 ●	-	-	7.4 ●
NAPHTHALENE	ND(<0.330)	ND(<0.330)	-	-	17.0 ●	-	-	1 10 ●
POLYCHLORINATED BIPHENYLS								
AROCHLOR 1248	-	-	-	-	-	-	-	52 ●
TOTAL POLYCHLORINATED BIPHENYLS	-	-	ND(<2.0)	497 ●	680 ●	2460 ●	369 ●	-
METALS								
CADMIUM	ND(<0.5)	ND(<0.5)	-	-	ND(<0.5)	-	-	ND(<0.5)
CHROMIUM	16 ●	4.9 ●	-	-	13 ●	-	-	11 ●
LEAD	46 ●	ND(<3.3)	-	528 ●	942 ●	55 ●	-	144 ●
MERCURY	0.11 ●	ND(<0.05)	-	3.8 ●	1.1 ●	0.09 ●	-	3.2 ●
OTHER								
CHLORIDE	-	-	-	-	-	-	-	-
SAMPLING DATE	01/13/86	01/13/86	03/21/86	03/18/86	01/13/86	03/18/86	03/21/86	01/13/86

ND None detected
SZ Saturation Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

● **Sample parameter is an observed release**

TABLE 2 (PART 3 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

	Soil							
PARAMETERS (mg/l,mg/kg)	B-1 (6-8 ft.)	L-1 (6.5 ft.)	L-2 (6.5 ft.)	L-2 (6.5-7 ft.)	L-7 (8 ft.)	L-33 (10-12 ft.)	B-1 (10-12 ft.)	L-33 (12-14 ft.)
VOLATILES								
CHLOROTOLUENE	-	-	-	-	6.0 ●	-	-	-
TRICHLOROETHENE	-	-	-	-	ND(<0.100)	-	-	-
ACID & BASE NEUTRALS								
1,2,4-TRICHLOROBENZENE	-	-	-	-	-	ND(<10)	-	103 ●
NAPHTHALENE	-	-	-	-	-	ND(<10)	-	122 ●
POLYCHLORINATED BIPHENYLS								
AROCHLOR 1248	-	-	-	-	-	70 ●	-	2139 ●
TOTAL POLYCHLORINATED BIPHENYLS	ND(<1.0)	676 ●	196 ●	582 ●	369 ●	-	ND(<1.0)	-
METALS								
CADMIUM	-	-	-	-	-	-	-	-
CHROMIUM	-	-	-	-	-	-	-	-
LEAD	-	283 ●	109 ●	76 ●	-	-	-	-
MERCURY	-	1.6 ●	0.82 ●	0.88 ●	-	-	-	-
OTHER								
CHLORIDE	-	-	-	-	-	-	-	-
SAMPLING DATE	03/13/86	03/18/86	03/18/86	03/18/86	03/21/86	04/13/86	03/13/86	04/13/86

ND None detected
SZ Saturation Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN
● Sample parameter is an observed release

TABLE 2 (PART 4 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil			Groundwater						
	L-33 (14-16 ft.)	B-1 (14-16 ft.)	B-1 (43-45 ft.)	L-1 (SZ)	L-2 (SZ)	L-3 (SZ)	L1, L2, L3 (SZ, C)	L-7 (SZ)	L-18 (SZ)	G&E-1-5 (SZ, C)
VOLATILES										
CHLOROTOLUENE	-	-	-	-	-	-	-	1 20	1.70	-
TRICHLOROETHENE	-	-	-	-	-	-	0 150	0 04	0 05	-
ACID & BASE NEUTRALS										
1,2,4-TRICHLOROBENZENE	-	-	-	-	-	-	3.470	-	-	0.460
NAPHTHALENE	-	-	-	-	-	-	2.340	-	-	0.380
POLYCHLORINATED BIPHENYLS										
AROCHLOR 1248	-	-	-	-	-	-	6 02	-	-	-
TOTAL POLYCHLORINATED BIPHENYLS	ND(<1.0)	ND(<1.0)	ND(<1.0)	-	-	-	-	-	-	-
METALS										
CADMIUM	-	-	-	-	-	-	-	0 02 ●	0 03	ND(<0 0
CHROMIUM	-	-	-	-	-	-	-	0.65	1.9	5 4
LEAD	-	-	-	11	0.19	0.14	-	1.5	7 0	34
MERCURY	-	-	-	0.23	ND(<0 002)	ND(<0 002)	-	0.05	0.12	0.614
OTHER										
CHLORIDE	-	-	-	-	-	-	-	-	-	-
SAMPLING DATE	04/13/86	03/13/86	03/13/86	03/18/86	03/18/86	03/18/86	03/18/86	03/21/86	03/21/86	01/14/86

ND None detected
SZ Saturation Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

● **Sample parameter is an observed release**

TABLE 2 (PART 5 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Groundwater				
	C-1	W-3	W-3	W-4	V-6
VOLATILES					
CHLOROTOLUENE	ND(<0.010)	-	0 200	ND(<0 010)	-
TRICHLOROETHENE	ND(<0.010)	0.047	0 355	ND(<0 010)	0.235
ACID & BASE NEUTRALS					
1,2,4-TRICHLOROBENZENE	-	-	-	-	-
NAPHTHALENE	-	-	-	-	-
POLYCHLORINATED BIPHENYLS					
AROCHLOR 1248	-	-	-	-	-
TOTAL POLYCHLORINATED BIPHENYLS	ND(<0.001)	ND(<0.001)	ND(<0 005)	ND(<0.001)	ND(<0 001)
METALS					
CADMIUM	ND(<0.005)	-	0.02 ●	ND(<0 005)	-
CHROMIUM	ND(<0.01)	-	0.13 ●	ND(<0.01)	-
LEAD	ND(<0.04)	-	0 13 ●	ND(<0 04)	0.32 ●
MERCURY	ND(<0.0002)	-	ND(<0.002)	ND(<0 0002)	-
OTHER					
CHLORIDE	2.5	-	1650	34	2900
SAMPLING DATE	03/25/86	03/12/86	03/26/86	03/25/86	03/13/86

ND None detected
SZ Saturated Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN
● **Sample parameter is an observed release**

TABLE 5 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
BURN SITE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater
	S-1 (depth unk.)	G&E-9 (1 ft.)	BS-3 (3-4 ft.)	G&E-6 (3-4 ft.)	G&E-10
VOLATILES					
METHYLENE CHLORIDE	-	-	-	-	640 ●
TRICHLOROETHENE	-	-	-	-	-
ACID & BASE NEUTRALS					
1,2,4-TRICHLOROBENZENE	ND(<10)	0.610 ●	-	ND(<0 330)	ND(<0 010)
NAPHTHALENE	ND(<10)	0.750 ●	-	ND(<0.330)	ND(<0.010)
POLYCHLORINATED BIPHENYLS					
AROCHLOR 1242	-	-	-	ND(<1 0)	-
AROCHLOR 1248	-	169 ●	250	-	-
TOTAL POLYCHLORINATED BIPHENYLS	-	155	-	-	-
METALS					
CADMIUM	0.1 ●	ND(<0.5)	-	ND(<0.5)	ND(<0 01)
CHROMIUM	2.0 ●	565 ●	-	5.4	1.7 ●
LEAD	6.9 ●	53 ●	-	4.7	0 4 ●
MERCURY	0 04 ●	0 18 ●	-	ND(<0 5)	0 0017 ●
OTHER					
TOTAL ORGANIC CARBON	-	-	-	-	-
CHLORIDE	-	-	-	-	-

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN JANUARY 14 AND MAY 1 OF 1986
● **Sample parameter is an observed release**

TABLE 5 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
BURN SITE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Groundwater					Surface Water	Product
	W-9	W-10	W-11	W-12	W-13	LAGOON	LAGOON
VOLATILES							
METHYLENE CHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0 010)	ND(<0.010)	ND(<0 010)	-	-
TRICHLOROETHENE	180 ●	0.025 ●	12 ●	0.073 ●	ND(<0 010)	-	-
ACID & BASE NEUTRALS							
1,2,4-TRICHLOROBENZENE	ND(<0.010)	ND(<0.010)	-	-	-	-	-
NAPHTHALENE	ND(<0.010)	ND(<0.010)	-	-	-	-	-
POLYCHLORINATED BIPHENYLS							
AROCHLOR 1242	-	0.012 ●	-	-	-	-	-
AROCHLOR 1248	0.114 ●	-	-	-	-	0 0027	-
TOTAL POLYCHLORINATED BIPHENYLS	-	-	ND(<0.001)	ND(<0.001)	ND(<0.001)	-	-
METALS							
CADMIUM	0.03 ●	-	ND(<0.005)	ND(<0 005)	0.02 ●	ND(<0 005)	-
CHROMIUM	0.67 ●	-	-	-	0 75 ●	ND(<0 01)	-
LEAD	0.94 ●	-	ND(<0.04)	ND(<0.04)	0.6 ●	1.5	-
MERCURY	0.004 ●	-	ND(<0.002)	ND(<0.0002)	ND(<0.002)	0.24	19
OTHER							
TOTAL ORGANIC CARBON	70 ●	38 ●	350 ●	-	-	40	-
CHLORIDE	-	-	1100 ●	57 9 ●	40 0 ●	-	-

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN JANUARY 14 AND MAY 1 OF 1986
● **Sample parameter is an observed release**

TABLE 4 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
OLD DRUM STORAGE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l)	Groundwater				
	A-9	A-10	A-11	W-6	W-7
VOLATILES					
VINYL CHLORIDE	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	0.030
CHLOROFORM	ND	ND	ND	ND	0.025
CHLOROTOLUENE	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	-
1,4-DICHLOROBENZENE	ND	ND	ND	ND	0.160
1,3-DICHLOROBENZENE	ND	ND	ND	ND	-
DICHLOROBROMOMETHANE	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	0.04	ND	ND
CARBON TETRACHLORIDE	19	12	39	ND	89
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND
CIS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	0.110
TRICHLOROFLOURMETHANE	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	0.017

ND None Detected (<0.010 mg/l)
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN MARCH 13 AND MARCH 17 OF 1986

TABLE 4 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
OLD DRUM STORAGE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l)	Groundwater				
	A-9	A-10	A-11	W-6	W-7
TRANS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND
TOLUENE	0.26	0.04	5.70	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	0 190
CHLORODIBROMOMETHANE	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND
METHYLBROMIDE	ND	ND	ND	ND	ND
METHYLCHLORIDE	ND	ND	ND	ND	ND
METHYLENE CHLORIDE	ND	ND	ND	ND	ND
TOTAL XYLENE	ND	ND	ND	ND	ND
OTHER					
TOTAL ORGANIC CARBON	30	20	30	14	150
CHLORIDE	595	165	115	-	-

ND None Detected (<0.010 mg/l)
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN MARCH 13 AND MARCH 17 OF 1986

TABLE 3 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
DISCHARGE PIPE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil					
	A-8 (2 ft.)	A-3 (3 ft.)	A-6 (3 ft.)	A-7 (3-4.5 ft. C)	A-6 (6 ft.)	A-3 (6.5-7 ft.)
VOLATILES						
VINYL CHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1-DICHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRANS-1,2-DICHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1-DICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROFORM	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROTOLUENE	ND(<0.100)	ND(<0.100)	-	-	-	ND(<0.100)
1,2-DICHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,4-DICHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,3-DICHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
DICHLOROBROMOMETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,2-DICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1,1-TRICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CARBON TETRACHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,2-DICHLOROPROPANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CIS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRICHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRICHLOROFLOURMETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1,2-TRICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
BENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRANS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
2-CHLOROETHYL VINYL ETHER	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
BROMOFORM	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TETRACHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1,2,2-TETRACHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TOLUENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLORODIBROMOMETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
ETHYLBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
METHYLBROMIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
METHYLCHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
METHYLENE CHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TOTAL XYLENE (SEMIQUANTITATIVE)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
POLYCHLORINATED BIPHENYLS						
TOTAL POLYCHLORINATED BIPHENYLS	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)
SAMPLING DATE	03/12/86	03/13/86	03/13/86	03/12/86	03/13/86	03/13/86

ND None Detected
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 3 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
DISCHARGE PIPE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

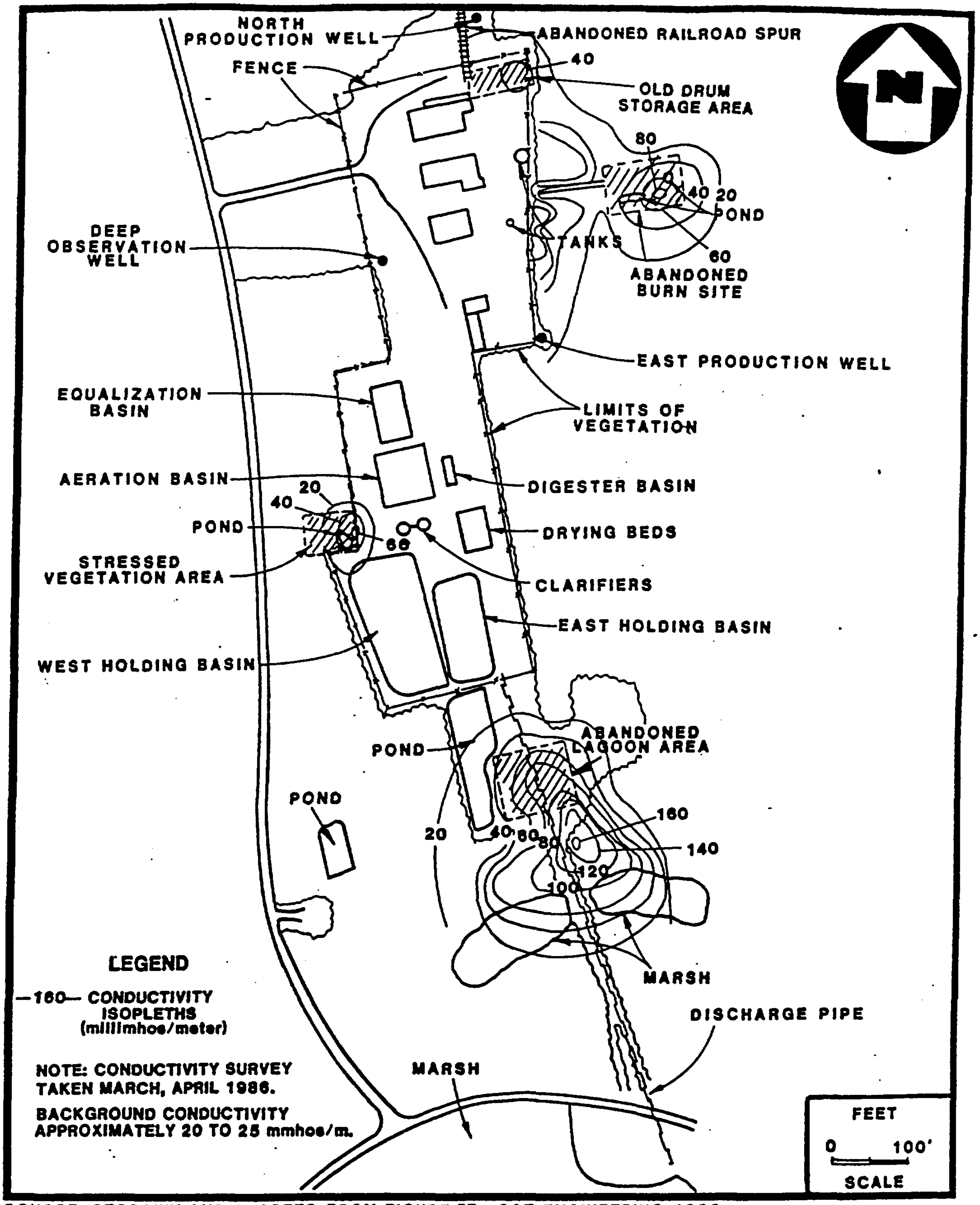
PARAMETERS (mg/l, mg/kg)	Groundwater				
	A-3	A-5	A-6	W-5	W-5
VOLATILES					
VINYL CHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRANS-1,2-DICHLOROETHENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROFORM	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROTOLUENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	-
1,2-DICHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,4-DICHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,3-DICHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
DICHLOROBROMOMETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,1-TRICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CARBON TETRACHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROPROPANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CIS-1,3-DICHLOROPROPENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRICHLOROETHENE	ND(<0.010)	ND(<0.010)	0.056	ND(<0.010)	ND(<0.010)
TRICHLOROFLOURMETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,2-TRICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
BENZENE	ND(<0.010)	ND(<0.010)	0.010	ND(<0.010)	ND(<0.010)
TRANS-1,3-DICHLOROPROPENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
2-CHLOROETHYL VINYL ETHER	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
BROMOFORM	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TETRACHLOROETHENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,2,2-TETRACHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TOLUENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLORODIBROMOMETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
ETHYLBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLBROMIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLCHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLENE CHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	0.080	ND(<0.010)
TOTAL XYLENE (SEMIQUANTITATIVE)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
POLYCHLORINATED BIPHENYLS					
TOTAL POLYCHLORINATED BIPHENYLS	-	-	-	ND(<0.001)	ND(<0.001)
OTHER					
TOTAL ORGANIC CARBON	100	60	50	-	-
SAMPLING DATE	03/13/86	03/13/86	03/13/86	04-04-86	05-01-86

ND None Detected

C Composite

\- Material not analyzed for or data were not available for inclusion

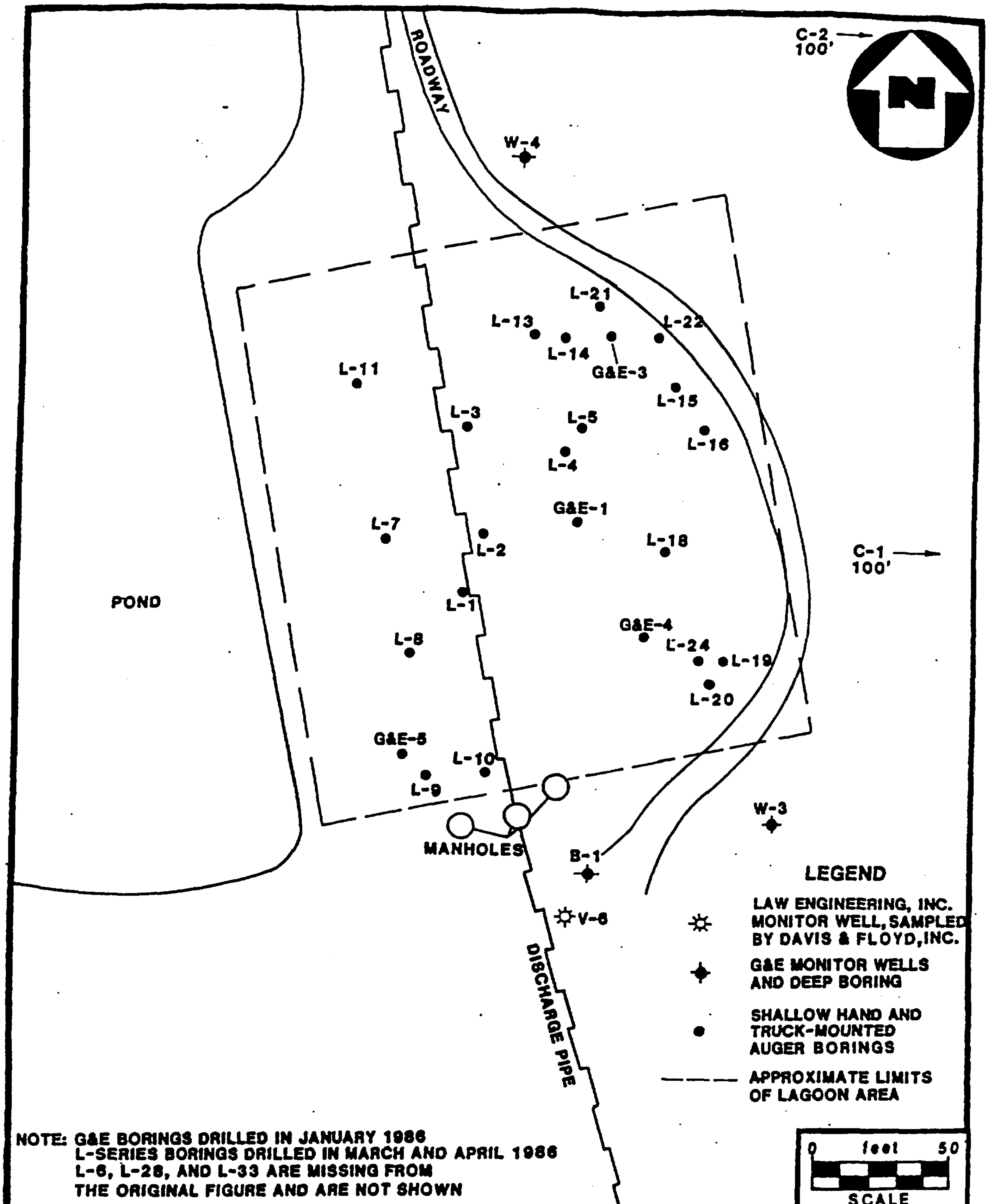
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN



SOURCE: REDRAWN AND ADAPTED FROM FIGURE 5B , G&E ENGINEERING 1986.

GEOPHYSICAL (CONDUCTIVITY) SURVEY
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 3

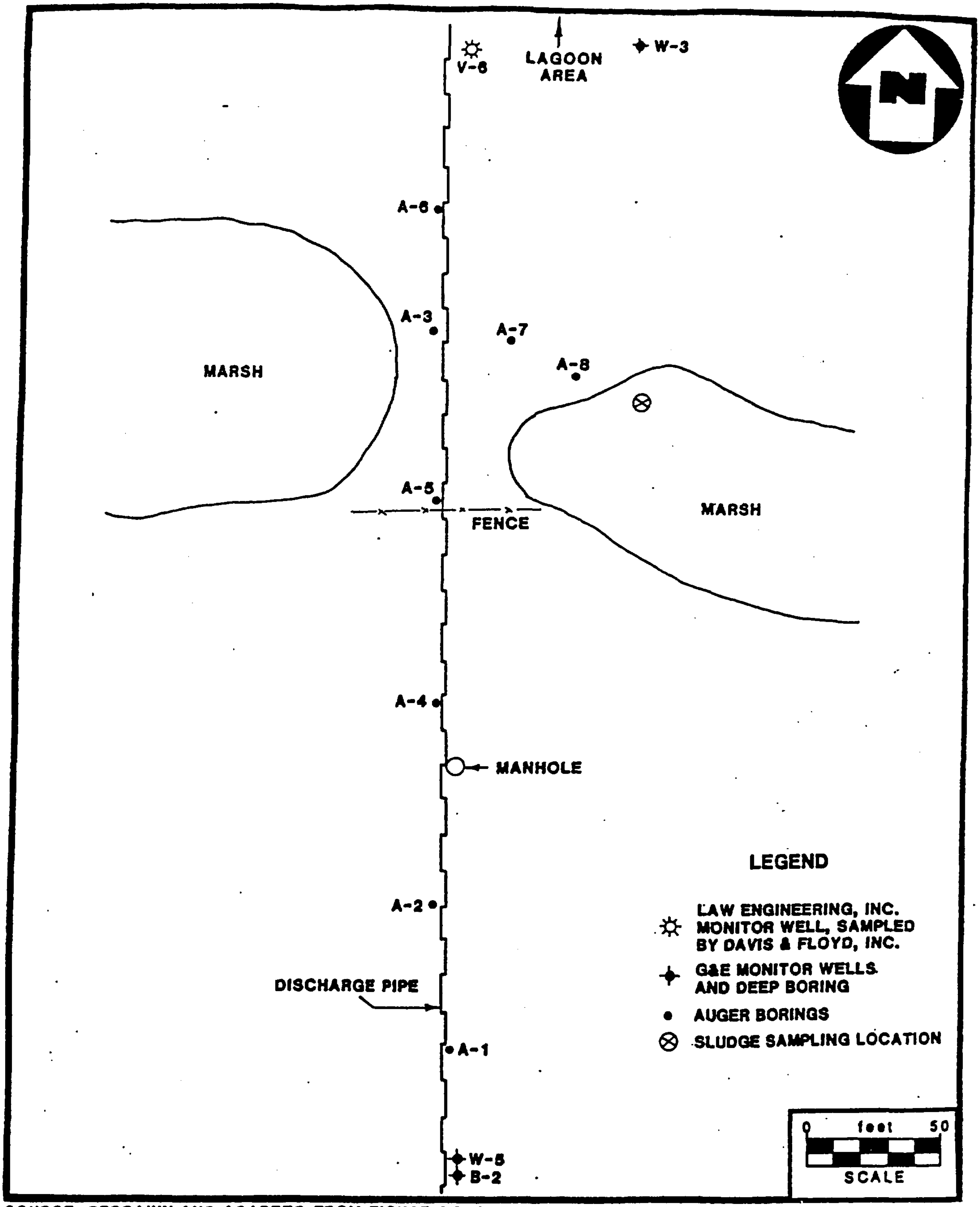


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6A, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
ABANDONED LAGOON AREA
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 4

SCIENCE AND TECHNOLOGY CORP.

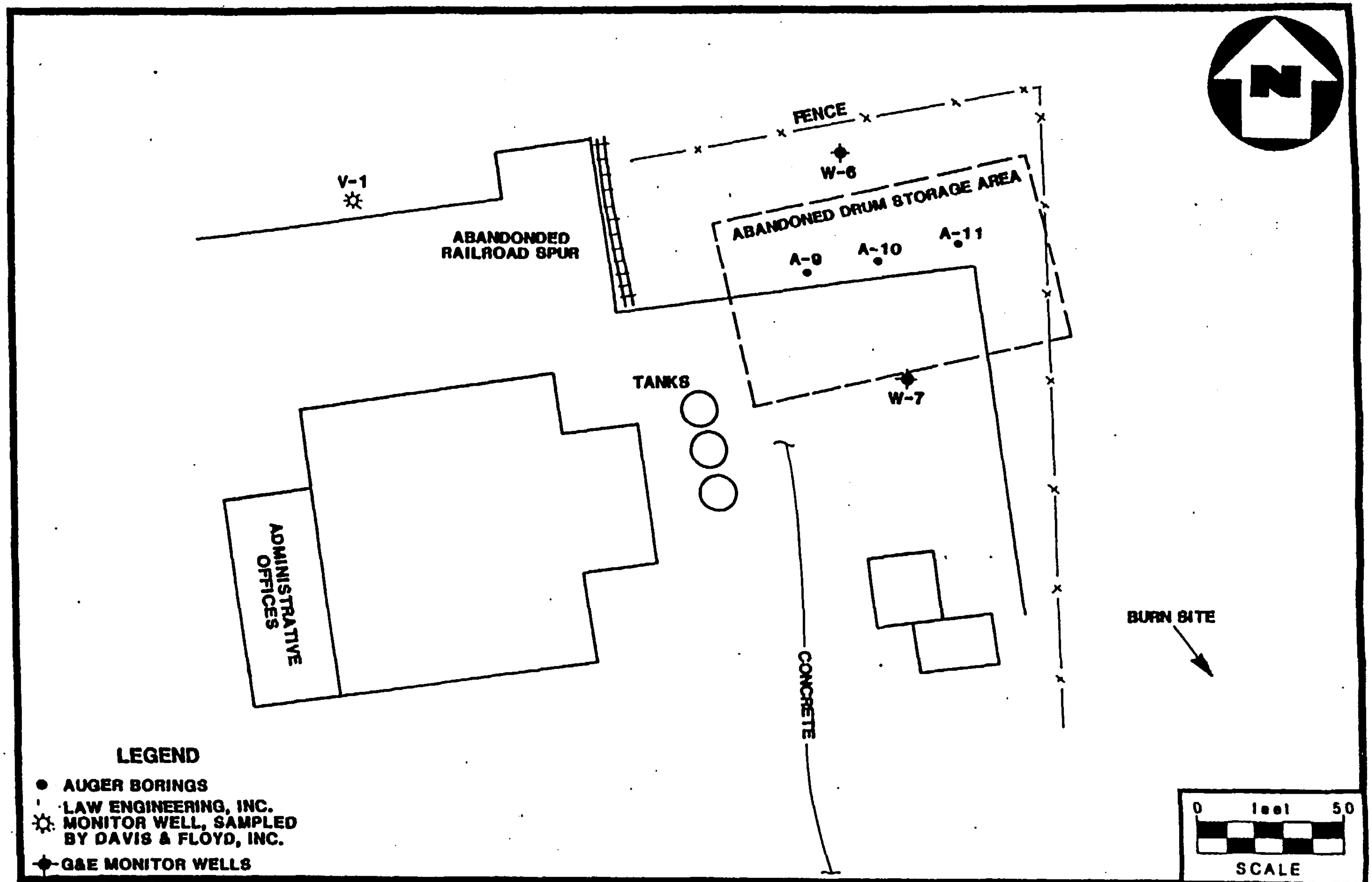


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6E, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
DISCHARGE PIPE
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 5

ARTE SCIENCE AND TECHNOLOGY CORP.

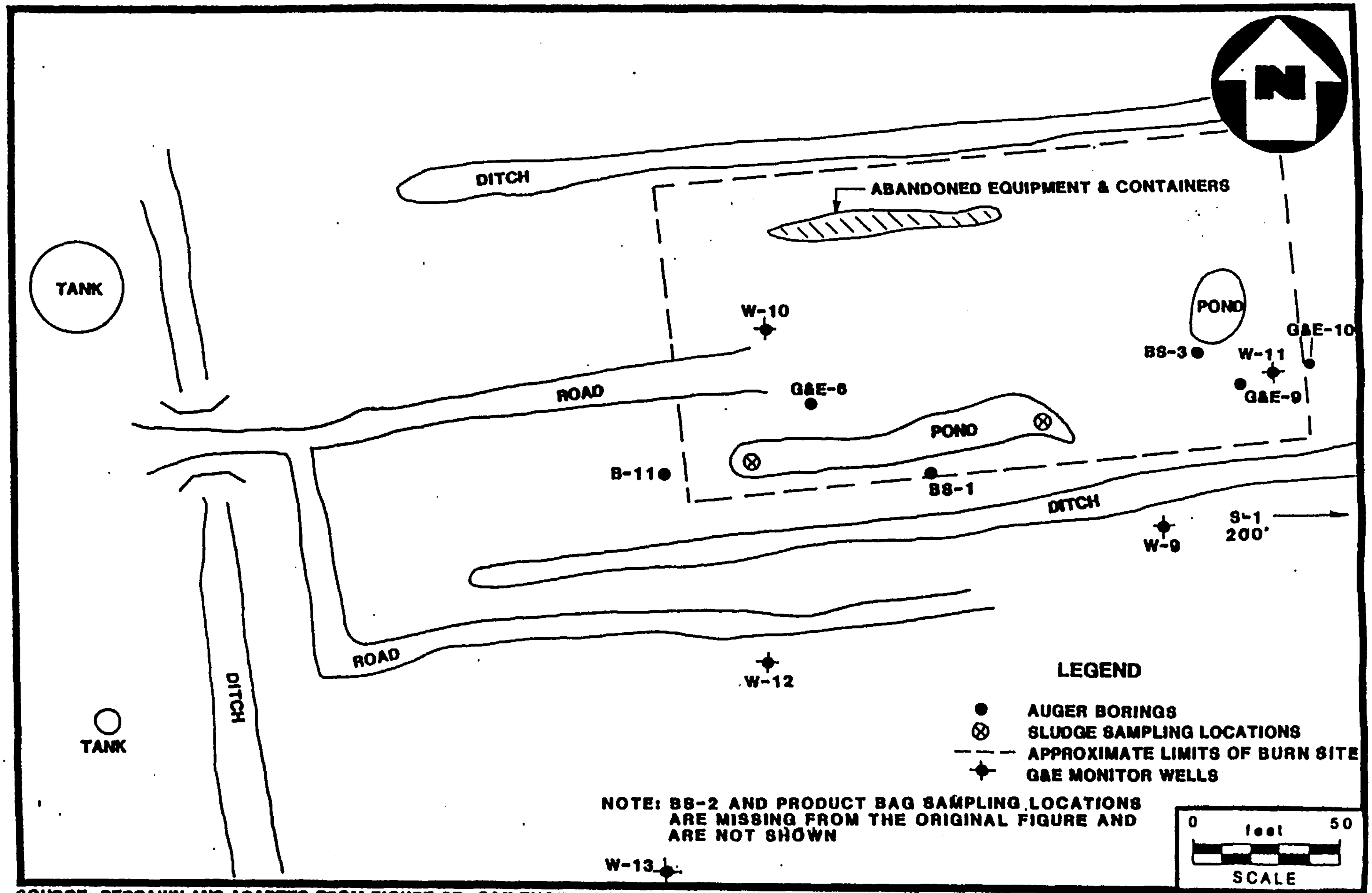


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6C, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
OLD DRUM STORAGE AREA
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 6

ES SCIENCE AND TECHNOLOGY CORP.

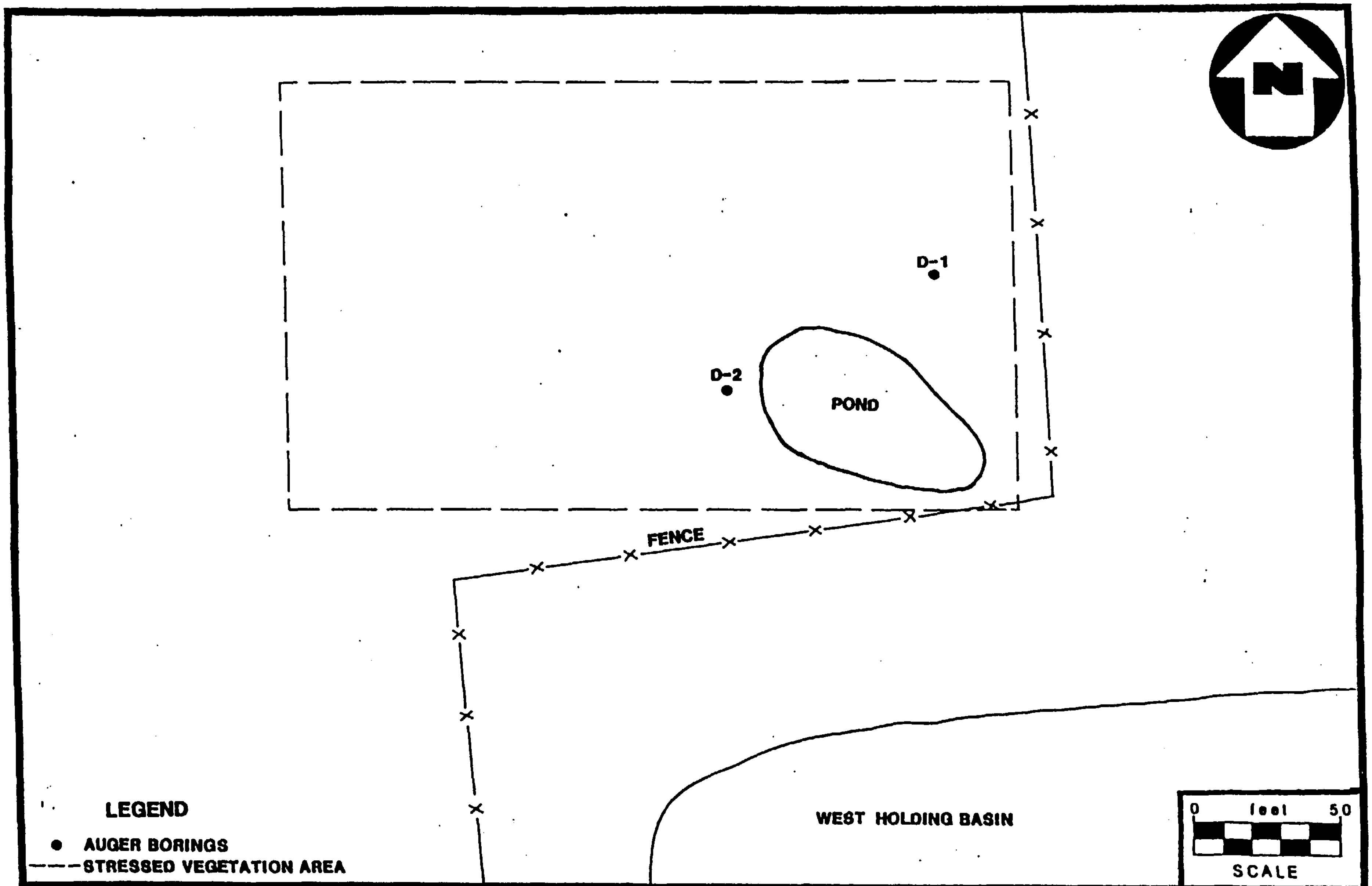


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6B, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
BURN SITE
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 7

SCIENCE AND TECHNOLOGY CORP.



SOURCE: REDRAWN FROM FIGURE 6D, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
STRESSED VEGETATION AREA
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 8

BASIC SCIENCE AND TECHNOLOGY CORP.

RMT, Inc.
100 Verdae Blvd.
P.O. Box 16778
Greenville, SC 29606
Phone: 803-281-0030
FAX: 803-281-0288

December 30, 1991

Mr. Tom Knight
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

SUBJECT: Lobeco Ground Water Assessment Workplan Revised to Address Slurry Wall Sampling and Soil Sampling at VS5/VS6 Area.

Dear Mr. Knight:

Enclosed please find four copies of the subject Workplan. Please note that the Workplan includes ground water sampling activities to address water quality conditions inside and outside the slurry walls at the remediated Burn Site and Lagoon.

Your prompt attention to this Workplan will be appreciated. Pleased call either Chuck Sherron or me with any questions or concerns.

Sincerely,

Mark Miesfeldt

Mark Miesfeldt
Hydrogeologist

Enclosure

cc: Sandra Hursey
Samuel Lane
John Meeks
Richard Koch
Chuck Sherron
Ian Hart
File 695.05(c)

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WATER QUALITY ASSESSMENT
AND ENFORCEMENT DIVISION

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LOBECO SITE GROUND WATER ASSESSMENT WORKPLAN FOR AMERICAN COLOR AND CHEMICAL, CORPORATION AND LOBECO PRODUCTS, INC.

May 1991
Revised December 1991

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WATER QUALITY ASSESSMENT
AND ENFORCEMENT DIVISION

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Section 1
INTRODUCTION

Lobeco Products, Inc. (LPI) is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Whale Branch of the Coosaw River. The location of the site is shown in Figure 1.

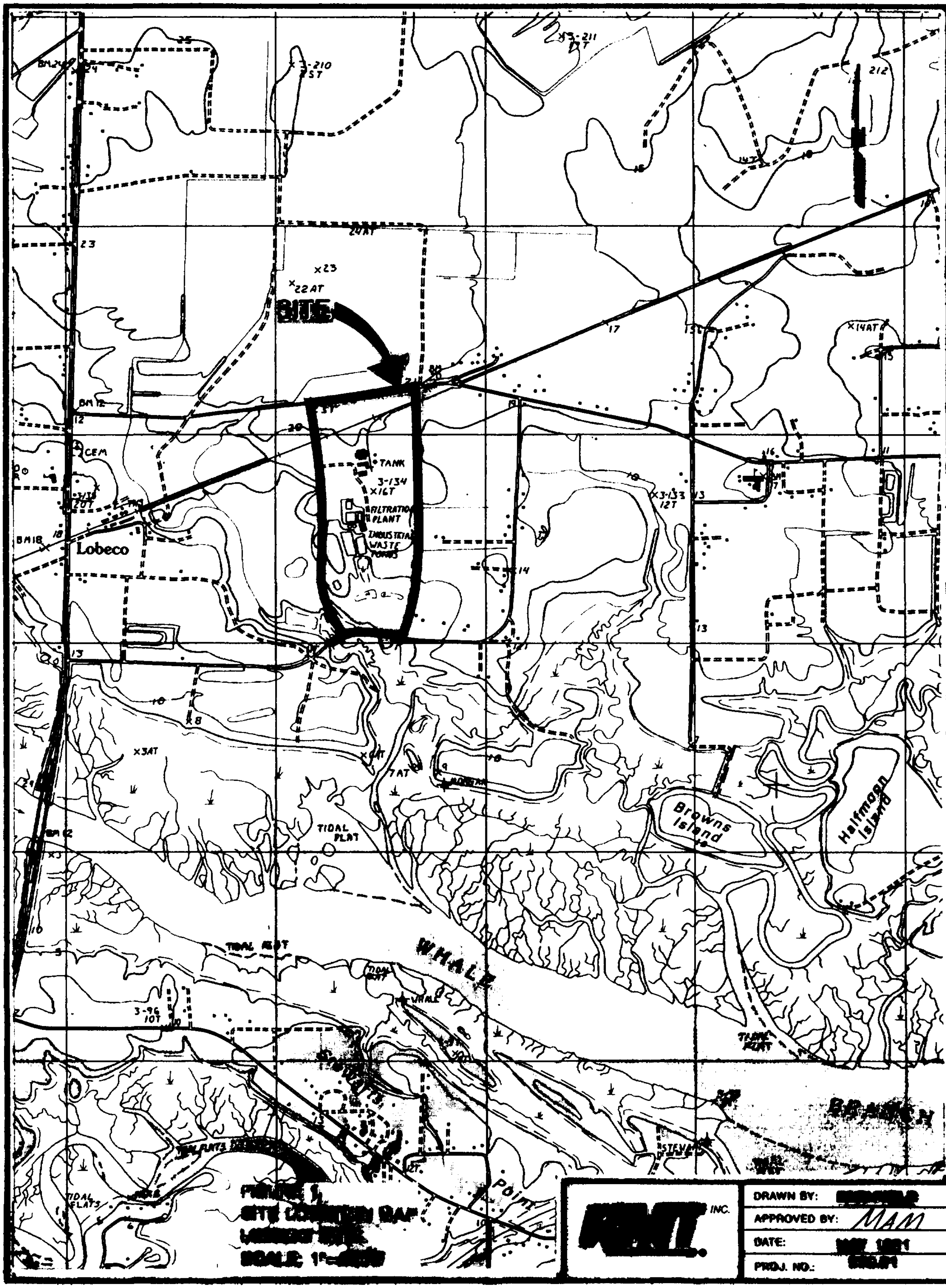
The facility was built in the late 1960's by the Berkshire Color and Chemical Company, a division of Tenneco Chemical Company (later Tenneco Polymers), and has been operated as a chemical manufacturing plant since that time. American Color and Chemical Corporation purchased the facility in January 1974. American Color and Chemical Corporation operated the plant until October 1982 when the facility was sold to Venture Chemical Company (later changed to Lobeco Products, Inc. in 1987). Lobeco Products has owned and operated the facility since October 1982. The facility currently produces agri-products, dye intermediates and drilling fluid chemicals for the oil and gas industry.

1.1 Background

On August 9 and December 5, 1984, the South Carolina Department of Health and Environmental Control (SC DHEC) sampled the sediment in Campbell Creek in Beaufort County, South Carolina, at and south of the Venture Chemical Company (now Lobeco Products, Inc.) outfall. Analyses obtained from these samples indicated the presence of polychlorinated biphenyls (PCBs) in the sediment.

Additional sampling was conducted by SC DHEC of crab tissue from animals taken from Campbell Creek, Whale Branch, Huspah Creek, and the Coosaw River. Analytical results showed that samples contained levels of PCBs. The highest levels of PCBs were found in samples collected in the vicinity of the LPI outfall. However, none of the concentrations detected exceeded the tolerance level recommended by the United States Food and Drug Administration.

A preliminary assessment by G & E Engineering identified two areas, the Old Burn Site and the Abandoned Lagoon Area, as containing elevated levels of PCBs in the soil and/or the ground water.


SITE
Lobeco
CEM
TANK
FILTRATION PLANT
INDUSTRIAL WASTE PONDS
TIDAL FLAT
Browns Island
Halfmoon Island
WHALE
Point
FIGURE 1
INC.
DRAWN BY:
APPROVED BY: MAM
DATE:
PROJ. NO.:

On June 25, 1987, the current owner (LPI) and two prior owners (American Color and Chemical Corporation and Tenneco Polymers, Inc.) entered into Consent Order 87-65-W with SC DHEC, Bureau of Water Pollution Control to evaluate the Lobeco site and recommend appropriate remedial action.

Between September 1987 and November 1989, Lane Environmental Services Corporation (LESC) conducted an environmental assessment and developed an appropriate remedial action plan to remove materials affected by PCBs from the Old Burn Site and the Abandoned Lagoon Area. On October 11, 1989, the Consent Order with SC DHEC was amended to approve the proposed remedial action, and a schedule for completing that action was developed. Implementation of the remedial action plan began in February, 1990.

Between February 1990 and November 1990, a total of 29,459 tons of soil and debris was excavated and transported to the Chemical Waste Management, Inc., landfill in Emelle, Alabama for disposal. Excavations continued until analysis by an on-site gas chromatograph demonstrated that the remaining soil contained less than 25 ppm PCBs, the clean-up level set forth in the Consent Order. Results of on-site analysis were confirmed by post-excavation samples analyzed by a South Carolina certified laboratory. In addition, 525,804 gallons of contaminated ground water from within slurry walls constructed around the two sites were pumped and treated with activated carbon to remove any PCBs prior to discharge to the LPI wastewater treatment plant.

On March 22, 1991, American Color and Chemical Corporation and LPI entered into a Consent Agreement with SC DHEC. Under the terms of the Consent Agreement, American Color and Chemical Corporation and Lobeco Products, Inc. agreed to submit a workplan to SC DHEC designed to assess the nature and extent of ground water impact that may have resulted from releases from the Remediated Burn Site, Remediated Lagoon Site, and former Drum Storage/Above Ground Storage Tank Site.

RMT, Inc. (RMT) was retained by American Color and Chemical and Lobeco Products, Inc. to prepare a workplan to address SC DHEC concerns. This workplan was developed and submitted in May 1991 accordance with Consent Agreement (91-12-W). Subsequent discussions between SC DHEC, American Color and Chemical Corporation, and Lobeco Products, Inc. have resulted in some additions to the scope of the workplan.

In order to acknowledge completion of Consent Order 87-65-W, SC DHEC agreed to transfer the requirement to address ground water issues at the remediated burn site and lagoon to Consent Order 91-12-W. These issues involved the assessment of ground water quality both inside and downgradient of breaches in the slurry walls at both the Remediated Burn Site and the Remediated Lagoon. The workplan has been revised to address these additional issues.

1.2 Purpose and Scope

The purpose of this workplan is to describe RMT's approach to further define ground water conditions which may have resulted from releases from the Abandoned Burn Site, the Abandoned Lagoon, and former Drum Storage/Above Ground Tank Area. In addition, this workplan describes RMT's approach to assessing potential releases of PCBs to the surface soils generally located between the former Burn Site and the plant production area.

The scope of this workplan is based on the Consent Agreement (91-12-W), the results of SC DHEC's 1988 site inspection, information presented in the "Lobeco Site Environmental Assessment Results and Proposed Remedial Action Plans," the "Final Report: Lobeco Site Remediation," SC DHEC correspondence dated November 5, 1991, and a meeting with SC DHEC held on December 3, 1991. Water level data collected from on-site monitoring wells and piezometers was also obtained to evaluate what effect the presence of the slurry walls, installed during the site remediation, have had on ground water flow characteristics.

The scope of this workplan includes the following work elements:

- Perform a ground water screening survey to further assess the horizontal and vertical extent of affected ground water downgradient of the former Burn Site, the former Lagoon, and the Old Drum Storage/Above Ground Tank Area.
- Perform a geophysical survey at the Remediated Burn Site and the Remediated Lagoon to locate the breaches in the slurry walls.
- Collect one shallow and one deep ground water sample from inside the slurry wall at the Remediated Burn Site and the Remediated Lagoon, and analyze the samples for the priority pollutant volatile and semi-volatile organic compounds plus PCBs.
- Collect a shallow ground water sample downgradient of the breaches cut in the slurry wall surrounding the Remediated Burn Site and the Remediated Lagoon, and analyze the samples for the priority pollutant volatile and semi-volatile organic compounds.

- Analyze sample THC-1 collected downgradient of the Old Drum Storage/Above Ground Tank Area for the priority pollutant volatile and semi-volatile organic compounds.

- Install ground water monitoring wells to substantiate the results of the screening survey.

- Collect ground water samples from the newly installed wells and select existing wells.

- Analyze ground water samples collected from the newly installed wells for the priority pollutant volatile and semi-volatile organic compounds.

- Collect approximately 20 surface soil samples in the area between the former Burn Site and the plant production area.

- Analyze the surface soil samples for PCBs using the field GC.

- Select two surface soil samples for confirmation laboratory analysis.

Section 2
FIELD INVESTIGATION

This section describes the investigation proposed to address SC DHEC concerns cited in the Consent Agreement (91-12-W) as amended. The investigation has been designed and the methods selected to meet the specific Data Quality Objectives (DQO's) discussed in Section 2.1.

A phased approach is proposed to assess the horizontal and vertical extent of affected ground water in and downgradient of the Remediated Burn Site, Remediated Lagoon Site, and downgradient of the Old Drum Storage/Above Ground Tank Area. Phase I of the investigation will consist of a ground water screening survey. Based on the results of this survey, Phase II will include the installation of monitoring wells and the collection and analysis of confirmation ground water samples.

2.1 Data Quality Objectives

The investigation activities proposed for the Lobeco Site Ground Water Assessment include sample collection and analysis. DQOs have been established to focus data acquisition towards meeting the specific investigation objectives of better delineating the horizontal and vertical extent of ground water impacts and assessing the potential for off-site migration at the Lobeco Site. The DQOs are based on available site specific information, however, after collecting additional data, the DQOs may be modified.

General consideration in developing DQOs include the following:

- Site characteristics,
- waste constituent characteristics, and
- future data use, such as the development of a proposed remedial action plan.

Data Quality Objectives defined for this investigation are:

- to further assess horizontal and vertical extent of affected ground water identified during the Lobeco Site Environmental Assessment, downgradient of the Abandoned Burn Site, and the Abandoned Lagoon,
- to assess potentially affected ground water, if any, that may have resulted from releases from the Old Drum Storage Area/Above Ground Storage Tank Area,

- to compare ground water quality inside the slurry walls to water quality downgradient of breaches cut in the walls, and
- to assess potential releases of PCBs to the surface soils in the area generally between the former Burn Site and the plant production area.

2.2 Ground Water Screening Survey

A ground water screening survey is proposed to better delineate the horizontal and vertical extent of releases of organic compounds from the Old Burn Site, Abandoned Lagoon, and Old Drum Storage/Above Ground Tank Area. The ground water screening survey has also been designed to further assess water quality conditions inside and outside the slurry walls surrounding the Remediated Burn Site and Lagoon, and near the site boundary. The results of this activity will be used to determine the number and location of confirmation monitoring wells.

2.2.1 Sampling Locations

Ground water samples will be collected from approximately 12 locations around the Remediated Burn Site, 9 locations around the Remediated Lagoon, and 5 locations around the Old Drum Storage/Above Ground Tank Area. Sampling locations are shown on Plate 1. Ground water samples will be collected from the water table and from the top of the Hawthorn-Cooper Formation, as needed.

When investigating releases from the former Burn Site, sampling will begin at well L-3 and proceed in a southerly and easterly direction as access allows. Samples will also be collected inside the slurry wall area and just downgradient of breaches in the slurry wall, to assess potential differences in ground water quality conditions. Sample intervals and/or sampling locations may be omitted if omission from the sampling program does not detract from the survey's objective. The survey may also be expanded if the extent of affected ground water is greater than anticipated.

When investigating releases from the former Lagoon, sampling will begin near well L-6 and proceed in a southerly direction along the access road south of the Abandoned Lagoon to County Road 301. Additional samples will be collected along County Road 301. As with the former Burn Site, samples will also be collected inside the slurry wall area and just downgradient of breaches in the slurry wall to assess potential differences in ground water quality conditions. As previously stated, the survey size may be expanded or reduced so long as the survey's objectives are not compromised.

When assessing ground water quality downgradient of the Old Drum Storage Area/Above Ground Tank Area the survey will begin near existing wells V-2 and V-3. Sampling will proceed in a south-westerly direction. Additional samples may be collected between well V-2 and the Abandoned Burn Site. As previously stated, the survey size may be reduced or expanded so long as the survey's objectives are met.

2.2.2 Sample Collection Methods

The "Hydrocone" sampling system, as shown in Appendix A, will be used to collect the ground water samples. The Hydrocone sampler will be pushed to the desired depth using *In-Situ* Technology's "Direct Push Technology". Before exposing the screened portion of the sampling devise, the sample chamber will be evacuated, then pressurized with argon gas. After the screen has been exposed and a sufficient volume of ground water has been collected, the sample chamber is repressurized with argon gas. By monitoring the argon gas back pressure, *In-situ's* on-site personnel can ensure that the sample chamber is sealed before retrieving the sampling devise. Once the sampler has been retrieved, the point and screen are unscrewed from the chamber. A teflon tube is inserted into the chamber and the sample is transferred directly into the appropriate sample containers, by gravity draining.

Following sample collection, boreholes will be backfilled with a cement/bentonite grout slurry. Abandonment will be accomplished in accordance with the South Carolina Well Standard R-61-71.10 and the procedures outlined in Appendix B.

Equipment that may come into contact with the ground water sample will be decontaminated before and after each use. This will consist of steam cleaning, followed by a deionized water rinse. Additional decontamination procedures are outlined in Appendix B.

2.2.3 Ground Water Headspace Analytical Method

Ground water samples collected using *In-situ's* direct push technology will be analyzed with a photovac model 10570 portable gas chromatograph using a 10.6 e.v. photoionization detector.

After volatile organic compounds in the sample have equilibrated with the headspace in the vial (approximately five minutes after sample collection), a syringe needle (not attached to a syringe) will be inserted through the septum to briefly allow the headspace pressure to equilibrate with atmospheric pressure. The sample will be analyzed by withdrawing an aliquot from the vial headspace and injecting it into the field gas chromatograph. Duplicate analyses will be performed on ten percent of the samples collected to verify the precision of the analytical technique.

In addition, ground water samples THC-1, AHC-1 through AHC-4, and BHC-1 through BHC-5 will be sent to the laboratory and analyzed for the priority pollutant volatile and semi-volatile organic compounds. Ground water samples AHC-1 through AHC-5 and BHC-1 through BHC-5 will also be analyzed for PCBs.

Field ground water screening results and approximate sampling locations will be plotted on a site base map and submitted to SC DHEC along with a request for monitoring well approval. The exact number and location of the wells will be based on the results of the ground water screening survey. After installing the monitoring wells, the sampling locations will be located by a registered surveyor.

2.3 Monitoring Well Installation

A minimum of five ground water monitoring wells will be installed on-site. The wells will be tentatively installed at the locations shown on Plate 1. The precise number and location of the monitoring wells is subject to change based on the results of the ground water screening survey, and will be submitted to SC DHEC, along with the request for well approval. Drilling and well installation will be accomplished according to the procedures outlined in Appendix B. The location and elevation of each well will be determined by a registered surveyor.

Single well hydraulic conductivity tests will be conducted on each of the newly installed wells using a programmable data logger and a pressure transducer. Before beginning the test, the static water level and the total depth of the well will be measured. The pressure transducer will be placed in the well and the height of the water column above the transducer will be recorded. Following this, a PVC slug will be placed into the well. After the water level returns to static conditions, the PVC slug will be removed and the change in water level will be automatically recorded. The test will be terminated when the observed water level in the well has returned to near static conditions. This procedure will be performed once in each well. The data collected will be used to estimate hydraulic conductivity according to the Bouwer and Rice method.

2.4 Ground Water Sampling

Following well development, one round of ground water samples and water level measurements will be collected from each well. Ground water samples will be collected and handled according to the procedures outlined in Appendix C.

In addition to the newly installed wells, ground water samples will be collected from wells L-1 through L-7, W-5 through W-7, and W-13. Ground water samples collected from these wells will be analyzed for the parameters listed in Table 1.

2.5 Soil Sampling

To assess potential releases of PCBs to surface soils generally located between the former Burn Site and the plant production area, the following strategy is proposed:

- collect approximately 20 surface soil samples at random locations within the area shown on Plate 1. Surface soil samples will be collected according to the procedures described in Appendix B.
- analyze the surface soil samples in the field using a portable gas chromatograph for PCBs.
- Based on the results of the field analyses, select two samples for confirmation laboratory analysis.
- At the conclusion of the monitoring well installation phase of this work, the sampling locations will be located by a registered surveyor.

TABLE 1
SUMMARY OF PROPOSED ANALYTICAL PARAMETERS [1]

Indicator Parameters

- pH
- Temperature
- Specific Conductance

Volatile Organic Compounds

- Benzene
- Bromoform
- Chlorobenzene
- Chloroform
- Methyl Chloride
- Methylene Chloride
- Toluene
- 1,2-Trans-Dichloroethylene
- Trichloroethylene

Semi-Volatile Organic Compounds

- 1,4-Dichlorobenzene
- Naphthalene
- 1,2,4-Trichlorobenzene
- Phenols

Inorganic Constituents

- Arsenic
- Beryllium
- Cadmium
- Chromium
- Cyanide
- Mercury
- Nickel
- Silver
- Zinc

PCBs

[1] Analytical parameter found at or above the detection limit during the Lobeco Environmental Assessment (September 1988).

NOTE: Additional parameters may be added based on the results of the priority pollutant analyses.

Section 3
WELL INVENTORY

In July 1989, SC DHEC completed a survey of private water supply wells in the vicinity of Lobeco Products, Inc. At the time the survey was conducted, ground water samples were collected from six private wells that border the site. The samples were analyzed for "…. volatile organics, priority pollutant metals, selected secondary metals, acid base and neutral extractable components, PCBs, alkalinity and total dissolved solids." According to SC DHEC, "Analysis for organics and inorganics indicates both the sampled wells and adjacent water supplies to be of satisfactory ground water quality respective of the parameters evaluated and normal to the hydrogeologic conditions of the low country area."

Work will be performed to update the SC DHEC survey by identifying potential users not present at the time of the SC DHEC survey. The collection of ground water samples from nearby private wells identified in this update, as well as ground water samples from the three on-site production wells, will be considered at the conclusion of this investigation.

Section 4
REPORTING

A report will be prepared that documents the findings of the Lobeco Site ground water investigation and the construction of the monitoring wells. The report will include the following:

- Water quality results from the ground water screening survey and the monitoring well sampling;
- well construction diagrams;
- lithologic logs from the newly installed monitoring wells;
- maps, cross-sections, and tables presenting the surveyed locations of the monitoring wells; ground water quality, water table configuration, ground water flow rates, and site stratigraphy;
- investigation conclusions along with recommendations for further action, if necessary, with regards to ground water quality at the Lobeco Site; and
- proposed remedial action plan.

Section 5

SCHEDULE OF IMPLEMENTATION

The project elements described in this workplan will be implemented in accordance with the following schedule:

Activity	Week
Receive SC DHEC Approval to Proceed	0
Mobilize for Screening Survey	5
Complete Screening Survey	7
Submit Request for Well Approval	10
Receive SC DHEC Approval to Proceed	11
Mobilize for Well Installation	14
Complete Well Installation	16
Receive Analytical Results	21
Draft Report to Clients for Review	25
Submit Final Project Report to SC DHEC	28

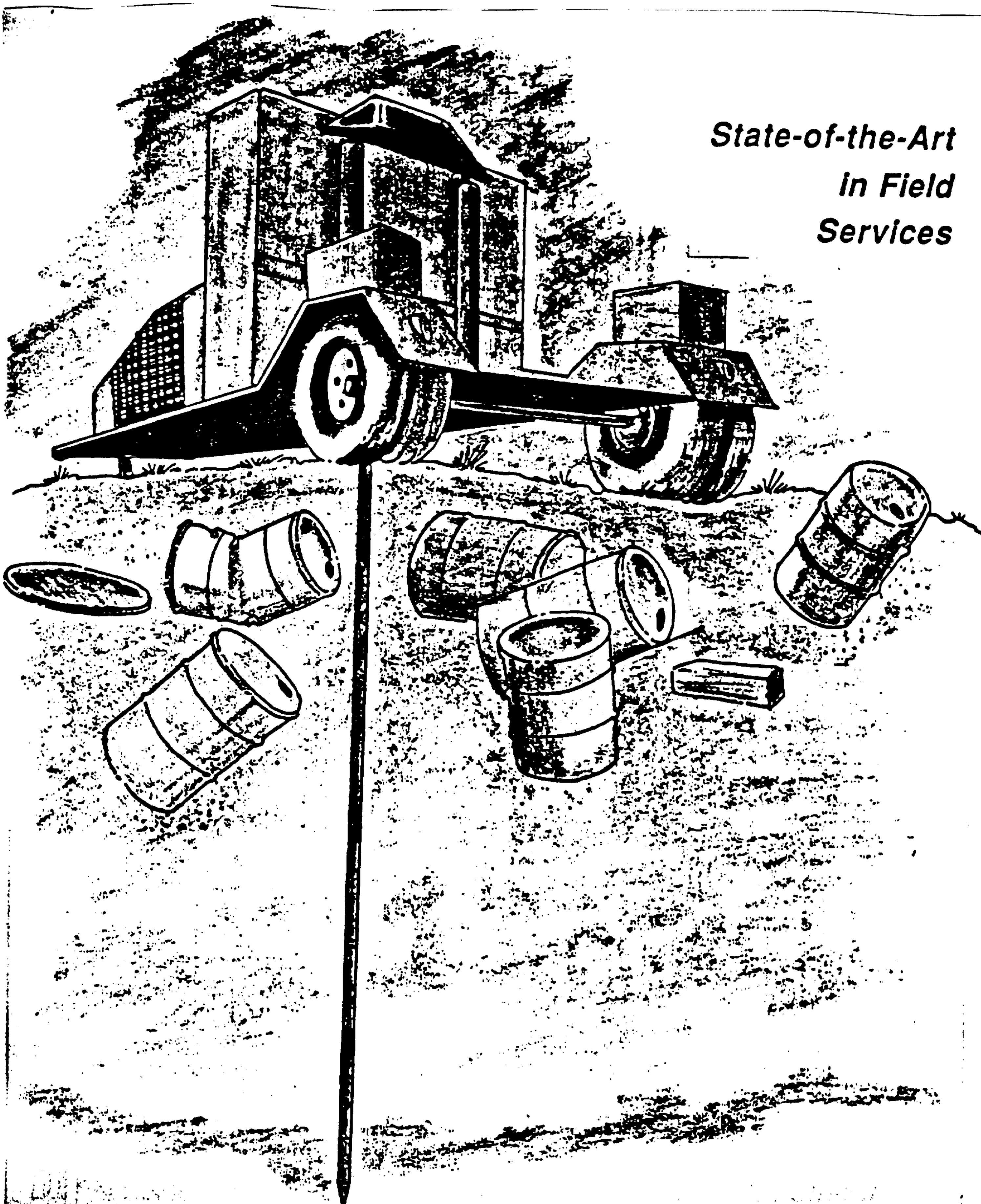
This schedule is based upon the assumption that field conditions will not be encountered that would require modification of the current Workplan. In the event that site conditions are encountered that would warrant changes to the Workplan, RMT will promptly advise American Color and Chemical and Lobeco Products of the nature of the field conditions, and provide recommendations for their resolution. SC DHEC will then be subsequently advised of any required changes to the Workplan and the expected affect these change will have on the project schedule.

Appendix A

APPENDIX A

HYDROCONE SAMPLING SYSTEM

State-of-the-Art in Field Services



in-situ TECHNOLOGY

1821 Tallokas Avenue
Orlando, Florida 32802
407-425-5015

in-situ TECHNOLOGY

INTRODUCTION:

WITH INCREASING NATIONAL EMPHASIS ON ENVIRONMENTAL ISSUES AND IN PARTICULAR THE CONTAMINATION OF OUR SOIL AND GROUNDWATER, THE NEED NOW EXISTS FOR A SAFE, RELIABLE MEANS OF SUBSURFACE EXPLORATION. TRADITIONAL METHODS SUCH AS THE STANDARD PENETRATION TEST (SPT) AUGER BORINGS AND THE USE OF MONITORING WELLS REPRESENT TECHNIQUES HAVING NO SIGNIFICANT EVOLUTION WITHIN THE PAST FIFTY YEARS. COMMON TO THESE EXITSING TECHNOLOGIES IS THE NEED TO BORE A HOLE INTO THE EARTH WHICH RESULTS IN CONTAMINATED WASTE SOIL AND WATER BEING BROUGHT TO THE SURFACE. THESE WASTE PRODUCTS IN TURN REQUIRE DISPOSAL. MORE IMPORTANTLY, CREWS WORKING AROUND THESE WASTE PRODUCTS ARE SUBJECTED TO THE POSSIBILITY OF DANGEROUS ENVIRONMENTAL EXPOSURE.

DPT TECHNOLOGY:

IN-SITU TECHNOLOGY INC IS A FIVE YEAR OLD COMPANY WHICH HAS DEVELOPED A UNIQUE METHODOLOGY EMPLOYING IN-HOUSE DEVELOPED HARDWARE AND COMPUTER SOFTWARE. THIS METHODOLOGY, KNOWN AS 'DIRECT PUSH TECHNOLOGY' (DPT), IS SIMPLY ONE OF PUSHING INTO THE EARTH, WITHOUT THE NEED FOR A DRILLED BORE HOLE, VARIOUS INSTRUMENTS FOR THE MEASURING AND SAMPLING OF SOIL, SOIL GAS AND SUBSURFACE GROUNDWATER.

THIS TECHNOLOGY HAS EVOLVED FROM THE SERVICES ORIGINALLY OFFERED UTILIZING THE STATIC DUTCH CONE PENETROMETER TEST (ASTM D-3441). WHILE STILL OFFERING GEOTECHNICIAL SUBCONTRACT SERVICES UTILIZING THE PENETROMETER, THE MAJORITY OF OUR WORK TODAY IS IN THE AREA OF ENVIRONMENTAL INSTRUMENTATION AND FIELD SERVICES.

FIELD SERVICES:

SERVICES WE OFFER ARE CENTERED AROUND THE USE OF A COMPLETE LINE OF DPT INSTRUMENTATION SYSTEMS, MOST OF WHICH WERE IN HOUSE DEVELOPED AND PATENTED. THESE SYSTEMS INCLUDE THE STATIC CONE PENETROMETER WITH PORE PRESSURE CAPABILITY (PIEZOCONE) AND THE GEOCONE FOR SOIL MEASURING AND SAMPLING. FOR GROUNDWATER SAMPLING, OUR WELL-POINT AND HYDROCONE SYSTEMS REPRESENT STATE OF THE ART TECHNOLOGIES. FOR SOIL VAPOR INVESTIGATIONS, WE OFFER OUR VAPORCONE SYSTEM AND FOR PUMPING TEST MOINITORING, OUR AQUIFER PUMP TEST MONITORING SYSTEM PROVIDES A UNIQUE AND COST EFFECTIVE ALTERNARTIVE.

PERSONNEL WITH IN-SITU TECHNOLOGY INC ARE FULLY CERTIFIED HAVING COMPLETED THE OSHA 40 HOUR HAZARDOUS SITE TRAINING COURSE AND ARE ON A CURRENT MEDICAL MONITORING PROGRAM. IN ADDITION, WE HAVE ON FILE WITH THE FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION AN APPROAVED QA/QC PLAN (880844G).

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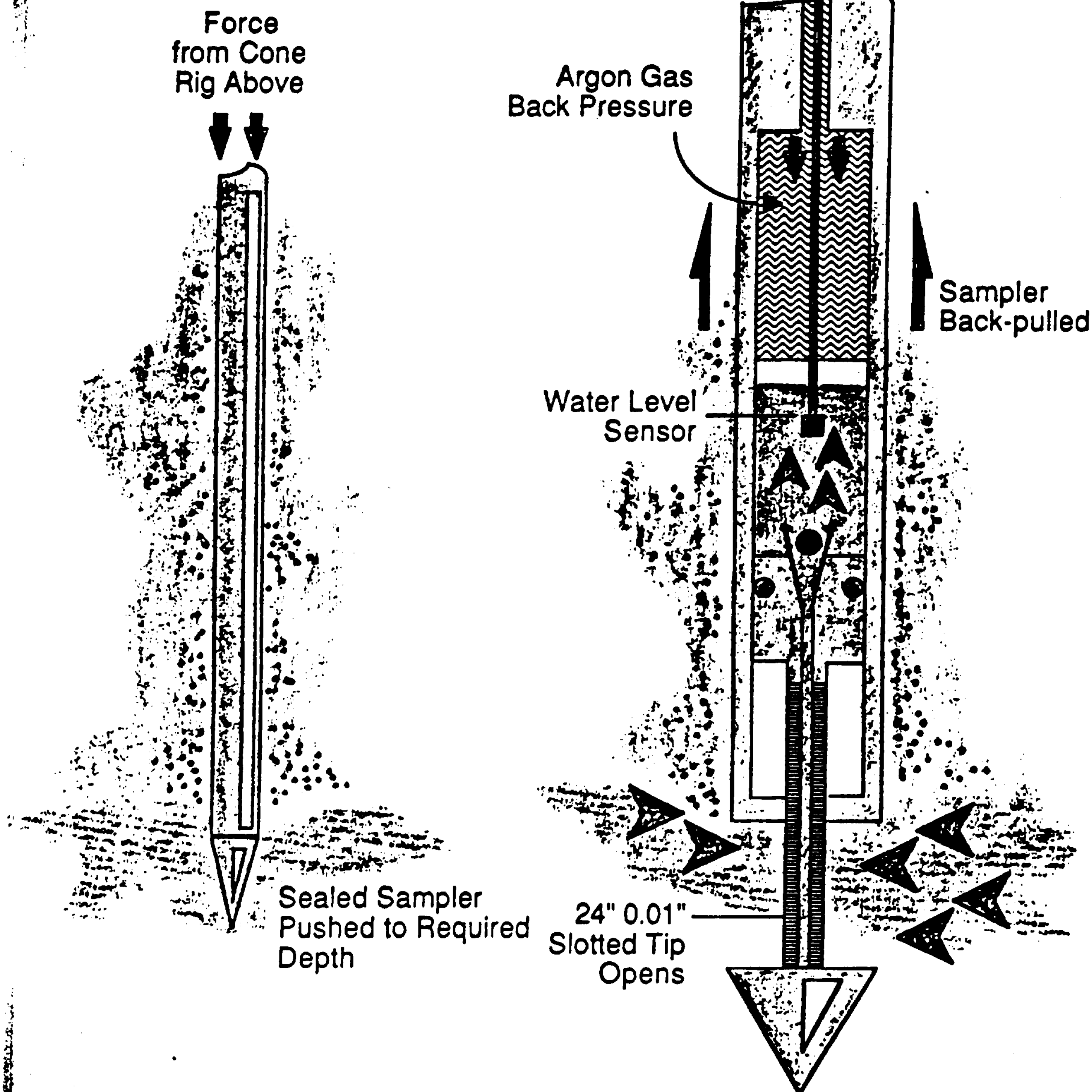

in-situ TECHNOLOGY

Sketch of HYDROCONE Water Sampler

in-situ TECHNOLOGY

HYDROCONE GROUNDWATER SAMPLING SYSTEM

DESCRIPTION:

THE HYDROCONE SYSTEM, AVAILABLE ONLY FROM IN-SITU TECHNOLOGY INC, IS A UNIQUE PATENTED STATE OF THE ART INSTRUMENT FOR OBTAINING SUBSURFACE GROUND WATER SAMPLES WITHOUT THE NEED FOR COSTLY MONITORING WELLS. IN ADDITION, AS THIS INSTRUMENT IS PUSHED DIRECTLY TO SAMPLING DEPTH, NO DRILLING PRODUCTS ARE GENERATED THUS ELIMINATING DISPOSAL PROBLEMS AND SIGNIFICANTLY REDUCING CREW EXPOSURE TO ENVIRONMENTAL CONTAMINATION.

THE HYDROCONE SYSTEM IS COMPRISED OF THE SAMPLER BODY WITH TELESCOPING POROUS TIP, AN ARGON GAS SOURCE WITH A GAS/ELECTRONIC UMBILICAL CABLE CONNECTING THE SAMPLER BODY TO A POWERFULL MICROCOMPUTER LOCATED AT THE SURFACE ON OUR DIRECT PUSH TECHNOLOGY (DPT) RIGS.

FOLLOWING COMPREHENSIVE DECONTAMINATION AND SURFACE CHECKOUT PROCEEDURES, THE HYDROCONE IS PUSHED DOWN TO SAMPLING DEPTH BY OUR DPT RIG. AS THE HYDROCONE IS SEALED UNTIL ARRIVING AT SAMPLING DEPTH, THIS INSTRUMENT WORKS EXTREMELY WELL SAMPLING UNDER FREE PRODUCT. ONCE SAMPLING DEPTH IS REACHED, THE POROUS TIP IS EXPOSED AND GROUNDWATER SAMPLING IS INITIATED. NATURAL HYDROSTATIC PRESSURE IS USED TO COLLECT THE SAMPLE WITH THE INSIDE OF THE SAMPLER BODY UNDER A VARIABLE ARGON GAS BACKPRESSURE. THIS IS DONE TO CONTROL THE RATE OF FILLING AND TO MINIMIZE SAMPLE VOLATILIZATION. DATA COLLECTED WITHIN THE SAMPLER SHOWING THE VOLUME OF COLLECTED SAMPLE IS CONTINUOUSLY BEING RELAYED TO THE SURFACE COMPUTER WHICH THEN PRESENTS A REAL TIME GRAPHIC DISPLAY AS THE TEST PROCEEDS. FOLLOWING SAMPLE COLLECTION, THE ARGON GAS BACKPRESSURE IS INCREASED TO SECURE THE SAMPLE AND THE HYDROCONE RETURNED TO THE SURFACE. AS NO BORE HOLE EXISTS FOLLOWING SAMPLING, THE HYDROCONE CAN BE USED REPEATEDLY AT EVER INCREASING DEPTHS AT THE SAME LOCATION FOR DETAILED VERTICAL DELINEATION.

DATA PRESENTATION INCLUDES A GRAPHIC DISPLAY OF THE SAMPLE COLLECTION AND ARGON GAS PRESSURE AS A FUNCTION OF TIME. AS ALL SYSTEM PARAMETERS ARE MONITORED BY ELECTRONIC SENSERS AND COMPUTER STORED, LATER DATA REDUCTION INCLUDES THE CALCULATION OF THE PERMEABILITY OF THE STRATA WHERE EACH HYDROCONE GROUND WATER SAMPLE WAS OBTAINED--A EXCLUSIVE FEATURE OF THE HYDROCONE AND ITS POWERFUL ELECTRONIC MONITORING SYSTEM.

HIGHLIGHTS:

- PERMEABILITY MEASURED AS GROUND WATER IS COLLECTED
- NO DRILLING, THUS NO DRILLING PRODUCTS AND REDUCED CREW EXPOSURE
- SAMPLING UNDER FREE PRODUCT AND AT EVER INCREASING DEPTHS

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Appendix B

APPENDIX B

PROCEDURES FOR DRILLING, SAMPLING AND WELL INSTALLATION

DOCUMENTATION

Field activity involving drilling and well installation will be observed and documented by an RMT Hydrogeologist. Field observations will be documented chronologically in a bound field book, dedicated to the project. Typical items included in the documentation are: personnel on-site, drilling and sampling techniques, description of material encountered, well installation (i.e. materials, as-built information, and development), and other information pertinent to the investigation. Standard forms used to document drilling and well installation activity are included in the Typical Forms Section included at the end of this appendix.

DRILLING METHODS

The primary drilling method will be hollow stem auger. Drilling and well installation will be completed by a well driller certified by the State of South Carolina. The Certified Well Driller will be responsible for notifying the State of South Carolina of the well installation, upon completion, as required by South Carolina law. Lubricants or glue will not be used in any manner that might possibly contaminate samples, boreholes or monitoring wells. Boreholes in which no well is installed will be grouted from the bottom of the borehole to within two feet of the land surface in accordance with the South Carolina Well Standards and Regulations.

Hollow Stem Auger

Drilling will be done with continuous flight hollow stem augers. In general, soil samples will be collected at five foot intervals beginning at the land surface. Actual sample intervals will be determined in the field. Additional soil sampling information is detailed below. Drill cuttings will be collected and placed in containers.

Mud Rotary

When drilling requires mud rotary techniques, the drilling fluid will be made up of potable water and bentonite powder. Borehole diameter will be 6 inches.

The settling pit (i.e. "mud tub", "sump", etc) will be covered during drilling operations to reduce the possibility of contaminating the drilling fluid. Equipment, such as hoses or tools, will not be placed in the settling pit if doing so might introduce contaminants into the drilling fluid.

Soil samples will be collected as detailed below and retained for future reference.

Surface Soil Sampling

Surface soil samples will be collected from within the first foot below land surface. The samples will be collected using decontaminated stainless steel scoops or a stainless steel hand auger. Any ground cover (detritus, leaves, vegetation, etc.) will be removed before sampling along with the first 3 to 4 inches of top soil. The sample will be collected from approximately 4 to 5 inches to one foot and homogenized in a stainless steel or glass holding vessel. Alternately, the sample may also be homogenized in the ground itself. After the sample has been thoroughly mixed, it will then be transferred using a stainless steel scoop to the appropriate sample containers. In the case of compositing more than one discrete soil sample, the above procedure will be used, with the samples being collected into one common holding vessel. The samples will then be mixed to form a single composite sample which will be transferred to the sample containers.

Subsurface Soil Sampling

Subsurface soil samples will be collected using a split barrel sampler in general accordance with ASTM D 1586. Samples will be collected from precisely predetermined depths. Borehole will be cleanly open to those depths.

Soil samples may also be collected using a thin-walled tube sampler (i.e., a "Shelby Tube") in general accordance with ASTM D 1587. Samples will be collected from precisely predetermined depths. Borehole will be cleanly open to those depths. The sample and tube will be sealed in microcrystalline wax upon removal from the borehole.

Grouting

Grouting will be done with a Portland cement slurry containing approximately five percent (5%) powdered bentonite. The grout slurry will be mixed by pump recirculation or other acceptable methods. When thoroughly mixed, the slurry will be pumped into the borehole or annulus via a rigid tremie.

WELL INSTALLATION

The actual well construction details will be determined by the RMT Hydrogeologist in the field at the time of drilling, based on actual field conditions. In general, wells will be installed as outlined in this Section and in Table 1. As-built well construction and development will be documented on forms shown in the Typical Forms Section.

Construction Materials

Well casing and screen will be 2-inch inside diameter, with threaded, flush joints. Casing and screen will be schedule 40 polyvinyl chloride (PVC). Well screens will be machine slotted. Slot size will be 0.010 inch. The PVC riser will be capped with a vented well cap. Filter sand will be Foster-Dixiana FX-50 or an equivalent. Downhole well seals will consist of bentonite pellets.

Installation Procedure

Wells will be installed through the hollow stem augers as they are withdrawn from the borehole or in a clean open borehole. Augers or borehole will be clean and open over their entire length prior to beginning well installation.

After drilling is complete, well screen and casing will be placed to the desired depth. Once the screen is correctly placed, the annular space around the screen will be packed with filter sand. The sand pack will extend approximately two feet above the top of the screen. The upper surface of the sand pack will then be sealed with bentonite pellets. The bentonite seal will be approximately two-feet thick. The bentonite pellets will be allowed to hydrate for at least 30 minutes before introducing grout into the borehole. The annular space above the bentonite seal will be grouted to the land surface. A steel protective cover with a lockable cap will be placed over each completed well and secured in the grout column. Locks will be provided for each well. A concrete pad (2 feet x 2 feet x 4 inches) will be framed and poured around each well. The concrete pad will extend six inches below the ground surface within six inches of the borehole. Weep holes will be drilled in each protective casing, just above the level of the concrete pad. A typical monitoring well schematic is included as Figure 1.

Well Development

Wells will be developed by pumping with a positive displacement PVC pump until discharge is relatively clear and free of sediment. Well development will be documented in the field on forms shown in the Typical Forms Section. Development water will be collected and placed in containers.

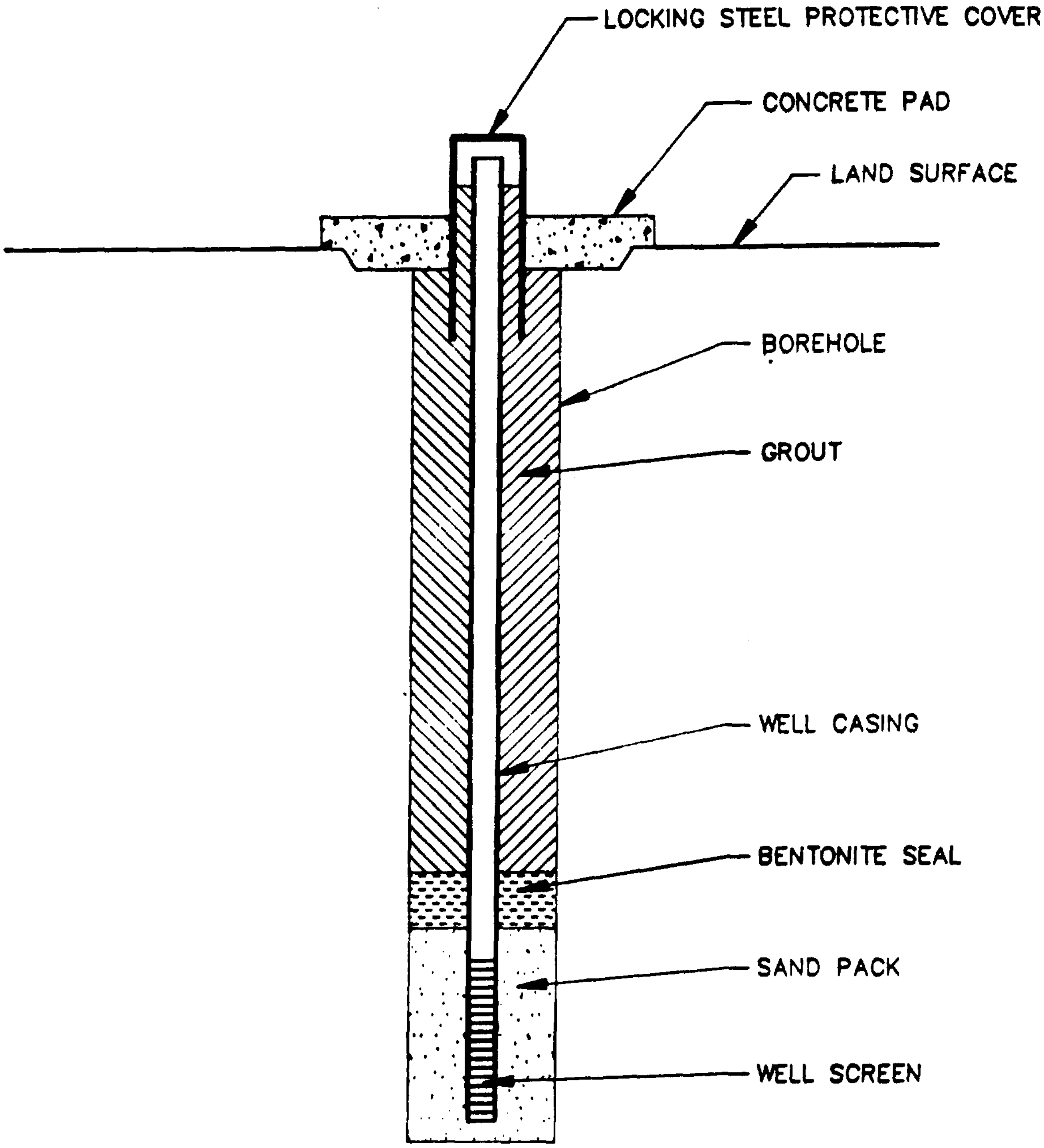
DECONTAMINATION

Decontamination of downhole tools and well materials will be accomplished by steam cleaning before drilling each borehole. Clean tools and equipment will be placed on and covered by clean plastic sheeting (or wrapped in aluminum foil) during transportation and storage. Downhole tools or equipment that contact possibly-contaminated surfaces will be decontaminated before further use. Water used in the decontamination process will be collected and placed in containers.

TABLE 1

Drilling, Sampling, and Well Construction Information

Boring Number	Estimate Depth (ft.)	Sampling Interval (ft.)	Borehole Diameter (inches)	Screen Slot Size (inches)	Screen Length (feet)	Well Construction Materials
L-3A	35	5	10	0.010	5	PVC
L-6A	35	5	10	0.010	5	PVC
L-8	15	5	10	0.010	10	PVC
L-8A	35	5	10	0.010	5	PVC
L-9	15	5	10	0.010	10	PVC



MONITORING WELL SCHEMATIC

Not To Scale

RMT

TYPICAL FORMS

RMT

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. ______

SHEET NO. ____ OF ______

PROJECT NAME ______ PROJECT NO. ______

LOCATION ______ INSTALLATION ______

CONTRACTOR ______ SURFACE ELEV. ______

DRILLING METHOD ______ BOREHOLE DIA. ______

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
					5	
					10	
					15	
					20	
					25	
					30	
					35	

GENERAL NOTES

DATE STARTED ______

DATE COMPLETED ______

RIG ______

CREW CHIEF ______

LOGGED ______ CHECKED ______

WATER LEVEL OBSERVATIONS

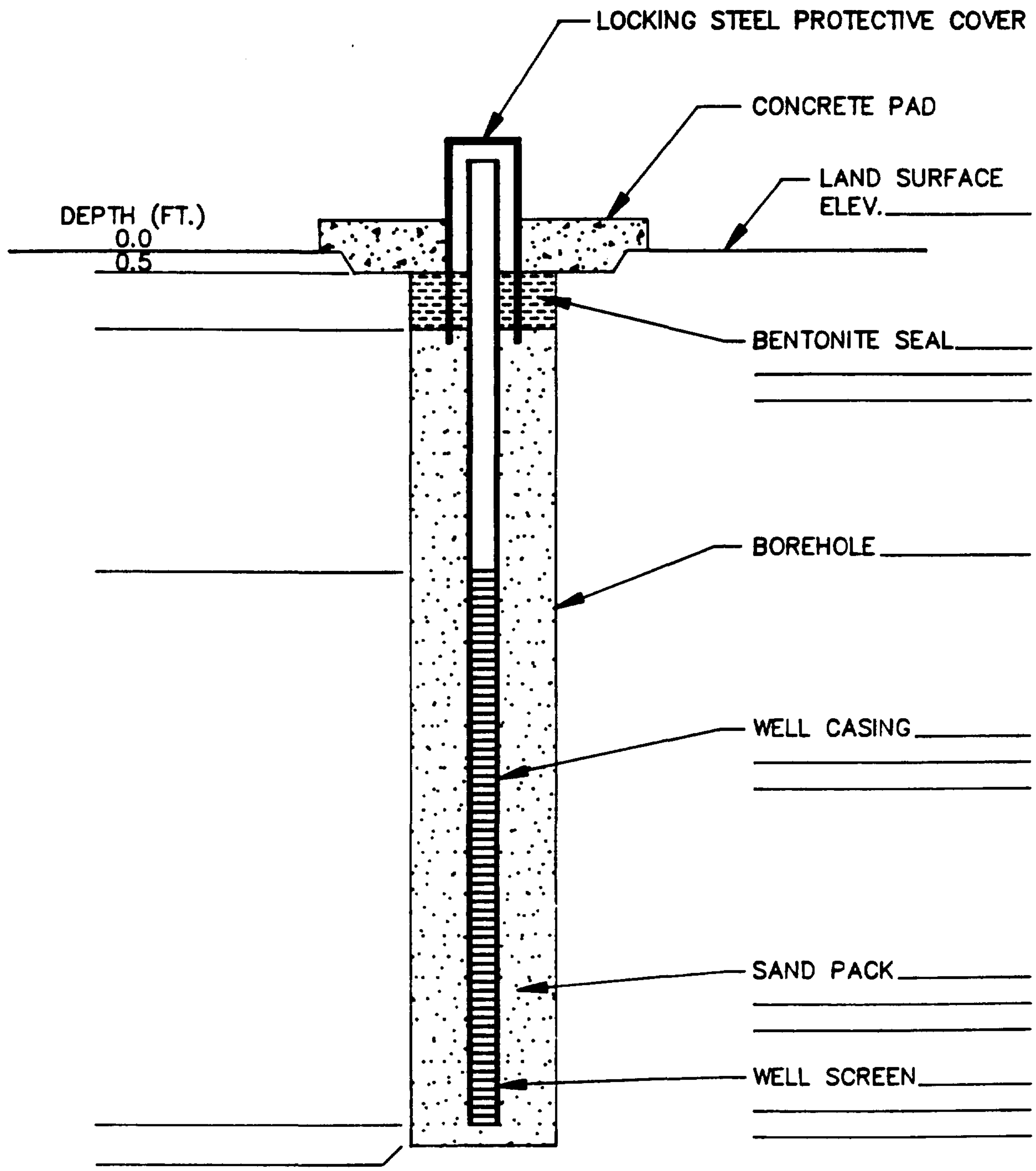
WHILE DRILLING ______

AT COMPLETION ______

AFTER DRILLING

CAVE-IN: DATE/TIME ______ DEPTH ______

WATER: DATE/TIME ______ DEPTH ______



WELL CONSTRUCTION DIAGRAM

Not To Scale

PROJECT

PROJECT NO.

WELL NO. DATE INSTALLED

DRILLING CONTRACTOR

RMT GEOLOGIST

RMT INC.

RMT INC.

SHEET ______ OF ______

100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

RECORD OF WELL DEVELOPMENT

PROJECT AND NUMBER: ______

DATE: ______

DEVELOPMENT PERFORMED BY: ______

WELL NUMBER: ______

METHOD OF DEVELOPMENT: ______

ESTIMATED RATE OF FLOW: ______

DEVELOPMENT TIME

START: ______ FINISH: ______ TOTAL TIME: ______

TOTAL VOLUME OF WATER REMOVED: ______

COMMENTS: ______

______

______

______

Appendix C

APPENDIX C
SAMPLING AND ANALYSIS PLAN

DETAILED SAMPLING PROCEDURES

The sampling of ground water is a critically important operation. Ground water sampling serves as a means of monitoring the environmental effects a facility may have on future sources of drinking water. Therefore, the importance of proper sampling of monitoring wells cannot be overemphasized. Special care must be taken to ensure that the sample collected from a monitoring well is representative of the ground water at that location and that the sample is neither altered nor contaminated by the sampling procedure.

The sample collection and handling procedures necessary to ensure a good quality monitoring program are explained in the following pages. The procedures have been arranged in the order they should be performed and consist of step-by-step instructions. The equipment needed for each procedure is given in the instructions.

GENERAL INFORMATION

The sample bottles will be provided by the analytical laboratory. All other sampling equipment is owned, cleaned, and maintained by RMT. Sturdy, durable shipping coolers are either provided by the laboratory or RMT.

Distilled water source is from a Barnstead NANO pure II that produces type 1 reagent grade water that exceeds ASTM, CAP, and NCCLS standards. This source is owned, operated and maintained by RMT.

All field activities are documented in a bound field notebook.
The following information appears on every page: project, date, and time.

In most cases, a field team consists of 2 people who are full time RMT employees. The field team checks all equipment before leaving the RMT laboratory.

EQUIPMENT CLEANING

Items Needed to Clean Equipment:

Laboratory Detergent	Distilled Water
Water	Propanol

Ground water sampling equipment that will come into contact with the sample must be cleaned according to the following procedure:

1. Wash with laboratory detergent and water.
2. Rinse thoroughly with tap water.
3. Rinse three times with distilled water.
4. Spray with propanol.
5. Rinse thoroughly with distilled water.
6. Equipment that will not be used immediately after cleaning will be wrapped in aluminum foil and stored in such a manner that the risk for destruction of the wrapping is minimal.

WATER LEVELS

Items Needed to Take Water Levels:

Electric Water Level Indicator or Chalked Steel Tape
Folding Rule graduated in hundredths of a foot
Chem wipes
Field Book
Disposable Gloves

1. Take cap off well, allow well to vent.

2. Remove dedicated equipment from well and place temporarily on a clean surface.

3. Turn the water level indicator to the "ON" position and press the test button. The light should come on and the buzzer should sound. Replace the battery, if necessary.

4. Unreel the cable slowly down the well and listen for the buzzer to indicate the probe is in the water.

5. Pull the cable up about 2 inches.

6. Lower the cable down the well a tenth at a time until you hear the buzzer sound. Mark the point with a marker, clip or finger.

7. Use the folding rule to measure down from the nearest foot marker on the cable to the water level marked in Step 6. Add the measured length to the value on the foot marker.

8. Record the depth to water (A) from Step 6 in the field book.

9. Unreel the cable all the way to bottom of well and record the depth (B).

10. Record depth to the bottom of the well (B) in the field book.

11. Record inside diameter of well in field book (C).

PURGING WELLS

Items Needed to Purge:

Bucket, known volume
Disposable Gloves
Water Levels
Depth to well bottom measurement
Field Book

1. Determining Amount of Water to Remove from Well

   A. Subtract water level from depth to bottom (B-A).

   B. Multiply the number from Step A by 0.163 for a 2 inch I.D. well.

   C. Multiply the number from Step B by 3. This number is equal to 3 well volumes in gallons, the minimum needed to properly purge the well. For instance, if the well is a 2 inch I.D. well that is 30 feet deep, and the depth to water is 20 feet, the number of gallons needed to purge the well is:

   - A. (30-20) = 10
   - B. 10 x .163 = 1.63
   - C. 3 x 1.63 = 4.89

   Therefore, you would need to remove 4.89 gallons from the well.

2. Bailing Method (using dedicated bailer)

   A. Place bucket near well.

   B. Wear Disposable Gloves

      1. Change and discard between wells

   C. Lower bailer down well, pull up, pour into bucket.

   D. Remove required volume and note time after each well volume.

   E. After each well volume is removed, measurements of pH, temperature, land specific conductance will be taken. If after 3 well volumes these measurements are not stable ($\pm$10%) purging will continue. Three (3) consecutive stable measurement must be recorded before purging will be considered complete. These values, times, and corresponding volumes will be recorded.

   F. Record the volume removed and method used in field book.

   G. It is important to make note of the color, odor, and amount of sediment, if any in the water, in the field book.

SAMPLING OF WELLS

Items Needed To Sample:

Sample Bottles
Chem wipes
Thermometer
Field Book
Disposable Gloves
pH Meter and Probe
Conductivity Meter & Probe

1. Take conductivity and temperature (quadruple replicate)

   A. Standardize meter according to manufacturer's instructions.
   B. Lower probe into the water that is collected in a beaker.
   C. Take a temperature reading, record in field book.
   D. Set temperature dial to temperature of water.
   E. Turn mode switch to xl, x10 or x100.
   F. Take 4 conductivity readings; record in field book.
   G. Rinse probe with distilled water.

2. Take pH measurement (quadruple replicate)

   A. Standardize meter according to manufacturer's instructions.
   B. Lower probe into the water that is collected in a beaker.
   C. Use temperature reading obtained in Step 1 and set the temperature dial on the pH meter.
   D. Turn mode switch to pH.
   E. Record reading from display in field book.
   F. Take 4 readings.
   G. Rinse probe with distilled water.

3. Label sample bottles with sample ID, date/time, project #, collector, and preservative used.

4. Wear disposable gloves.
   Change and discard between samples.

5. Lower bailer down well.

6. Discard the first bailer of water.

7. Pour water directly from bailer into sample bottles that do not require filtering.

8. Continue bailing until adequate water volume has been collected.

9. In bottles where preservative is required, pH will be verified in the field by pouring some of the preserved sample over litmus paper. If the proper pH has not been attained, more preservative will be added in the field.

10. <u>For Filtering:</u>

    Step 7 will be eliminated.

    a) Once the bailer has been brought to the surface full of water, the intake hose on the filtering system will be inserted into the bailer top.

    b) Sample aliquot will then be pumped from the bailer through the filter (0.45 um) and directly into the sample bottle.

    c) Sample collector will continue to bail and filter until all bottles contain required volumes.

11. Repeat Steps 1-9 for each sample location.

SAMPLING OF SURFACE SOILS

Surface soil samples will be collected according to the procedures outlined in Appendix B.

FILTERING OF SAMPLES

Items Needed to Filter:

Peristaltic Pump
Filter Assembly (membrane filters, teflon spacers)
Silicone Tubing
Tweezers
Sample Bottles
Portable Battery

1. Filtering should be done on a clean, flat surface.

2. Set up filter assembly and pump so that all equipment coming into contact with the sample will not touch the ground or become dirty in any other way.

3. Tweezers will be used to place the membrane filter between the 2 teflon spacers.

4. Filters will never be reused. All contact equipment will be thoroughly cleaned using the procedures described later in this protocol collection.

5. Sample aliquot will be pumped through the intake from the bailer through the 0.45 um membrane filter system and empty directly into the sample bottles. The first 100 ml of sample that flows through the system will be discarded.

SAMPLE HANDLING AND SHIPPING

1. Immediately after sample collection, sampler will check the label for completeness. Samples will be placed into a cooler containing bagged ice.

2. Chain of custody form will be completed and kept with the samples at all times inside the cooler in a plastic bag. Before shipping, the plastic bag that contains the chain of custody form shall be taped securely to the lid of the cooler.

3. Custody shall be maintained by the sampler until the coolers are prepared for transport and shipped via air freight, one day delivery.

4. Upon returning to the laboratory, sampler will place samples in refrigerator until able to replace the bagged ice with frozen blue ice or ice packs.

5. Glass sample bottles will have the lid taped securely and will be wrapped in bubble wrap packaging to eliminate the possibility of breakage. All sample containers will be placed upright in the cooler. Packaging materials of bubble wrap or styrofoam peanuts will be used.

6. Cooler will be taped shut with fiber strapping tape. Drain plug will be securely taped.

7. Samples will be shipped at the end of each sampling day. If time prohibits daily shipments, samples may be placed in a locked sample refrigerator with a custody seal bearing the name of the sampler. Samples will be shipped promptly.

8. Labs should be notified of the expected arrival. They will need to know: how many samples, method of transport, and air bill number.

Plate 1 Water Table Configuration Map (May 2, 1991)
Showing Proposed Sampling Locations

OVERSIZED

DOCUMENT

NUS CORPORATION

1927 LAKESIDE PARKWAY
SUITE 614
TUCKER, GEORGIA 30084
404-938-7710

SSSB/SAS
RECEIVED
OCT 1990
EPA - REGION IV
ATLANTA, GA

C-586-10-0-120

October 12, 1990

Mr. A.R. Hanke
Waste Programs Branch
Waste Management Division
Environmental Protection Agency
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Subject: Final Screening Site Inspection Report, Phase II
American Color and Chemical/Venture Chemical
Lobeco, Beaufort County, South Carolina
Revision 0
TDD No. F4-8904-54

Dear Mr. Hanke:

Enclosed please find three (3) copies of the Final Screening Site Inspection Report, Phase II, Revision 0, for American Color and Chemical/Venture Chemical, Lobeco, Beaufort County, South Carolina.

Please contact me at NUS Corporation if you have any questions concerning this report.

Very truly yours,

James Miller

James Miller
Project Manager

Approved:

Greg Schank

JM/gwn

Enclosures (3)

R-586-9-0-27

FINAL REPORT

SCREENING SITE INSPECTION, PHASE II
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA
EPA ID #SCD046507018

Prepared Under
TDD No. F4-8904-54
CONTRACT NO. 68-01-7346

Revision 0

FOR THE

WASTE MANAGEMENT DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 21, 1990

NUS CORPORATION
SUPERFUND DIVISION

Prepared By	Reviewed By	Approved By
James Miller	Greg Schank for	
James Miller	Bob Donaghue	Phil Blackwell
Project Manager	Assistant Regional Project Manager	Regional Project Manager

NOTICE

The information in this document has been funded wholly by the United States Environmental Protection Agency (EPA) under Contract Number 68-01-7346 and is considered proprietary to the EPA.

This information is not to be released to third parties without the expressed or written consent of the EPA.

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EXECUTIVE SUMMARY

American Color and Chemical/Venture Chemical is located near the Coosaw River, about 12 miles northwest of Beaufort, South Carolina. The 26-acre site is currently owned by Lobeco Products, Inc. Previous tenants at the site include the Tenneco Chemical Company and the American Color and Chemical Company. The facility has primarily manufactured dye chemicals and intermediates during its more than 20-year history. Prior to February 1977, a lagoon, burn site, and drum storage area were used to manage waste at the facility. These areas have consistently shown elevated concentrations of chlorinated organics and heavy metals in environmental samples collected during previous investigations. The facility is currently under a consent order with the state to remediate the lagoon and burn site by December 1990.

Lobeco, South Carolina, is situated within the Coastal Plain Physiographic Province in a region that is characterized by low flatland inundated with water. The geology of the study area involves a thick wedge of sedimentary rocks, which can be divided into several hydrologic units based on differences in permeability and hydrologic characteristics. The uppermost hydrologic unit at this facility is the surficial aquifer, which consists of intermixed sand and clay layers. It is underlain by a thick sequence of green clay, which acts as an aquitard that separates the overlying unit from the deeper Tertiary Limestone Aquifer System. There are no wells in the Lobeco area that penetrate the full thickness of the Tertiary Limestone Aquifer System.

The surface water, groundwater, air, and onsite exposure pathways are of concern at American Color and Chemical/Venture Chemical. The surface water pathway was determined to be of primary concern. Several previous sampling investigations have shown that the sediment and fauna of nearby Campbell Creek are contaminated with polychlorinated biphenyls (PCBs). Numerous commercial fish species are considered at risk from releases of contaminants to the surface water pathway. The groundwater pathway is the next most significant pathway of concern at this site. There are approximately 182 people using the surficial aquifer within 4 miles of the site, and at least one of these users is located directly downgradient of the burn site. The air and onsite exposure pathways are of concern due to the presence of uncontained, contaminated soils. Potentially affected targets include local students, employees, and residents.

In November 1986, G & E Engineering, Inc. conducted a study at American Color and Chemical/Venture Chemical which involved a geophysical screening and the evaluation of analytical data from 197 samples. The geophysical instrument that was utilized delineated several zones of higher conductivity, which are interpreted to represent areas containing contaminated soil and groundwater. The analytical test results verify that the same areas are primarily contaminated with chlorinated organics and/or metals. The constituents, which are of primary concern, include: PCBs, trichloroethene (TCE), methylene chloride, lead, and mercury. All of these were found in soil and groundwater samples at concentrations significantly over background and are known components of waste deposited at this site. Also, the same type of contamination was found in several downgradient wells, which suggests that contaminants are migrating from this site.

Although extensive contamination has been documented in soil, groundwater, and sediment at and near the site, the facility is under a consent order with the state for remediation. Should all wastes and contaminated soils be removed, this site would not be a viable candidate for a Listing Site Inspection (LSI). Therefore, FIT 4 recommends that consideration of any further action at this site be contingent upon results of the ongoing remediation.

1.0 INTRODUCTION

The NUS Corporation Region 4 Field Investigation Team (FIT) was tasked by the U.S. Environmental Protection Agency (EPA), Waste Management Division to conduct a Phase II Screening Site Inspection (SSI) at the American Color and Chemical/Venture Chemical site in Lobeco, Beaufort County, South Carolina. The investigation was performed under the authority of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The task was performed to satisfy the requirements stated in Technical Directive Document (TDD) number F4-8904-54. At EPA's directive, FIT conducted no field activities for this SSI; analytical data incorporated into this report were generated during two previous studies at the site.

1.1 OBJECTIVES

The objectives of this investigation were to determine the nature of contaminants present at the site and to determine if a release of these substances has occurred or may occur. Further, this investigation sought to determine the possible pathways by which contamination could migrate from the site and the populations and environments it would potentially affect. Through these objectives, a recommendation was made regarding future activities at the site.

1.2 SCOPE OF WORK

The objectives were achieved through the completion of a number of specific tasks. These activities were to:

- Obtain and review background material relevant to HRS scoring of the site;
- Obtain maps of site;
- Obtain information on local water systems;
- Evaluate target population within a 4-mile radius of the site with regard to the groundwater and air pathways, and the possibility of direct contact, and within 15 downstream miles with regard to surface water use;

- Conduct a survey for private wells;
- Determine location and distance to nearest potable well;
- Develop a site sketch to scale;
- Reevaluate previous field investigations performed by Davis & Floyd, Inc. and G & E Engineering, Inc.; and
- Complete a Site Inspection Report, provided as Appendix A in this report.

2.0 SITE CHARACTERIZATION

2.1 SITE BACKGROUND AND HISTORY

American Color and Chemical/Venture Chemical is located just north of the Coosaw River, approximately 12 miles northwest of the town of Beaufort (Ref. 1, p. 1). Specifically, the site is located southeast of the intersection of highways 38 and 480 (Ref. 2). It is presently owned and operated by Lobeco Products, Inc. (Ref. 3, p. 1).

The plant was originally built by Tenneco Chemical Company in 1967. It was sold to American Color and Chemical Company in January 1974, and then resold to Venture Chemical Company in October 1982. Venture Chemical Company has since then changed its name to Lobeco Products, Inc. (Ref. 3, p. 1).

Lobeco primarily manufactures agric-products, dye intermediates, and drilling fluid chemicals for the oil industry. The chemicals used and produced on site consist mostly of organic compounds. Acidic industrial wastewater is generated as a by-product of the manufacturing process. This wastewater is neutralized in an onsite water treatment plant and then discharged into nearby Campbell Creek (Ref. 3, pp. 1-2).

Prior to the installation of the wastewater treatment system, a lagoon, drum storage area, and burn site were used to manage waste at the facility. These areas have consistently shown elevated concentrations of chlorinated organics (especially polychlorinated biphenyls) and/or heavy metals in environmental samples collected thus far (Ref. 3, p. 2). The samples were collected during three previous investigations: in September 1985, between January and May of 1986, and in March and April of 1988 (Appendices B, spread sheet; C, p. 1-5). The 1985 and 1986 sampling investigations were conducted by Davis & Floyd, Inc. and G & E Engineering, Inc., respectively. Both studies were performed because the South Carolina Department of Health and Environmental Control (DHEC) suspected contamination based upon previous water quality studies in nearby Campbell Creek (Appendix C, pp. 1-3, 1-4). G & E evaluated both sets of data in their November 1986 report entitled, <u>Ongoing Soil and Groundwater Study and Conceptualized Cleanup Plan, Venture Chemicals, Inc., Lobeco, South Carolina</u> (Appendix B, p. 31). The 1988 investigation was initiated by RMT, Inc. to fulfill the requirements of a DHEC Consent Order (No. 87-65-W) dated June 25, 1987 (Appendix C, pp. 1-4, 1-5). The findings of this study are presented in RMT's <u>Lobeco Site Environmental Assessment,</u>

Results and Proposed Remedial Action Plans for American Color and Chemical Corporation and Tenneco Resins, Inc., dated September 1988 (Appendix C).

Consent Order 87-65-W was amended on October 11, 1989 (Ref. 4). The amendment was incorporated into the original order and requires that the present and past owner(s) of the chemical plant are to remove "high level" contamination at the abandoned lagoon and burn site (Ref. 5, pp. 1, 3). The latter document also includes a provision which specifies that the extent of groundwater contamination for "certain" areas on the property be delineated during future studies (Ref. 5, p. 1). This stipulation was intended to expedite implementation of the clean-up plan, which is targeted for completion in December of 1990 (Refs. 5, p. 1; 6; Appendix C, p. 10-2).

Lobeco Products, Inc. was also issued consent orders for two separate violations of its National Pollution Discharge Elimination System (NPDES) permit (no. SC0000914). The first consent order (86-94-W) was issued on September 29, 1986 for a violation of the toxicity limit (Ref. 7). The company also violated the toxicity limit, in addition to the limits for biochemical oxygen demand, total coliform, and ultimate oxygen demand, which initiated the issuance of the second order (88-37-W) (Ref. 8, p. 5). The August 8, 1988 document ordered Lobeco to "immediately begin and continue to properly operate and maintain its waste treatment facilities so as to maximize treatment" (Ref. 8, pp. 6-7). The only other permit violation that is known to have occurred at this facility is for failure to monitor polychlorinated biphenyls (PCBs) on a weekly basis. Venture Chemicals, Inc. received a Notice of Violation on December 18, 1985 for this infraction, but no enforcement action was ever taken (Ref. 9).

Lobeco Products, Inc. filed a part A application under the Resource Conservation and Recovery Act (RCRA) for waste treatment in tanks and the old lagoon. The tank treatment was later given exclusion under RCRA because it was a Waste Water Treatment Unit. Also, the waste in the lagoon was determined to be nonhazardous. Because of this, the Part A application was withdrawn on October 18, 1984 (Ref. 3, p. 2).

2.2 SITE DESCRIPTION

2.2.1 Site Features

The facility property consists of approximately 250 acres (Ref. 1, p. 1). Within these 250 acres, five contaminated areas connect to form an elongated, 26-acre parcel of land, which is considered the site (Figure 1). The contaminated areas include: the abandoned lagoon, the sediments and marsh near the Lobeco outfall, the old drum storage area, the old burn site, and an area of stressed vegetation (Ref. 3, pp. 2-3, 5). The site has an average downward slope of 0.006 ft/ft (Appendix B, p. 24).

Several active waste management facilities are located in the site area. These are part of the NPDES water treatment system and consist of the following: an equalization basin, an aeration basin, a digester basin, clarifiers (two), drying beds, and holding ponds (east and west ponds) (Ref. 3, p. 2). All of the active waste management facilities, and one of the inactive waste sites (drum storage area), are completely surrounded by a fence. A gate at the northwest corner provides the only security access. The site layout is depicted in Figure 2.

2.2.2 Waste Characteristics

Historical effluent and solid waste management practices at this facility involved the lagoon, drum storage area, and burn site. The lagoon was used as a settling basin for process effluent, which consisted of aqueous product extractions (washes) and cooling water mixed in with sanitary waste. Off-grade products and other process wastes were kept at the drum storage area prior to being incinerated at the burn site (Ref. 10, p. 9). Several of these materials are known to have contained either PCB, naphthalene, or toluene (Ref. 10, pp. 11-12). No known waste quantity information exists for inactive waste management facilities at this site (Ref. 10, p. 12).

The chemical plant also operated a hot oil circulating system for certain reactions that require higher than normal temperature. The hot oil system operated on electric heaters in a pump-around loop. On occasion, pump leaks developed and/or electric heating tubes failed, which resulted in spills onto the plant floor. When this happened, the standard clean-up procedure was to scoop up as much as possible into drums. The residue was then washed into the floor drain system, which ultimately led into the effluent system and then to the lagoon. The heating oil that was initially used was a PCB (Arochlor 1248) supplied by Monsanto (Ref. 10, p. 10).

Historical aerial photographs show that the new wastewater treatment facilities were installed between September 1975 and February 1977 (Appendix B, p. 12). The plant currently utilizes the activated sludge method to treat wastes (Refs. 3, p. 2; 11). Only non-hazardous wastes undergo treatment (Ref. 1, p. 2). Sludge solids from the bio-treatment area are landfilled at an offsite location (Refs. 1, p. 2; 11). Lobeco Products, Inc. transports liquid hazardous wastes off site (Ref. 1, p. 2).

Various types of containment exist at each of the former disposal areas. A PCB contaminated sludge layer at the bottom (8 feet) of the old lagoon was covered by a 1- to 2-foot natural earth cap and then backfilled (Ref. 10, p. 11; Appendices B, pp. 13, 39; C, p. 2-2). The old drum storage area has been partially covered with a concrete pad (Appendix B, p. 6). There is no artificial cover on the burn site, but the area is completely overgrown with groundcover-type vegetation (Appendix B, pp. 13-14, 39). Finally, all of the former disposal areas are unlined (Refs. 10, p. 12; 12).

3.0 REGIONAL POPULATIONS AND ENVIRONMENTS

3.1 POPULATION AND LAND USE

3.1.1 Demography

American Color and Chemical/Venture Chemical is in a moderately populated rural area approximately 12 miles northwest of Beaufort, South Carolina (Ref. 3, p. 3; Appendix B, p. 24). Most of the population in the area consists of full-time residents. A house count on USGS topographic maps covering the area indicated that 4,313 people (1,135 houses x 3.8 people/house) live within 4 miles of the site; 380 people (100 houses x 3.8 people/house) were counted within 1 mile. The nearest residence is located 500 feet east of the site (Appendix D).

There are very few work areas and schools in the study area. The only major work area known to exist within 4 miles of the site is the Marine Corps Air Station on Port Royal Island (Appendix D). Also, there are currently 75 employees at the Lobeco plant (Ref. 13, p. 3). No schools or day-care centers are located adjacent to the site (Ref. 13, p. 11; Appendix D). The nearest school is James Davis Elementary, which is located approximately 1 mile east of the site (Appendix D). There are 436 students attending this school (Ref. 14).

3.1.2 Land Use

The area within a 4-mile radius of the site is characterized by low flatland inundated with surface water (Ref. 15, pp. 5, 13). Because of this, the majority of land surrounding American Color and Chemical/Venture Chemical is sparsely settled (Ref. 15, p. 13). Nevertheless, agriculture plays an important role in the economy of the area (Ref. 15, p. 16).

Agricultural uses include livestock and crop production. Crops grown include corn, soybeans, small grains, fruits, and vegetables (Ref. 16). There are no parks or land-related sensitive environments within 4 miles of the site (Refs. 13, p. 11; 17; Appendix D).

3.2 SURFACE WATER

3.2.1 Climatology

Beaufort County is characterized by a subtropical climate with hot and humid summers and mild winters. The annual rainfall is approximately 50 inches with the greatest precipitation occurring from June to August (Ref. 15, pp. 5, 9). Annual evapotranspiration is 44 inches, making net annual precipitation approximately 6 inches (Ref. 18). Mean annual temperature for the Lobeco area is approximately 66°F (Ref. 15, p. 10).

3.2.2 Overland Drainage

Surface water runoff from the property collects in an onsite drainage ditch system (Appendix B, p. 24). The water in the ditch flows south and eventually empties into a tidally influenced marsh area that surrounds Campbell Creek (Ref. 19, p. 17; Appendix B, p. 24).

3.2.3 Potentially Affected Water Bodies

Overland drainage discharges into the tidal marsh surrounding Campbell Creek. During ebb tide, Campbell Creek flows southeasterly into Whale Branch of the Coosaw River (Ref. 20; Appendix D). The surface water migration pathway ends in the Coosaw River, approximately 9 miles downstream from its confluence with Whale Branch (Ref. 17). During flood tide, however, flow direction is reversed, and the migration pathway extends to include several additional tributaries of Whale Branch and the Coosaw River (Refs. 17; 20; 21; Appendix D).

Along the surface water migration pathway, the waters are designated Class SA (Ref. 22, pp. 272, 277). This is indicative of saltwaters suitable for harvesting of clams, mussels, and oysters for human consumption (Ref. 22, p. 272). There are no drinking water intakes downstream from the site (Ref. 23).

Numerous sensitive environments are present along the surface water migration pathway. All of the potentially affected water bodies lie contiguous to coastal wetlands (Ref. 17; Appendix D). These wetlands, and their associated drainageways, serve as a nursery and breeding ground for the eastern oyster (Crassostrea virginica) (Ref. 17). The drainageways also provide a habitat for numerous commercial fish species and most areas have been approved for shellfish harvesting (Refs. 17, 24). Minor exceptions basically include Campbell Creek, a portion of Whale Branch near its confluence with the creek, and several tributaries to the Coosaw River that are hydrologically interconnected with the nearby Beaufort River (Ref. 24). Finally, the Florida manatee (Trichechus manatus) and shortnose sturgeon (Acipenser brevirostrum) are designated as federally endangered and may be found along the migration pathway (Refs. 17; 25, section 6). These species have no critical habitats in the state of South Carolina (Ref. 25, section 7).

A significant amount of analytical data has been generated from previous water quality studies along the surface water migration pathway. The earliest samples were collected in August 1983 as part of an evaluation for the facility's discharge permit. At this time, the Chemical Oceanography Section of the Marine Resources Research Institute collected oyster samples from Campbell Creek. The samples contained very complex mixtures of organic compounds and showed elevated concentrations of lead (>2.0 ppm). Subsequent to these findings, DHEC conducted an assessment of the creek area in order to further evaluate the influence of the plant's discharge on the environment (Ref. 26). Samples that were collected in November 1983 showed sixty-six (66) organic chemical compounds in oyster tissue, sediment, and the Lobeco plant effluent (Ref. 27, p. 1). The investigation concluded that the fauna in Campbell Creek had been moderately to severely impacted due to the discharge of wastewater from the facility. However, the study did not present any direct evidence of fish kills in the creek (Ref. 27, p. 2).

The November 1983 sampling investigation led to several additional water quality studies in the Campbell Creek area. The testing was conducted in 1984 by both DHEC and an outside consultant to the chemical plant. The results from these studies showed an improvement in the water quality and biota of Campbell Creek, although PCBs were detected in the sediment near the Lobeco outfall. Analysis for PCBs was not performed during previous testing (Appendix C, p. 1-3).

The remaining water quality studies that have been conducted along the surface water migration pathway basically involve the monitoring of PCBs. DHEC collected samples of blue crabs (Callinectes sapidus) from Campbell Creek and its associated water bodies during September and October of 1985 (Ref. 28; Appendix C, p. 1-3). Detectable levels of PCBs were found in nearly all the samples (Ref. 28). The samples that showed the highest concentrations (mean = 0.949 ppm) were those collected near the discharge pipe (Ref. 28; Appendix C, pp. 1-3, 1-4). Other PCB monitoring was performed by the Marine Resources Division between June and October of 1985. During this time, they collected crab, oyster, and sediment samples along Campbell Creek and Whale Branch. The results from this analyses were similar to previous DHEC findings. The highest concentration detected (25.21 ppm) was from a sediment sample collected at the Lobeco outfall (Ref. 26). Finally, the facility is required to monitor PCBs on a weekly basis as part of their NPDES permit (Refs. 9; 19, p. 18). The permit also requires that several types of biological studies be conducted on a regular basis, but discussion of these studies is outside the scope of this investigation (Ref. 19, pp. 18-19).

3.3 GROUNDWATER

3.3.1 Hydrogeology

American Color and Chemical/Venture Chemical is located in the lower part of the Coastal Plain Physiographic Province (Refs. 15, pp. 5, 9; 29, p. 379; Appendix D). The topography of the surrounding area is characterized by low relief, lagoons, tidal swamps, and salt marshes (Appendix C, p. 4-1). The region is underlain by a thick wedge of sedimentary rocks, which unconformably overlie crystalline igneous and metamorphic rocks equivalent to rocks of the Piedmont Physiographic Province (Ref. 22, pp. 22-23).

The formations within the upper portion of this sedimentary wedge comprise the aquifers that are used in the study area (Refs. 15, p. 32; 22, p. 23; Appendix C, p. 4-1). The youngest of these is the Pamlico Formation, which represents the surface geology at the site (Appendix B, p. 25). Underlying units in descending order include: the Hawthorn and Cooper formations, the Ocala and Santee limestones, and the Black Mingo Formation (Refs. 22, pp. 23, 25; 29, pp. 380-381; Appendix B, pp. 25-26). These formations may be divided into several hydrologic units based on differences in permeability and hydrologic characteristics.

The uppermost hydrogeologic unit at American Color and Chemical/Venture Chemical is the unconfined surficial or water-table aquifer (Appendix B, p. 25). This unit consists primarily of quartz sand and lenses of clay to a depth of 35 to 40 feet below land surface (bls) (Appendices B, p. 4-1; C, p. 25). Although the saturated thickness of this unit is dependent on climatic conditions, elevations of nearby streams indicate the water table is between 5 and 10 feet bls (Refs. 3, p. 3; 29, p. 379). Recharge to this aquifer is from local rainfall (Ref. 29, p. 379; Appendix C, p. 4-5).

The water-table aquifer is underlain by approximately 50 feet of green clay from the Hawthorn and Cooper formations (Appendices B, p. 26; C, p. 4-2). This unit has a hydraulic conductivity of 10^{-7} cm/sec and serves as an aquitard that separates the overlying unit and the deeper Tertiary Limestone Aquifer System (Appendices B, p. 50; C, p. 6-31). The Tertiary Limestone aquifer is about 900 feet thick and is divided into an upper and a lower hydrologic unit (Refs. 22, p. 276; 30, p. 47). The upper unit consists of highly permeable fossiliferous limestone and is the primary source of groundwater in Beaufort County (Refs. 15, pp. 31-32; 29, p. 380; 30, p. 47). The lower unit is moderately productive and is not used as extensively as the upper unit (Ref. 30, p. 55). Recharge to the Tertiary Limestone aquifer is primarily through downward leakage from overlying units (Ref. 30, p. 73). The Tertiary Limestone Aquifer System is underlain by the Black Mingo Formation, which acts as a 400-foot thick confining layer (Refs. 22, p. 23; 29, p. 381; 30, p. 27).

Groundwater in the surficial, water-table aquifer system flows south toward Campbell Creek, reflecting the general influence of topography on the water table (Appendices B, pp. 28-29; C, p. 6-9). In the Tertiary Limestone aquifer, groundwater flow is regionally toward the east (Ref. 15, pp. 53-54). Within 2 miles of the site, however, an induced cone of depression exists in the potentiometric surface of the Tertiary Limestone aquifer (Ref. 15, figure 19; Appendix B, p. 27). This occurs because two closely spaced production wells on the Lobeco property pump sizable quantities (about 500,000 gal/d each) from an area in the aquifer where the transmissivity is relatively low (less than 5,000 ft^2/d) compared to other locations in the region (Ref. 15, p. 56). Within the cone of depression, the groundwater flow direction is toward the Lobeco pumping center.

The production wells at the chemical plant have depths of 263 and 307 feet and are open to both the upper and lower units of the Tertiary Limestone Aquifer System. The upper unit is the most productive interval screened in these wells, and it extends from about 90 to 150 feet bls (Ref. 1, p. 3). It is also the unit in which most of the remaining wells in the Lobeco area are completed (Refs. 15, p. 32; 31; Appendix B, p. 27). These wells commonly yield between 100 and 300 gallons per minute (Ref. 29, p. 380).

3.3.2 Aquifer Use

The surficial aquifer, which is also the aquifer of concern, is used for drinking purposes (Refs. 3, p. 3; 29, p. 379). However, a local well driller estimated that it supplies water to only 5 percent of the wells found within the study area (Ref. 31). This corresponds to 38 homes within 3 miles of the site, since approximately 770 private well owners were identified on the USGS topographic maps covering the area; an additional 10 (0.05 x 193) are included when considering a 4-mile radius. This gives a total of 48 homes or 182 people (48 houses x 3.8 people/house) relying on groundwater from the surficial aquifer within 4 miles of the site. There are no public water systems associated with the surficial aquifer (Refs. 3, p. 4; 13, pp. 4-5; Appendix B, p. 27).

DHEC conducted all of the previous studies on potable groundwater near the site area. The only available analytical data are from a July 1989 report, which gives the results of samples taken from six nearby private water supply wells. These samples were analyzed for volatile organics, priority pollutant metals, selected secondary metals, acid base and neutral extractable components, PCBs, alkalinity, and total dissolved solids. The analytical test results show that the groundwater surrounding the American Color and Chemical/Venture Chemical site is not contaminated. However, the report indicates that PCBs were detected in one of the wells during an earlier study. This well, owned by Mr. Ronald Glenn, is screened in the Tertiary Limestone aquifer. It serves 5 people and is located about 800 feet from the abandoned lagoon. The Anderson well is located adjacent to the Glenn well and is the only well within one-quarter mile of the site that is completed in the surficial aquifer. The shallow well was one of the six wells sampled during the 1989 investigation (Ref. 32).

3.4 SUMMARY OF POTENTIALLY AFFECTED POPULATIONS AND ENVIRONMENTS

There are four pathways of concern at the site: the surface water, groundwater, air, and onsite exposure pathways. Each of these has been deemed a potential contaminant migration route because each pathway is viable and targets are associated with each pathway.

Surface water is the primary pathway of concern. It has been demonstrated from several previous sampling investigations that the sediment and fauna of Campbell Creek are contaminated with PCBs. The creek serves as a habitat for numerous commercial fish species and would be open to shellfish harvesting if it were not for the influence of the chemical plant's wastewater discharge. Also, there are at least two endangered species that may be present along the migration pathway.

The groundwater pathway is less significant but also of concern. Although the target population associated with the surficial aquifer is small, there is at least one shallow well located downgradient from the burn site which may eventually become contaminated. Furthermore, there has been evidence of possible PCB contamination in a nearby private well that is screened in the deeper Tertiary Limestone aquifer. If the two aquifers were considered as a single hydrologic unit, the target population would increase significantly from 182 people to about 4,170 people.

The air and onsite exposure pathways are of concern due to the presence of uncontained, contaminated soils. Potentially affected targets within a 4-mile site radius include students, employees, and residents. The population of residents within 4 miles of the site is estimated at 4,313. Targets for onsite exposure include 75 employees at the subject facility and 380 residents located within a 1-mile radius of the site.

4.0 FIELD INVESTIGATION

The data presented in this section was obtained from the G & E Engineering, Inc. report entitled Ongoing Soil and Groundwater Study and Conceptualized Cleanup Plan, Venture Chemicals, Inc., Lobeco, South Carolina. The G & E report provides analyses for nearly all environmental samples collected at the site prior to November 1986 (Appendix B, pp. 8, 31, spread sheet). The analytical results from the most recent sampling investigation by RMT, Inc. (Appendix C) are not discussed in this section because those samples were tested for only a limited number of constituents (Appendix C, p. 6-17). The G & E report also provides data from a geophysical survey that was conducted in March and April of 1986 (Appendix B, p. 15). This survey appears to have been utilized as a screening tool that aided in the selection of locations for subsequent sampling events. The results of the survey are presented in section 4.1; sampling information is presented in sections 4.2 and 4.3.

4.1 GEOPHYSICAL INVESTIGATION

A geophysical survey was conducted by G & E during their assessment of the subject site. The survey was performed to detect and map contaminated soil and groundwater by delineating zones of lower and higher conductivity around areas of concern (Appendix B, pp. 2, 15). The zones of higher conductivity are interpreted to represent areas where contaminants have escaped into the soil or groundwater systems (Appendix B, p. C). These contaminants produce an increase in free ion concentration (measured as conductivity) when introduced into the underlying media (Appendix B, p. 15). The zones of lower conductivity are indicative of natural background (Appendix B, p. C).

Background conductivity values ranged between 20 and 25 millimhos/meter (mmhos/m). Several areas at the facility showed conductivity values much greater than these background levels (Appendix B, p. 15). The old drum storage area, the abandoned lagoon, the burn site, and the stressed vegetation areas had anomalously high conductivities (50 to 80 mmhos/m or greater) relative to the background levels (Appendix B, pp. 15-16, figure 5a). The most anomalous area (150 mmhos/m) is that area just south of the abandoned lagoon, thought to be the location of runoff between the lagoon and marsh (Appendix B, pp. 15-16). The locations of all anomalous areas are depicted in Figure 3.

4.2 SAMPLE COLLECTION

The analytical data presented in the G & E report was collected during two previous sampling investigations: on September 18, 1985 and between January 13 and May 1 of 1986 (Appendix B, spread sheet). The earlier samples were collected to perform preliminary evaluations of the groundwater conditions at the site (Appendices B, p. 6; C, p. 1-3). To accomplish this, Davis & Floyd, Inc. sampled six permanent monitoring wells, the two plant production wells, and one deep observation well (Appendix B, p. 6). The latter samples were collected "to determine the source, nature and extent of zones of surface and subsurface contamination" (Appendix B, p. 1). To accomplish this, G & E collected product, sludge, soil, surface water, and groundwater samples from a number of strategic locations (Appendix B, spread sheet). These locations were selected based on previous monitoring well data, historical aerial photographs, an onsite reconnaissance, and the geophysical survey (Appendix B, p. 14). A total of 197 samples were collected between the two investigations (Appendix B, p. G, spread sheet). Only the background samples and samples that showed significant contamination will be discussed in this report.

4.2.1 Sample Collection Methodology

All sample collection, sample preservation, and chain-of-custody procedures used during these investigations were in accordance with standard operating procedures as specified in Sections 3 and 4 of the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual; United States Environmental Protection Agency, Region IV, Environmental Services Division (ESD), April 1, 1986 (Appendix B, p. G).

4.2.2 Description of Samples and Sample Locations

One hundred and ninety-seven samples were evaluated in the November 1986 G & E report: 91 from the abandoned lagoon, 31 near the discharge pipe, 21 from the old drum storage area, 31 from the burn site, 8 from the stressed vegetation area, 7 from miscellaneous locations, and 8 from background locations (Appendix B, spread sheet). The miscellaneous locations represent groundwater samples collected by Davis & Floyd that are outside the confines of the contaminated areas (Appendix B, figure 4). Other samples (6) collected at the site include product, sludge, and surface water samples. These were taken from either the ponds at the burn site or the eastern part of the marsh area at the discharge pipe (Appendix B, p. 19, spread sheet). The remaining 184 (197-7-6) samples (soil and groundwater) were collected from numerous hand and truck-mounted auger borings that were converted into either temporary or permanent monitoring wells (Appendix B, pp. 16, 18-19, spread sheet). Sample locations for each of the five contaminated areas are shown in Figures 4 through 8.

The auger borings for the G & E investigation were drilled as either part of the "waste facility sampling program" or a program for "soil exploration." Under the waste facility sampling program, the borings were placed within areas of known contamination and advanced to shallow depths (<8 feet) (Appendix B, pp. 18-19). The samples obtained from these borings were collected at specified depths and used for analytical testing (Appendix B, p. 18, spread sheet). The test results provided important information concerning the vertical extent of contamination beneath each "source" area. The soil exploration borings are different because these were drilled adjacent to areas of known or suspected contamination (Appendix B, p. 17). This was done in order to determine the horizontal extent of contaminated media so that some of the borings could be converted into upgradient and downgradient permanent monitoring wells (Appendix B, pp. 2, 17). In addition to analytical testing, laboratory tests were performed on selected soil samples to determine permeability and engineering properties (Appendix B, p. 18). The final difference is that the soil exploration borings involved continuous split-spoon sampling (Appendix B, p. 17).

4.2.3 Field Measurements

Water level elevations were recorded by both G & E and Law Environmental Services during field activities. The measurements were used to generate water table maps (Ref. 1, p. 7; Appendix B, figures 11a, 11b). Also, each consultant conducted in-situ permeability tests (slug tests) on selected groundwater monitoring wells. The slug tests were performed to calculate hydraulic conductivities of the monitored soil strata (Ref. 1, p. 7; Appendix B, p. 20). Water level and time measurements were recorded during each slug test (Appendix B, pp. 20-21).

4.3 SAMPLE ANALYSIS

4.3.1 Analytical Support and Methodology

There are differences in the parameters tested and the analytical support for each investigation. Davis & Floyd performed their own analyses and tested each groundwater sample for the following parameters:

- temperature;
- pH;
- specific conductance;
- Total Organic Carbon (TOC);
- chloride;
- priority pollutant analysis for volatile organics (32 compounds);
- 1-aminoanthraquinone;
- aniline;
- dimethyl amine;
- p-chlorophenol;
- n-cyanoethyl-n-ethyl-m-toluidene (CEET); and
- metals (Appendix B, pp. 6-7).

Samples collected by G & E were analyzed for a variety of parameters including:

- pH;
- specific conductance;
- TOC;
- Volatile Organic Analysis (VOA);
- selected chlorinated organics (TCE, TCB, etc.);
- naphthalene;
- phenolic compounds;
- PCB; and
- metals including lead, mercury, arsenic, cadmium, and chromium (Appendix B, p. 22).

However, not every sample was tested for each parameter listed above (Appendix B, p. 45, spread sheet). Initial samples collected during G & E's investigation were analyzed by J.L. Rogers & Callcott Engineers, Inc. of Greenville, South Carolina; subsequent analyses were performed by West-Paine Laboratories, Inc. from Baton Rouge, Louisiana (Appendix B, p. E, spread sheet).

A variety of EPA approved analytical methods and procedures were utilized for the Davis & Floyd and G & E samples. The specific methods and procedures are listed on the individual analytical reports which are contained in Volume II of Appendix B.

4.3.2 Analytical Data Quality

All analyses are reported to have been performed by EPA approved methods. Only limited information on data quality is available. There is no evidence of independent quality assurance (QA) review or data validation. The data packages presented do not include sufficient information for complete QA review of the data. Individual analytical reports and data spread sheets are provided in Appendix B.

4.3.3 Presentation of Analytical Results

This section discusses the results from the analyses of samples collected by Davis & Floyd in 1985 and G & E in 1986. The discussion is broken into subheads for each of the five contaminated areas. Separate tables (2 through 6) have been generated to present the analytical data for each area. Table 1 is also included and this presents the data from a background location. Only the significant results are shown on the tables.

4.3.3.1 Abandoned Lagoon

Analytical test results from the abandoned lagoon (Table 2) indicate that the soil and groundwater are primarily contaminated with chlorinated organics and metals. The chlorinated organic of greatest concern is Arochlor 1248, which is a PCB that was detected in both media. Chromium, lead, and mercury account for the most significant metal contamination. None of the above-mentioned constituents are known to have been detected in background samples.

Samples from C-1, W-3, W-4, V-6, and B-1 (6-8 ft, 10-12 ft, 14-16 ft, 43-45 ft) indicate that the PCB soil and groundwater contamination is restricted to the areal extent of the lagoon. The lagoon soils are contaminated at depths of up to 14 feet bls with average PCB concentrations of 750 mg/kg. The most significant PCB soil contamination was found in a sludge layer that varies in depth from about 4 to 7 feet bls. The depth to the contaminated sludge is greatest in the center of the lagoon. The highest concentration detected in the sludge layer was from sample G&E-3 (4-5 ft), which showed a PCB concentration of 6,750 mg/kg. The groundwater at the abandoned lagoon showed an Arochlor 1248 concentration of 6.02 mg/l (L-1, L-2, L-3 composite).

Other organic compounds found in environmental samples include 1,2,4-trichlorobenzene (1,2,4-TCB) and naphthalene. Naphthalene was detected at a maximum concentration of 122 mg/kg in soil boring L-33 (12-14 ft) and in the groundwater composited from L-1, L-2, and L-3 at 2.340 mg/l. Similar concentrations (103 mg/kg and 3.470 mg/l) of 1,2,4-TCB were detected in the same samples.

The soil samples from the old lagoon showed elevated levels of chromium, lead, and mercury. These constituents were detected at maximum concentrations in borings L-1 and G&E-3. The maximum levels are as follows: 46 mg/kg for chromium and 2,286 mg/kg for lead in boring G&E-3 (4-5 ft) and 19 mg/kg of mercury in boring L-1 (1 ft). The lowest levels were generally found in boring G&E-5. Concentrations for the sample taken 4-5 feet bls range from not detected for lead and mercury to 4.9 mg/kg for chromium.

Chromium, lead, and mercury were also detected at relatively high levels in groundwater samples collected from the abandoned lagoon. The groundwater composited from G&E borings 1 and 5 showed a lead concentration of 34 mg/l, which is 680 times greater than the EPA maximum contaminant level (MCL). The other constituents were detected at lesser amounts, but their concentrations are still well above the MCL (Ref. 33). Also, the presence of chromium and lead in downgradient wells (W-3, V-6) suggests that the contaminants are migrating from the lagoon.

Monitoring wells W-3 and V-6 also indicate chloride and organic contamination. The organic compounds that were detected include chlorotoluene and trichloroethene (TCE). All of these constituents were found at concentrations significantly greater than the concentrations detected in background samples.

4.3.3.2 Discharge Pipe

TOC is the only parameter that was detected along the discharge pipe south of the abandoned lagoon (Table 3). Concentrations ranging from 50 to 100 mg/l were revealed in groundwater samples obtained from borings A-3, A-5, and A-6. These concentrations are significantly greater than the values obtained from background wells. There was no TOC analysis performed on soil samples collected from this area.

4.3.3.3 Old Drum Storage

Analytical results for groundwater samples collected from the old drum storage area indicate that the major contaminants of concern are chlorinated organics. TOC and chloride are also of concern. Selected analytical data for this area are presented in Table 4.

TOC and chloride were present at elevated levels in groundwater samples collected at the old drum storage area. Samples A-9, A-10, and A-11 showed TOC concentrations of 30, 20, and 30 mg/l, respectively. The chloride concentrations for the same samples ranged from 115 to 595 mg/l. Only the chloride concentrations are significantly greater than the values reported from any of the background wells.

The most significant chlorinated organic is carbon tetrachloride. This constituent was detected in all groundwater samples collected within the boundaries, and downgradient, of the source area. Within the source area, soil borings A-9 through A-11 showed carbon tetrachloride concentrations ranging from 12 to 39 mg/l. Monitoring well W-7, located slightly downgradient from the source area, revealed the highest concentration (89 mg/l) of carbon tetrachloride. There are no other downgradient wells that monitor the old drum storage area (Appendix C, plate 7). Carbon tetrachloride was not detected in any of the background groundwater samples.

Monitoring well W-7 also showed a TOC concentration of 150 mg/l. This concentration is significantly greater than any of the values detected in background wells.

4.3.3.4 Burn Site

The contamination at the burn site mainly involves chlorinated organics and metals (Table 5). Methylene chloride, PCBs, and TCE account for the most significant organic contamination. These constituents were found at relatively high levels in several groundwater samples. The same samples also showed elevated concentrations for cadmium, chromium, lead, and mercury. None of the above mentioned constituents are known to have been detected in background samples.

Within the confines of the burn site area, methylene chloride, PCBs, and TCE were detected in the groundwater. Methylene chloride was detected at a maximum concentration of 6.40 mg/l in a water sample obtained from boring G&E-10. Monitoring wells W-10 and W-11 showed PCB (Arochlor 1242) and TCE concentrations of 0.012 mg/l and 12 mg/l, respectively. The PCBs were also detected in the soil at depths ranging from 1 to 6 feet bls. The highest concentration was detected in sample BS-3 (3-4 ft), which showed an Arochlor 1248 concentration of 250 mg/kg.

Mercury is the only other contaminant that was detected within the confines of the burn site at significant levels. A concentration of 0.24 mg/l was found in a surface water sample obtained from a lagoon that is located within the burn site. A solid sample removed from a product bag that was located within the same lagoon revealed a mercury concentration of 19.0 mg/kg.

Groundwater monitoring well W-9, located near the burn site, showed a PCB concentration of 0.114 mg/l, a TCE concentration of 180 mg/l, and concentrations for chromium and lead that significantly exceed the MCL (Ref. 33). Cadmium and mercury were also detected although at much lower levels. These findings suggest a definite contaminant migration trend since the well is located hydraulically downgradient from the burn site.

The furthest downgradient well (W-13) that monitors the burn site showed elevated levels of cadmium, chromium, and lead. There were no PCBs detected in this well, or in any other wells located downgradient from W-9.

4.3.3.5 Stressed Vegetation

The only contamination at the stressed vegetation area is with chromium and lead, which were detected in a soil sample. Chromium and lead were detected in sample D-1 (1-2 ft) at concentrations of 3.3 mg/kg and 3.8 mg/kg, respectively. Selected analytical data for this area are presented in Table 6.

4.4 SUMMARY OF FIELD INVESTIGATION

G & E's geophysical investigation provided the necessary data needed to detect and map contaminated soil and groundwater at this site. Several zones of higher conductivity were delineated during the investigation, and these are thought to be representative of contaminated areas. The geophysical results were then utilized to determine optimum sampling locations.

One hundred and ninety-seven samples were collected by G & E and Davis & Floyd during 1985 and 1986. Soil and groundwater samples account for the majority of samples that were collected. These were mostly taken within and adjacent to areas of concern. The samples were analyzed for total organic carbon (TOC), volatiles, acid and base neutrals, polychlorinated biphenyls (PCBs), and metals.

The findings of the geophysical investigation are supported by the analytical test results for environmental samples collected at this site. The areas that showed anomalously high conductivity values are primarily contaminated with chlorinated organics and/or metals. The chlorinated organic of greatest concern is PCB. This constituent is present in the lagoon soil at an average concentration of 750 mg/kg and in the lagoon groundwater at 6.02 mg/l. The PCBs were also detected at the burn site, along with trichloroethene (TCE) and methylene chloride. All three of these constituents were detected in groundwater samples at concentrations of 0.012 mg/l or greater. The burn site and lagoon also account for the most significant metal contamination. Several soil and groundwater samples showed relatively high levels of lead and mercury.

There is a strong correlation between the sample results and the wastes disposed of at American Color and Chemical/Venture Chemical. The PCB contamination is present because the effluent that was treated during the active life of the lagoon occasionally contained PCBs from in-plant spill incidents; PCBs were also constituents of a waste incinerated at the burn site. Much of the other organic contamination can also be attributed to incineration at the burn site, or to spills and leaks that occurred in the associated drum storage area (Ref. 10, pp. 9, 11-12). The only strong correlation that can be made for metals is that the product bags found at the burn site were the source of mercury contamination in environmental samples collected at the same location.

5.0 SUMMARY

The surface water, groundwater, air, and onsite exposure pathways are of concern at American Color and Chemical/Venture Chemical. The surface water pathway is of primary concern. Polychlorinated biphenyls (PCBs) are known to have been introduced into Campbell Creek, which receives both runoff and processed wastewater from this facility. These constituents are known to be accumulating in the food chain. The creek and associated waters have already been closed to shellfish harvesting because of this contamination. The groundwater pathway is also of concern. There is at least one shallow well located downgradient of the site. Also, potential users could be seriously endangered. The air and onsite exposure pathways are of lesser concern.

A total of 197 previously collected samples were reevaluated in this report. The samples were collected within and adjacent to areas of concern which include: the abandoned lagoon, the sediments and marsh near the plant's discharge pipe, the old drum storage area, the old burn site, and an area of stressed vegetation. The abandoned lagoon and burn site are by far the most contaminated areas. Significantly high concentrations of PCB, trichloroethene (TCE), methylene chloride, lead, and mercury were detected in soil and groundwater samples collected from these areas. All of these constituents are known components of waste deposited at the site. Also, several of the downgradient wells that are monitoring the abandoned lagoon and burn site are contaminated with the same constituents, which suggests a definite migration trend.

Although extensive contamination has been documented in soil, groundwater, and sediment at and near the site, the facility is under a consent order with the state for remediation. Should all wastes and contaminated soils be removed, this site would not be a viable candidate for a Listing Site Inspection (LSI). Therefore, FIT 4 recommends that consideration of any further action at this site be contingent upon results of the ongoing remediation.

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2. Map of Beaufort County, South Carolina (Charlotte, North Carolina: Champion Map Corporation, 1988).

3. Updated Preliminary Assessment Report for American Color and Chemical/Venture Chemical. Prepared by Charles Strange, South Carolina Department of Health and Environmental Control, December 2, 1988, pp. 1-5.

4. Tom Knight, Division of Water Quality Assessment and Enforcement, South Carolina Department of Health and Environmental Control, telephone conversation with James Miller, NUS Corporation, February 8, 1990. Subject: Amendment to Consent Order 87-65-W.

5. South Carolina Department of Health and Environmental Control, Columbia Office, Amendment to Consent Order 87-65-W: South Carolina DHEC vs. Tenneco Resins, Inc., American Color and Chemical Corporation, and Lobeco Products, Inc., pp. 1, 3.

6. Sandra Hursey, Division of Water Quality Assessment and Enforcement, South Carolina Department of Health and Environmental Control, telephone conversation with James Miller, NUS Corporation, February 7, 1990. Subject: Scheduled completion date for remediation activities at American Color and Chemical/Venture Chemical.

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21. Russell E. Berry, Shellfish Manager, Low Country District, interoffice memorandum to Luke Hause, Director of Shellfish & Recreational Waters, South Carolina Department of Health and Environmental Control, April 10, 1984. Subject: Source of contamination in Whale Branch and the Huspah Creek area, p. 2.

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33. Steve Pardieck, Chief, Drinking Water Branch (W-6), interoffice memorandum to Regional Drinking Water Branch Chiefs, Regions I-VIII, X, U.S. Environmental Protection Agency, October 6, 1987. Subject: Updated Drinking Water Standards and Health Advisory Table.

TABLE 1 (PART 1 OF 3)

SELECTED ANALYTICAL DATA
BACKGROUND
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater		
	W-1 (4-6 ft.)	W-2 (10-12 ft.)	W-1 (14-16 ft.)	W-1 (38-40 ft.)	W-1	W-1	W-2
VOLATILES							
VINYL CHLORIDE	-	-	-		ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRANS-1,2-DICHLOROETHENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROFORM	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROTOLUENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROBENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,4-DICHLOROBENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,3-DICHLOROBENZENE	-	-	-		ND(<0.010)	ND(<0.010)	ND(<0.010)
DICHLOROBROMOMETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,1-TRICHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CARBON TETRACHLORIDE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROPROPANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CIS-1,3-DICHLOROPROPENE	-	-			ND(<0.010)	ND(<0.010)	ND(<0.010)

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 1 (PART 2 OF 3)

SELECTED ANALYTICAL DATA
BACKGROUND
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater		
	W-1 (4-6 ft.)	W-2 (10-12 ft.)	W-1 (14-16 ft.)	W-1 (38-40 ft.)	W-1	W-1	W-2
TRICHLOROETHENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRICHLOROFLOURMETHANE	-	-	-		ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,2-TRICHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
BENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRANS-1,3-DICHLOROPROPENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
2-CHLOROETHYL VINYL ETHER	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
BROMOFORM	-	-	-		ND(<0.010)	ND(<0.010)	ND(<0.010)
TETRACHLOROETHENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,2,2-TETRACHLOROETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
TOLUENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROBENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLORODIBROMOMETHANE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
ETHYLBENZENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLBROMIDE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLCHLORIDE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLENE CHLORIDE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)
TOTAL XYLENE	-	-	-	-	ND(<0.010)	ND(<0.010)	ND(<0.010)

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 1 (PART 3 OF 3)

SELECTED ANALYTICAL DATA
BACKGROUND
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater		
	W-1 (4-6 ft.)	W-2 (10-12 ft.)	W-1 (14-16 ft.)	W-1 (38-40 ft.)	W-1	W-1	W-2
POLYCHLORINATED BIPHENYLS							
AROCHLOR 1248	-	-	-	-	-	ND(<0.001)	ND(<0.001)
TOTAL POLYCHLORINATED	-	-	-	-	-		-
METALS							
CADMIUM	-	-	-	-	-	ND(<0.005)	ND(<0.005)
CHROMIUM	-	-	-	-	-	ND(<0.01)	ND(<0.01)
LEAD	-	-	-	-	-	ND(<0.04)	ND(<0.04)
MERCURY	-	-	-	-	-	ND(<0.0002)	ND(<0.0002)
OTHER							
TOTAL ORGANIC CARBON	-	-	-	-	21	5	9
CHLORIDE	-	-	-		79	15	13.4
SAMPLING DATE	03/11/86	03/12/86	03/11/86	03/12/86	03/12/86	03/22/86	03/22/86

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 2 (PART 1 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil							
	L-1 (1 ft.)	L-9 (2-3 ft.)	L-1 (2.5 ft.)	L-3 (2.5 ft.)	L-28 (3-4 ft.)	L-10 (3.5-4 ft.)	L-3 (4 ft.)	G&E-3 (4-5 ft.)
VOLATILES								
CHLOROTOLUENE	-	ND(<0.100)	-	-	-	ND(<0.100)	-	-
TRICHLOROETHENE	-	ND(<0 100)	-	-	-	ND(<0 100)	-	-
ACID & BASE NEUTRALS								
1,2,4-TRICHLOROBENZENE	-	-	-	-	-	-	-	24 0
NAPHTHALENE	-	-	-	-	-	-	-	12 0
POLYCHLORINATED BIPHENYLS								
AROCHLOR 1248	-	-	-		250	-	-	-
TOTAL POLYCHLORINATED BIPHENYLS	112	140	108	39	-	17	122	6750
METALS								
CADMIUM	-	-	-	-	-	-	-	ND(<0 5)
CHROMIUM	-	-	-	-	-	-	-	46
LEAD	698	-	500	42	-	-	90	2286
MERCURY	19	-	4 3	0 63	-	-	1 9	13
OTHER								
CHLORIDE	-	-	-	-	-	-	-	-
SAMPLING DATE	03/18/86	03/21/86	03/18/86	03/18/86	04/03/86	03/21/86	03/18/86	01/13/86

ND None detected
SZ Saturation Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 2 (PART 2 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

	Soil							
PARAMETERS (mg/l, mg/kg)	**G&E-4 (4-5 ft.)**	**G&E-5 (4-5 ft.)**	**L-13 (4-6.5 ft.)**	**L-2 (4.5 ft.)**	**G&E-1 (5-6 ft.)**	**L-3 (6 ft.)**	**L-24 (6-6.5 ft.)**	**G&E-4 (6-7 ft.)**
VOLATILES								
CHLOROTOLUENE	-	-	ND(<0 100)	-	-	-	ND(<0 100)	-
TRICHLOROETHENE	-	-	ND(<0 100)	-	-	-	ND(<0 100)	-
ACID & BASE NEUTRALS								
1,2,4-TRICHLOROBENZENE	ND(<0 330)	ND(<0.330)	-	-	54 0	-	-	7 4
NAPHTHALENE	ND(<0 330)	ND(<0 330)	-	-	17 0	-	-	1 10
POLYCHLORINATED BIPHENYLS								
AROCHLOR 1248	-	-	-	-	-	-	-	52
TOTAL POLYCHLORINATED BIPHENYLS	-	-	ND(<2 0)	497	680	2460	369	-
METALS								
CADMIUM	ND(<0 5)	ND(<0 5)	-	-	ND(<0 5)	-	-	ND(<0 5)
CHROMIUM	16	4.9	-	-	13	-	-	11
LEAD	46	ND(<3 3)	-	528	942	55	-	144
MERCURY	0 11	ND(<0.05)	-	3.8	1 1	0 09	-	3 2
OTHER								
CHLORIDE	-	-	-	-	-	-	-	-
SAMPLING DATE	01/13/86	01/13/86	03/21/86	03/18/86	01/13/86	03/18/86	03/21/86	01/13/86

ND None detected
SZ Saturation Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 2 (PART 3 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l,mg/kg)	Soil							
	B-1 (6-8 ft.)	L-1 (6.5 ft.)	L-2 (6.5 ft.)	L-2 (6.5-7 ft.)	L-7 (8 ft.)	L-33 (10-12 ft.)	B-1 (10-12 ft.)	L-33 (12-14 ft.)
VOLATILES								
CHLOROTOLUENE	-	-	-	-	6 0	-	-	-
TRICHLOROETHENE	-	-	-	-	ND(<0 100)	-	-	-
ACID & BASE NEUTRALS								
1,2,4-TRICHLOROBENZENE	-	-	-	-	-	ND(<10)	-	103
NAPHTHALENE	-	-	-	-	-	ND(<10)		122
POLYCHLORINATED BIPHENYLS								
AROCHLOR 1248	-	•	-	-	-	70	-	2139
TOTAL POLYCHLORINATED BIPHENYLS	ND(<1 0)	676	196	582	369	-	ND(<1 0)	-
METALS								
CADMIUM	-	-	-	-	-	-	-	-
CHROMIUM	-	-	-	-	-			
LEAD	-	283	109	76		-	-	-
MERCURY	-	1 6	0 82	0 88	-	-	-	-
OTHER								
CHLORIDE	-	-	-	-	-	-	-	
SAMPLING DATE	03/13/86	03/18/86	03/18/86	03/18/86	03/21/86	04/13/86	03/13/86	04/13/86

ND None detected
SZ Saturation Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 2 (PART 4 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil			Groundwater						
	L-33 (14-16 ft.)	B-1 (14-16 ft.)	B-1 (43-45 ft.)	L-1 (SZ)	L-2 (SZ)	L-3 (SZ)	L1, L2, L3 (SZ, C)	L-7 (SZ)	L-18 (SZ)	G&E-1-5 (SZ, C)
VOLATILES										
CHLOROTOLUENE	-	-	-	-	-	-	-	1.20	1.70	-
TRICHLOROETHENE	-	-	-	-	-	-	0.150	0.04	0.05	-
ACID & BASE NEUTRALS										
1,2,4-TRICHLOROBENZENE	-	-	-	-	-		3.470			0.460
NAPHTHALENE	-	-	-	-	-	-	2.340		-	0.380
POLYCHLORINATED BIPHENYLS										
AROCHLOR 1248	-	-	-	-	-	-	6.02	-	-	-
TOTAL POLYCHLORINATED BIPHENYLS	ND(<1.0)	ND(<1.0)	ND(<1.0)	-	-	-	-	-	-	-
METALS										
CADMIUM	-	-	-	-	-	-	-	0.02	0.03	ND(<0.01)
CHROMIUM	-	-	-	-	-		-	0.65	1.9	5.4
LEAD	-	-	-	11	0.19	0.14	-	1.5	7.0	34
MERCURY	-	-	-	0.23	ND(<0.002)	ND(<0.002)	-	0.05	0.12	0.614
OTHER										
CHLORIDE	-	-	-	-	-	-	-	-	-	
SAMPLING DATE	04/13/86	03/13/86	03/13/86	03/18/86	03/18/86	03/18/86	03/18/86	03/21/86	03/21/86	01/14/86

ND — None detected
SZ — Saturation Zone
C — Composite
\- — Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 2 (PART 5 OF 5)

SELECTED ANALYTICAL DATA
ABANDONED LAGOON
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Groundwater				
	C-1	W-3	W-3	W-4	V-6
VOLATILES					
CHLOROTOLUENE	ND(<0.010)	-	0.200	ND(<0.010)	-
TRICHLOROETHENE	ND(<0.010)	0.047	0.355	ND(<0.010)	0.235
ACID & BASE NEUTRALS					
1,2,4-TRICHLOROBENZENE	-	-	-		-
NAPHTHALENE	-	-		-	-
POLYCHLORINATED BIPHENYLS					
AROCHLOR 1248	-	-	-	-	-
TOTAL POLYCHLORINATED BIPHENYLS	ND(<0.001)	ND(<0.001)	ND(<0.005)	ND(<0.001)	ND(<0.001)
METALS					
CADMIUM	ND(<0.005)	-	0.02	ND(<0.005)	-
CHROMIUM	ND(<0.01)	-	0.13	ND(<0.01)	-
LEAD	ND(<0.04)	-	0.13	ND(<0.04)	0.32
MERCURY	ND(<0.0002)	-	ND(<0.002)	ND(<0.0002)	-
OTHER					
CHLORIDE	2.5	-	1650	34	2900
SAMPLING DATE	03/25/86	03/12/86	03/26/86	03/25/86	03/13/86

ND None detected
SZ Saturated Zone
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 3 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
DISCHARGE PIPE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/L, mg/kg)	Soil					
	A-8 (2 ft.)	A-3 (3 ft.)	A-6 (3 ft.)	A-7 (3-4.5 ft., C)	A-6 (6 ft.)	A-3 (6.5-7 ft.)
VOLATILES						
VINYL CHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1-DICHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRANS-1,2-DICHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1-DICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROFORM	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROTOLUENE	ND(<0.100)	ND(<0.100)	-	-	-	ND(<0.100)
1,2-DICHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,4-DICHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,3-DICHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
DICHLOROBROMOMETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,2-DICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1,1-TRICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CARBON TETRACHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,2-DICHLOROPROPANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CIS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRICHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRICHLOROFLOURMETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1,2-TRICHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
BENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TRANS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
2-CHLOROETHYL VINYL ETHER	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
BROMOFORM	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TETRACHLOROETHENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
1,1,2,2-TETRACHLOROETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TOLUENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLOROBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
CHLORODIBROMOMETHANE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
ETHYLBENZENE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
METHYLBROMIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
METHYLCHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
METHYLENE CHLORIDE	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
TOTAL XYLENE (SEMIQUANTITATIVE)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)	ND(<0.100)
POLYCHLORINATED BIPHENYLS						
TOTAL POLYCHLORINATED BIPHENYLS	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)	ND(<1.0)
SAMPLING DATE	03/12/86	03/13/86	03/13/86	03/12/86	03/13/86	03/13/86

ND None Detected
C Composite
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 3 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
DISCHARGE PIPE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/L, mg/kg)	Groundwater				
	A-3	A-5	A-6	W-5	W-5
VOLATILES					
VINYL CHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRANS-1,2-DICHLOROETHENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROFORM	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROTOLUENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	-
1,2-DICHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,4-DICHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,3-DICHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
DICHLOROBROMOMETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,1-TRICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CARBON TETRACHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROPROPANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CIS-1,3-DICHLOROPROPENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TRICHLOROETHENE	ND(<0.010)	ND(<0.010)	0.056	ND(<0.010)	ND(<0.010)
TRICHLOROFLOURMETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,2-TRICHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
BENZENE	ND(<0.010)	ND(<0.010)	0.010	ND(<0.010)	ND(<0.010)
TRANS-1,3-DICHLOROPROPENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
2-CHLOROETHYLVINYLETHER	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
BROMOFORM	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TETRACHLOROETHENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
1,1,2,2-TETRACHLOROETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
TOLUENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLOROBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
CHLORODIBROMOMETHANE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
ETHYLBENZENE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLBROMIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLCHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
METHYLENE CHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	0.080	ND(<0.010)
TOTAL XYLENE (SEMIQUANTITATIVE)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)
POLYCHLORINATED BIPHENYLS					
TOTAL POLYCHLORINATED BIPHENYLS	-	-	-	ND(<0.001)	ND(<0.001)
OTHER					
TOTAL ORGANIC CARBON	100	60	50	-	-
SAMPLING DATE	03/13/86	03/13/86	03/13/86	04/04/86	05/01/86

ND None Detected

C Composite

\- Material not analyzed for or data were not available for inclusion

NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN

TABLE 4 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
OLD DRUM STORAGE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l)	Groundwater				
	A-9	A-10	A-11	W-6	W-7
VOLATILES					
VINYL CHLORIDE	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	0.030
CHLOROFORM	ND	ND	ND	ND	0.025
CHLOROTOLUENE	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	
1,4-DICHLOROBENZENE	ND	ND	ND	ND	0.160
1,3-DICHLOROBENZENE	ND	ND	ND	ND	-
DICHLOROBROMOMETHANE	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	0.04	ND	ND
CARBON TETRACHLORIDE	19	12	39	ND	89
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND
CIS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	0.110
TRICHLOROFLOURMETHANE	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	0.017

ND None Detected (<0.010 mg/l)
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN MARCH 13 AND MARCH 17 OF 1986

TABLE 4 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
OLD DRUM STORAGE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l)	Groundwater				
	A-9	A-10	A-11	W-6	W-7
TRANS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND
2-CHLOROETHYL VINYL ETHER	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND
TOLUENE	0 26	0 04	5 70	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	0 190
CHLORODIBROMOMETHANE	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND
METHYLBROMIDE	ND	ND	ND	ND	ND
METHYLCHLORIDE	ND	ND	ND	ND	ND
METHYLENE CHLORIDE	ND	ND	ND	ND	ND
TOTAL XYLENE	ND	ND	ND	ND	ND
OTHER					
TOTAL ORGANIC CARBON	30	20	30	14	150
CHLORIDE	595	165	115	-	-

ND None Detected (<0.010 mg/l)

\- Material not analyzed for or data were not available for inclusion

NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN MARCH 13 AND MARCH 17 OF 1986

TABLE 5 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
BURN SITE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil				Groundwater
	S-1 (depth unk.)	G&E-9 (1 ft.)	BS-3 (3-4 ft.)	G&E-6 (3-4 ft.)	G&E-10
VOLATILES					
METHYLENE CHLORIDE	-	-	-	-	640
TRICHLOROETHENE	-	-	-	-	-
ACID & BASE NEUTRALS					
1,2,4-TRICHLOROBENZENE	ND(<10)	0.610	-	ND(<0.330)	ND(<0.010)
NAPHTHALENE	ND(<10)	0.750	-	ND(<0.330)	ND(<0.010)
POLYCHLORINATED BIPHENYLS					
AROCHLOR 1242	-	-	-	ND(<1.0)	-
AROCHLOR 1248	-	169	250	-	-
TOTAL POLYCHLORINATED BIPHENYLS	-	155	-	-	-
METALS					
CADMIUM	0.1	ND(<0.5)	-	ND(<0.5)	ND(<0.01)
CHROMIUM	2.0	565	-	5.4	1.7
LEAD	6.9	53	-	4.7	0.4
MERCURY	0.04	0.18	-	ND(<0.5)	0.0017
OTHER					
TOTAL ORGANIC CARBON	-	-	-	-	-
CHLORIDE	-	-	-	-	-

ND None Detected

\- Material not analyzed for or data were not available for inclusion

NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN JANUARY 14 AND MAY 1 OF 1986

TABLE 5 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
BURN SITE
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Groundwater					Surface Water	Product
	W-9	W-10	W-11	W-12	W-13	LAGOON	LAGOON
VOLATILES							
METHYLENE CHLORIDE	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	ND(<0.010)	-	-
TRICHLOROETHENE	180	0.025	12	0.073	ND(<0.010)	-	-
ACID & BASE NEUTRALS							
1,2,4-TRICHLOROBENZENE	ND(<0.010)	ND(<0.010)	-	-	-	-	-
NAPHTHALENE	ND(<0.010)	ND(<0.010)	-	-	-	-	-
POLYCHLORINATED BIPHENYLS							
AROCHLOR 1242	-	0.012	-	-	-	-	-
AROCHLOR 1248	0.114	-	-	-	-	0.0027	-
TOTAL POLYCHLORINATED BIPHENYLS	-	-	ND(<0.001)	ND(<0.001)	ND(<0.001)	-	-
METALS							
CADMIUM	0.03	-	ND(<0.005)	ND(<0.005)	0.02	ND(<0.005)	-
CHROMIUM	0.67	-	-	-	0.75	ND(<0.01)	-
LEAD	0.94	-	ND(<0.04)	ND(<0.04)	0.6	1.5	-
MERCURY	0.004	-	ND(<0.002)	ND(<0.0002)	ND(<0.002)	0.24	19
OTHER							
TOTAL ORGANIC CARBON	70	38	350			40	-
CHLORIDE	-	-	1100	57.9	40.0	-	-

ND None Detected

\- Material not analyzed for or data were not available for inclusion

NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN BETWEEN JANUARY 14 AND MAY 1 OF 1986

TABLE 6 (PART 1 OF 2)

SELECTED ANALYTICAL DATA
STRESSED VEGETATION
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

PARAMETERS (mg/l, mg/kg)	Soil	Groundwater	
	D-1 (1-2ft.)	D-1	D-2
VOLATILES			
VINYL CHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRANS-1,2-DICHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1-DICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CHLOROFORM	ND(<0.100)	ND(<0.010)	ND(<0.010)
CHLOROTOLUENE	ND(<0.100)	ND(<0.010)	-
1,2-DICHLOROBENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,4-DICHLOROBENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,3-DICHLOROBENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
DICHLOROBROMOMETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1,1-TRICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CARBON TETRACHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,2-DICHLOROPROPANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CIS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRICHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRICHLOROFLOURMETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1,2-TRICHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
BENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TRANS-1,3-DICHLOROPROPENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
2-CHLOROETHYL VINYL ETHER	ND(<0.100)	ND(<0.010)	ND(<0.010)
BROMOFORM	ND(<0.100)	ND(<0.010)	ND(<0.010)
TETRACHLOROETHENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
1,1,2,2-TETRACHLOROETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TOLUENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
CHLOROBENZENE	ND(<0.100)	ND(<0.010)	ND(<0.010)

ND None Detected
\- Material not analyzed for or data were not available for inclusion
NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN ON MARCH 26 AND MARCH 27 OF 1986

TABLE 6 (PART 2 OF 2)

SELECTED ANALYTICAL DATA
STRESSED VEGETATION
AMERICAN COLOR AND CHEMICAL/VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

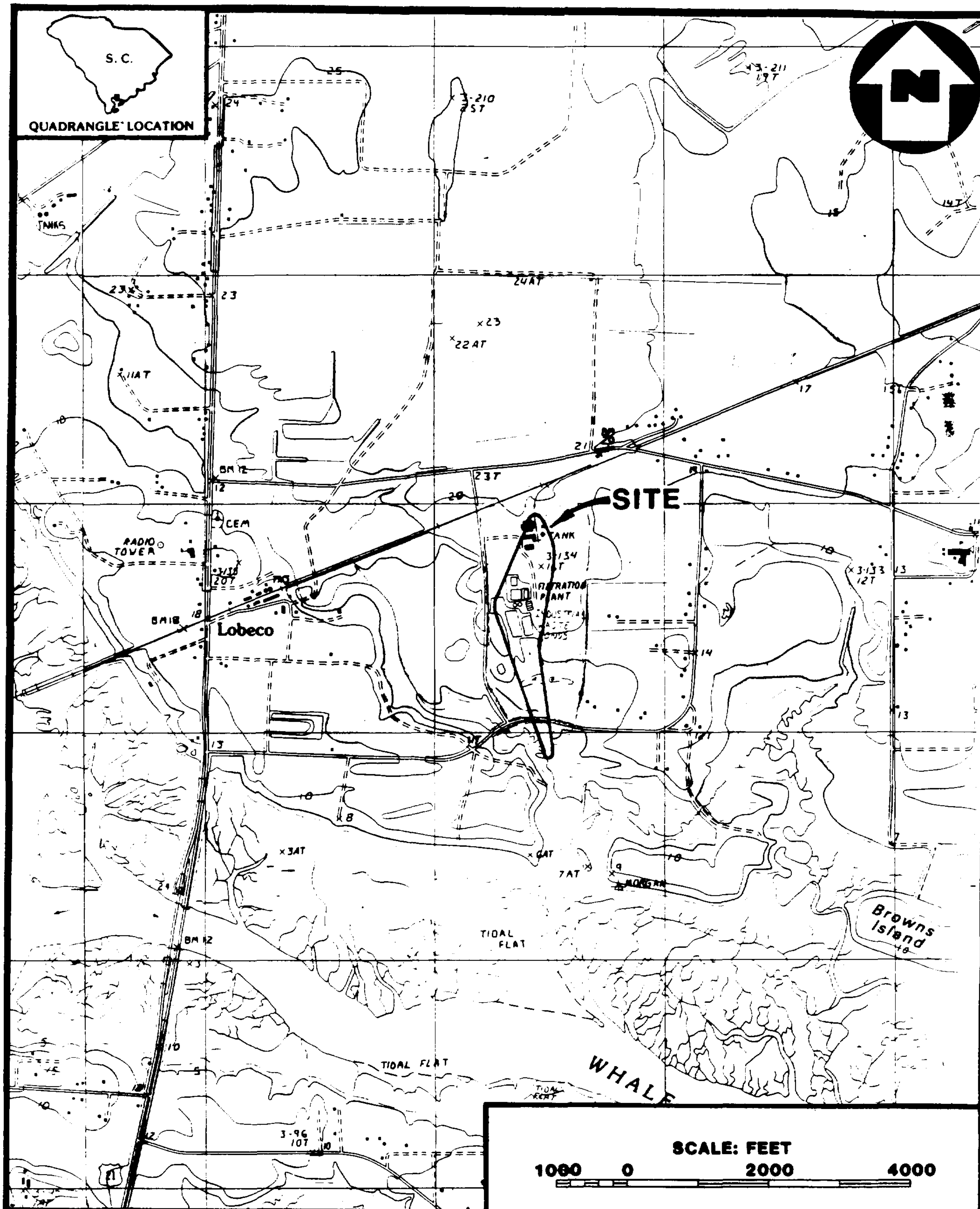
PARAMETERS (mg/l, mg/kg)	Soil	Groundwater	
	D-1 (1-2ft.)	D-1	D-2
CHLORODIBROMOMETHANE	ND(<0.100)	ND(<0.010)	ND(<0.010)
ETHYLBENZENE	ND(<0.100)	ND(<0.010)	0.013
METHYLBROMIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
METHYLCHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
METHYLENE CHLORIDE	ND(<0.100)	ND(<0.010)	ND(<0.010)
TOTAL XYLENE	ND(<0.100)	ND(<0.010)	ND(<0.010)
POLYCHLORINATED BIPHENYLS			
TOTAL POLYCHLORINATED	-	ND(<0.001)	-
METALS			
CHROMIUM	3.3	ND(<0.01)	ND(<0.01)
LEAD	3.8	ND(<0.04)	ND(<0.04)

ND None Detected

\- Material not analyzed for or data were not available for inclusion

NOTE: G & E ENGINEERING, INC. COLLECTED ALL SAMPLES SHOWN ON MARCH 26 AND MARCH 27 OF 1986

Figures

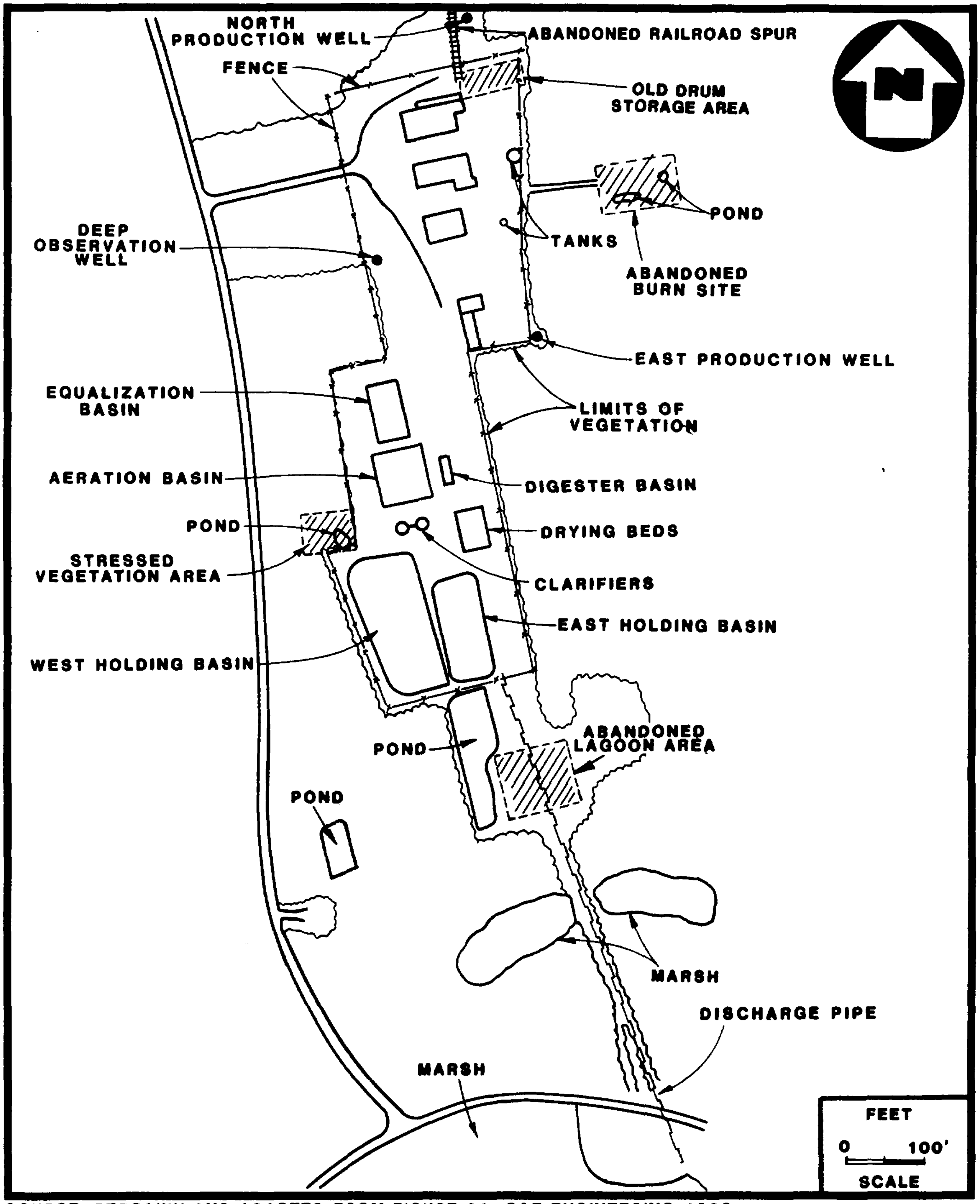


BASE MAP IS A PORTION OF THE U.S.G.S. 7.5 MINUTE QUADRANGLE DALE 1988, SHELDON 1988, FLORIDA.

SITE LOCATION MAP
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 1

NUS CORPORATION

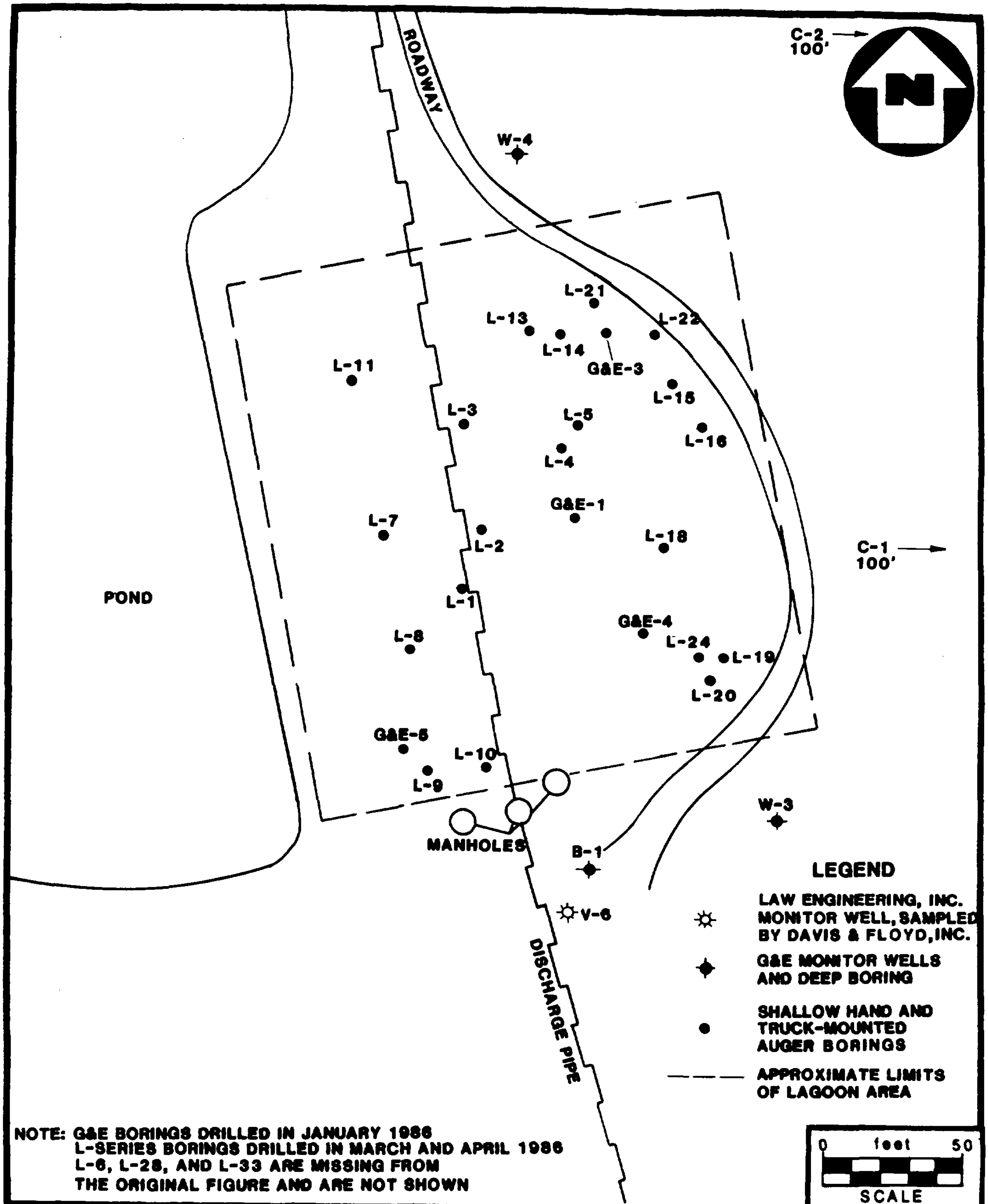


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 3A, G&E ENGINEERING 1986.

SITE LAYOUT MAP
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 2

NUS CORPORATION

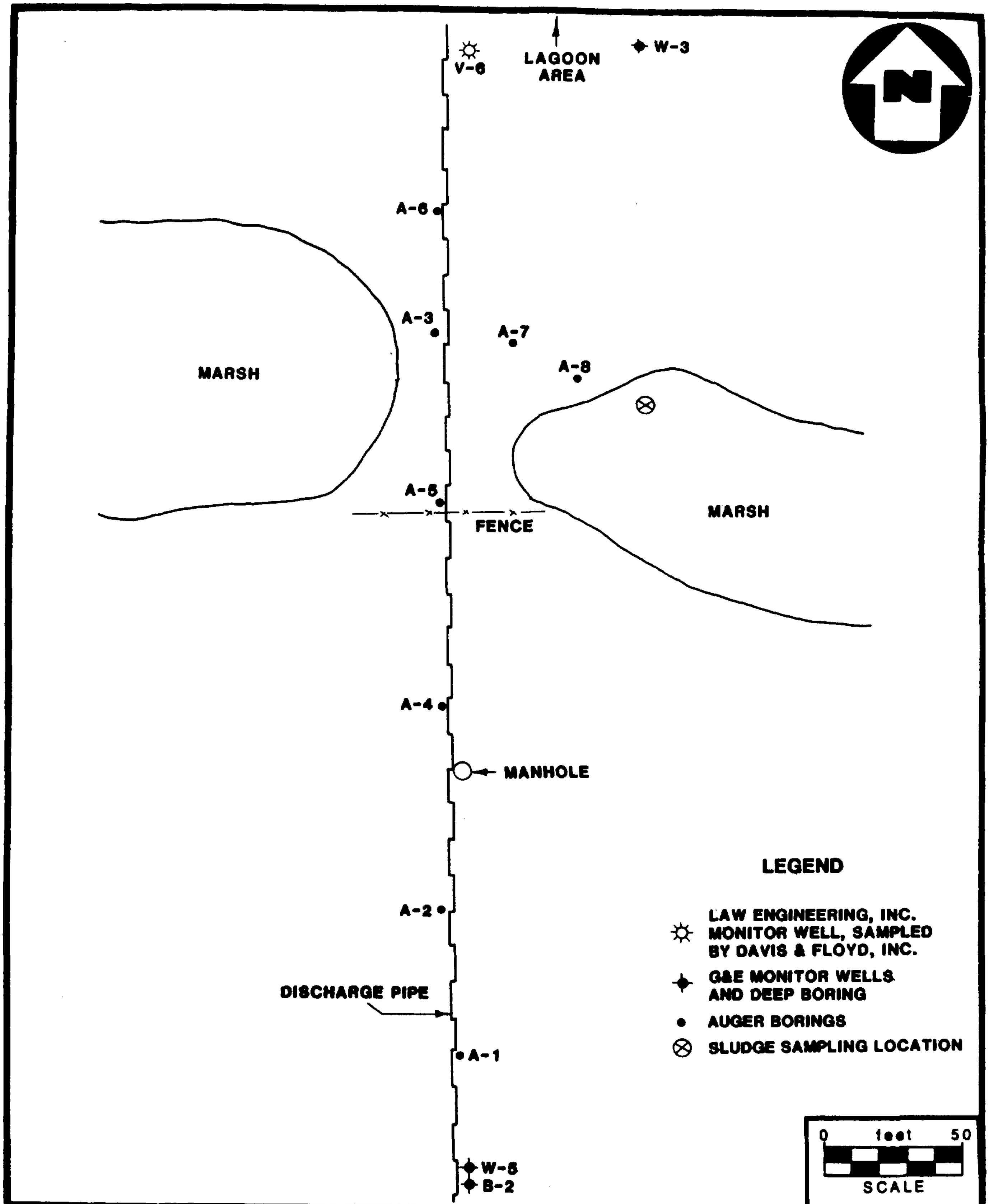


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6A, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
ABANDONED LAGOON AREA
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 4

NUS CORPORATION

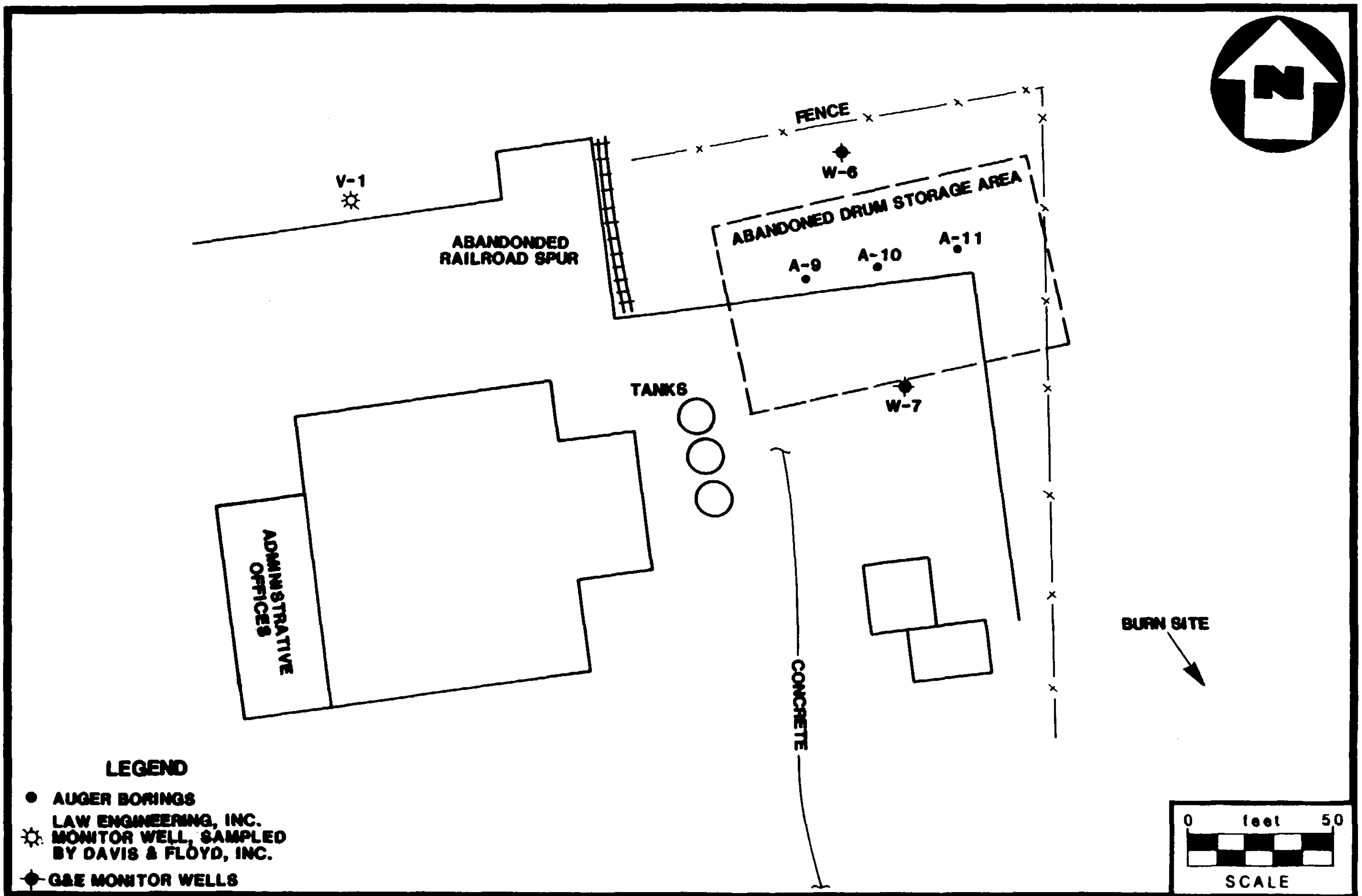


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6E, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
DISCHARGE PIPE
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 5

NUS CORPORATION

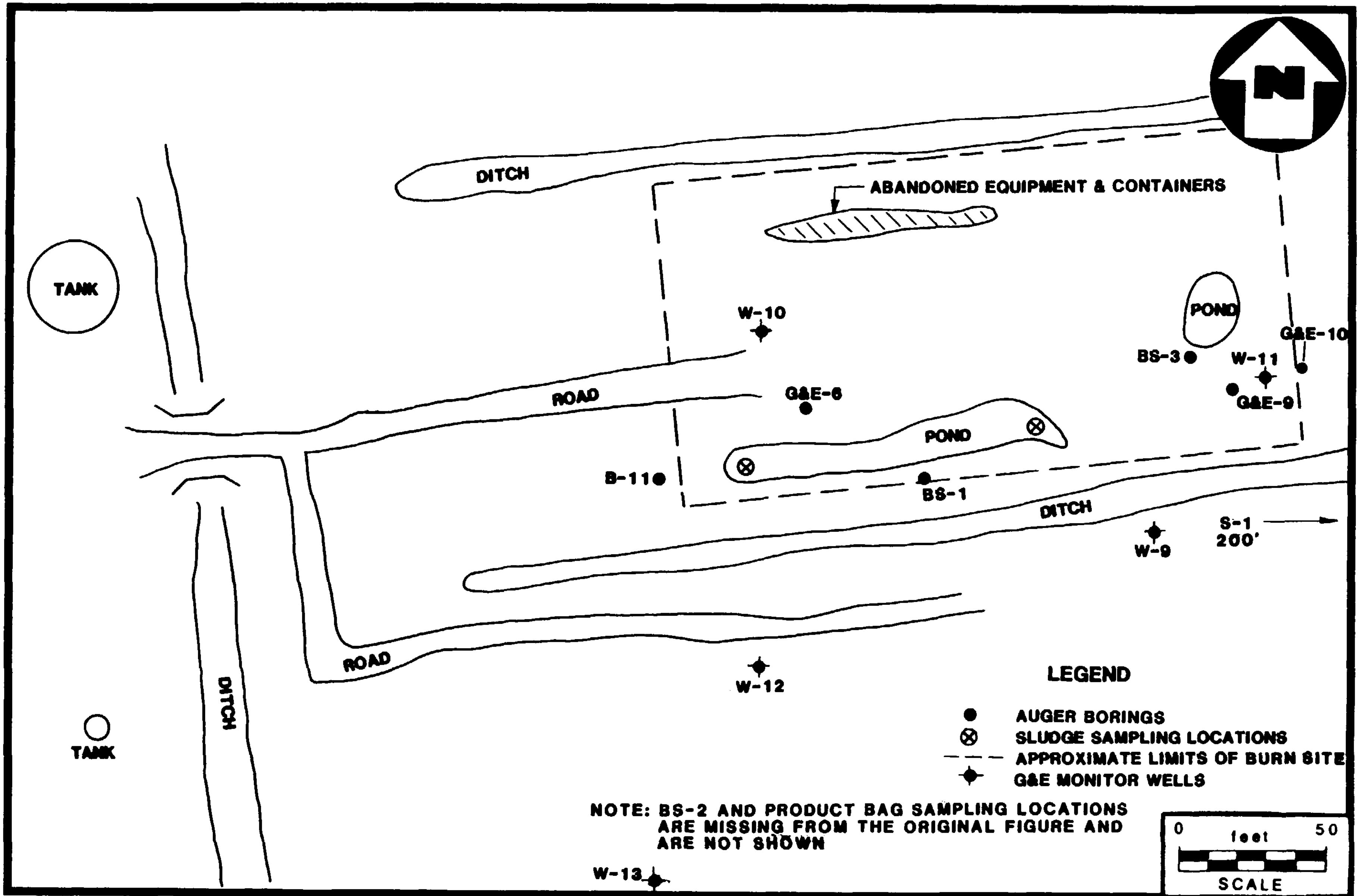


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6C, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
OLD DRUM STORAGE AREA
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 6

NUS CORPORATION

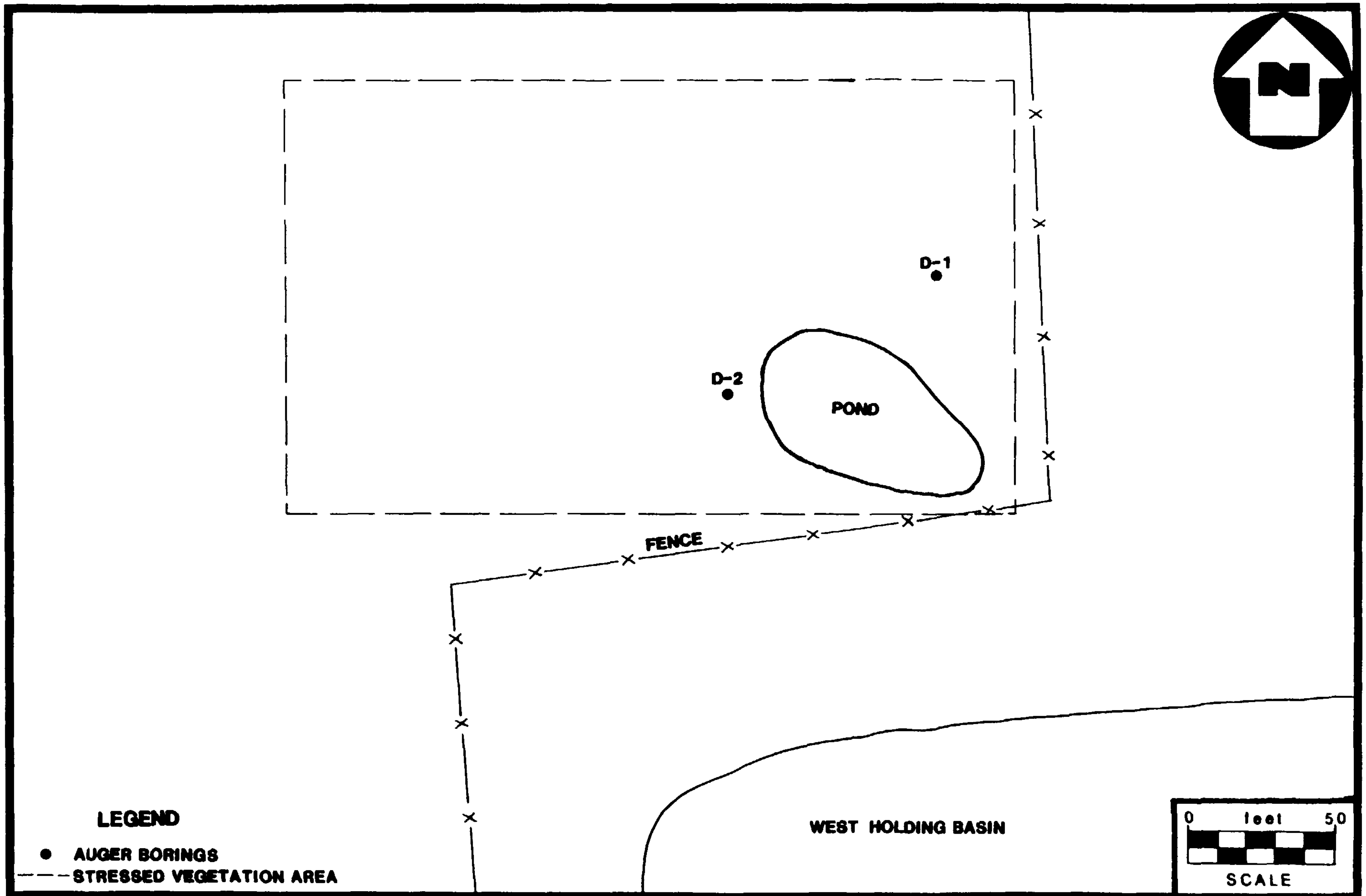


SOURCE: REDRAWN AND ADAPTED FROM FIGURE 6B, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
BURN SITE
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 7

NUS CORPORATION



SOURCE: REDRAWN FROM FIGURE 6D, G&E ENGINEERING 1986.

SAMPLE LOCATION MAP
STRESSED VEGETATION AREA
AMERICAN COLOR AND CHEMICAL / VENTURE CHEMICAL
LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA

FIGURE 8

NUS CORPORATION

REFERENCE # 1

LAW ENVIRONMENTAL SERVICES

PRELIMINARY HYDROGEOLOGIC ASSESSMENT

for

VENTURE CHEMICALS INC.

LOBECO, SOUTH CAROLINA

JUNE 21, 1985

LAW ENVIRONMENTAL SERVICES
DIVISION OF LAW ENGINEERING TESTING COMPANY
2749 DELK ROAD, S.E.
MARIETTA, GEORGIA 30067
(404) 952-9005

July 2, 1985

Venture Chemicals, Inc.
P.O. Box 815
South Carolina Highway 38
Lobeco, South Carolina 29931

Attention: Mr. John M. Meeks

Subject: Preliminary Hydrogeologic Assessment
Venture Chemical Plant
Lobeco, South Carolina
Law Environmental Services Project No. AE5238

Dear Mr. Meeks:

Law Environmental Services is pleased to submit this preliminary hydrogeologic assessment report of Venture Chemicals, Lobeco, South Carolina plant site. Our services were performed in general accordance with the scope of work outlined in the March 18, 1985 Ground-Water Detection Monitoring Plan. Our services were authorized by your Purchase Order No. 6676 dated April 8, 1985.

Our services as described in this report include the installation and development of six (6) Type II ground water quality monitoring wells, permeability testing of selected wells, water-level measurements, evaluation of hydrogeologic data, and preparation of a report. Ground-water sampling and chemical analyses were performed by others.

RE
JUL 05 1985

We appreciate the opportunity to assist Venture Chemicals with this important project. Please call us if you have any questions about this report.

Sincerely yours,

LAW ENVIRONMENTAL SERVICES

William G. Gierke
William G. Gierke
Staff Hydrogeologist

Charles A. Spiers
Charles A. Spiers, P.G.
Project Hydrogeologist

Thomas L. Cross ds
Thomas L. Cross, P.E.
Senior Hydrologist

Enclosure

WGG:CAS:TLC:ds

TABLE OF CONTENTS

INTRODUCTION

Venture Chemicals, Inc. reached an agreement with the South Carolina Department of Health and Environmental Control (DHEC) to implement a ground-water monitoring program at Venture Chemical's Lobeco, South Carolina facility. The proposed monitoring well plan was reviewed and approved by Mr. Charles Clymer of DHEC as stated in his April 8, 1985 letter. However, several exceptions to the plan were noted in Mr. Clymer's letter. Most of these dealt with sampling and analyses of ground water from monitoring wells, which was performed by Davis and Floyd.

Other concerns noted in DHEC's letter are addressed in this report. This report discusses the installation of six monitoring wells and data generated from the wells, along with other pertinent site hydrogeologic data.

LOCATION AND DESCRIPTION

Venture Chemicals, Inc. operates a plant located in Lobeco, South Carolina approximately 12 miles northwest of the town of Beaufort, South Carolina (Figure 1). The site is located approximately one mile north of the Whale Branch of the Coosaw River and 0.75 miles east of U.S. Route 21. The facility property comprises about 250 acres and the plant occupies about 50 acres. Figure 2 illustrates the layout of the facility.

The plant primarily manufactures agri-products, dye intermediates, and drilling fluid chemicals for the oil industry. Chemicals used and produced on-site consist primarily of organic compounds. Acidic industrial waste water from the plant is treated and neutralized on-site, prior to discharge to Campbell's Creek (see inset on Figure 1) in accordance with NPDES permit requirements. All wastes treated on-site are considered non-hazardous. Sludge from the bio-treatment area is disposed of off-site in a DHEC approved landfill. Venture Chemicals transports liquid hazardous wastes off-site.

Previous tenants at this site include Tenneco Company from 1967 to 1974 and American Color Chemical Company from 1974 to 1982.

REGIONAL HYDROGEOLOGY

The Lobeco, South Carolina area is underlain by sedimentary rocks that range in age from late Cretaceous to Holocene, comprising an overall thicknes of about 3,500 feet. This sequence of sedimentary rocks supplies all of the ground water used in the area (Hayes, 1979).

The principal aquifer beneath the site is composed of the Santee Limestone and basal portion of the Cooper Marl. These stratigraphic units form the principal artesian aquifer that supplies the majority of ground water in Beaufort County. A

gamma ray log (Figure 4) of the deep observation well at the site shows that the top of the principal artesian aquifer is about 80 feet below land surface.

Specific yields of wells open to the principal artesian aquifer range from about 50 gallons per minute (gpm) to about 2,500 gpm (Hayes, 1979). Two deep production water wells exist at the site (Figure 2). These wells are 263 and 307 feet deep and periodically pump about 350 gpm each. The well sare screened at various intervals in the principal artesian aquifer (see Appendix for well details and logs). The most productive interval screened in these wells is the upper permeable zone of the principal artesian aquifer which extends from about 80 to 150 feet below land surface (Figure 4). Pumping of the two wells has caused a cone of depression of about 10 feet in the principal artesian aquifer as indicated on the regional potentiometric map published by The South Carolina Water Resources Commission (SCWRC) in June, 1984. The water level of the on-site SCWRC observation well was measured at 11.71 feet below mean sea level on March 27, 1985 (Table 1).

Overlying the principal aquifer is the Hawthorn formation which is composed of phosphatic, clayey sand and sandy clay with occasional zones of dolomitic, sandy to clayey limestone. The upper and lower sections of the Hawthorn formation act as confining beds. The middle section of the Hawthorn formation may be an aquifer (Hawthorn aquifer) in some areas; however, published

(21.6 feet), suggests that there is little or no hydraulic connection between the "uppermost" unconfined aquifer and the underlying principal artesian aquifer, even though the deeper aquifer is heavily pumped. This lack of hydraulic connection implies that downward seepage from the "uppermost" aquifer to the lower principal artesian aquifer is not likely to occur. As previously mentioned, the two aquifers are separated by the Hawthorn formation which is considered to be a confining bed.

Water elevations of the east and west holding basins were measured at 12.02 and 12.75 feet NGVD, respectively. These elevations are 6.43 and 7.16 feet higher than the water level in well V-5 which is directly downgradient (~ 10 feet) from the holding basins. This difference in water levels suggests that mounding of ground water caused by the holding basins is negligible.

A potentiometric map (Figure 2) derived from water levels obtained from site monitoring wells on April 27, 1985 shows that the direction of ground-water flow in the "uppermost" aquifer is to the south, toward Campbells Creek. In the "uppermost" aquifer, a slight hydraulic gradient of 0.003 ft/ft exists across the site.

Field permeability tests (found in the Appendix) performed on monitoring wells V-1, V-3, V-4, and V-6 yielded hydraulic conductivity (k) values ranging from 1.6 x 10^{-4} centimeters per second (cm/s) in well V-6 to 1.3×10^{-3} cm/s in well V-3 (Table 2). An average k-value for the permeability tests is 4.8×10^{-4} cm/s. This value is representative of the silty fine sands found in test holes at each monitoring well location.

The velocity of ground-water flow at the site can be estimated by using the formula V=Ki/Ne (Darcy's Law)

where; V = Velocity (cm/sec)

K = hydraulic conductivity (cm/sec)

i = hydraulic gradient (ft/ft)

Ne = effective porosity (dimensionless)

An estimated ground-water flow velocity was estimated by using the following data:

K = 4.8×10^{-4} cm/s

i = 0.003 ft/ft

Ne = 0.20 (assumed)

Based on the above data, an estimated flow velocity of 7.2×10^{-6} cm/s (7.4 feet/year) is calculated for ground water in the uppermost aquifer at the site.

CONCLUSIONS

Based on existing data, the following conclusions are presented:

1. The ground-water flow direction in the "uppermost" aquifer at the Venture Chemical's facility is from north to south, toward Campbells Creek.

2. An estimated ground-water flow velocity in the site area is 7.2×10^{-6} cm/s or 7.4 feet/year.

3. Significant differences between water levels in the holding basins and nearby monitoring wells suggests that mounding of ground water caused by the basins is negligible.

4. The "uppermost" unconfined aquifer and the underlying principal artesian aquifer do not appear to be hydraulically connected. Evidence supporting this lack of connection includes the presence of the Hawthorn Formation (a confining bed) and water level differences of 21.6 feet or more between the two aquifers.

REFERENCES

Department of the Navy Facilities Engineering Command, 1982. Soil Mechanics. NAVFAC Design Manual 7.1.

Hayes, Larry R., 1979. The Ground-Water Resources of Beaufort, Colleton, Hampton, and Jasper Counties. South Carolina Water Resources Commission Report No. 9, 91 pp.

Spigner, B.C., and Ransom C., 1979. Report on Ground-Water Conditions in the Low Country Area, South Carolina. South Carolina Water Resources Commission Report Number 132, 144 pp.

OVERSIZED

DOCUMENT

UPDATED PRELIMINARY ASSESSMENT REPORT
American Color and Chemical/Venture Chemical
SCD 046 507 018
Beaufort County

Completed by: Charles Strange
Date completed: December 2, 1988

I. INTRODUCTION/EXECUTIVE SUMMARY

The American Color and Chemical/Venture Chemical site is now owned by Lobeco Products, Inc. The Lobeco Products, Inc. facility is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Coosaw River.

The plant was built by Tenneco Chemical Company (later Tenneco Resins, Inc.) in 1967, but was purchased by American Color and Chemical Company in January, 1974. American Color and Chemical Company subsequently sold the facility to Venture Chemical Company (now Lobeco Products) in October, 1982. Lobeco has operated the facility since that time (Ref. No. 6, pg. 2).

The plant primarily manufactures agric-products, dye intermediates and drilling fluid chemicals for the oil industry. Chemicals used and produced on-site consist primarily of organic compounds. Acidic industrial wastewater from the plant is treated and neutralized on-site, prior to discharge to Campbell's Creek. Elevated chlorides and volatile organics have been detected in the groundwater on site. PCBs and Hg have also been detected in the groundwater. An area of stressed vegetation was found to have elevated levels of chromium and lead. A high priority for a screening site inspection is assigned.

II. SITE BACKGROUND AND HISTORY

A. Ownership History

The plant was originally owned by Tenneco Chemical Company (later Tenneco Resins, Inc.) but was later purchased by American Color and Chemical Company in January, 1974. American Color and Chemical subsequently sold the facility to Venture Chemical Company (now Lobeco Products) in October, 1982. Lobeco Products, Inc. has operated the facility since that time.

B. Site Description

The facility is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Coosaw River. No schools or Day Care Centers were noted in the vicinity of the

site by reviewing topographic quadrangle maps. The geographical coordinates of the site are latitude 32 degrees, 33 minutes, 03.0 seconds and longitude 80 degrees, 43 minutes, 46.0 seconds (Ref. No. 8).

C. Regulatory History/RCRA Summary

The Lobeco site is under a Consent Order dated August 8, 1988 for violation of its NPDES permit (Permit #SC 0000914) by discharging waste into the environment in violation of the discharge permit, specifically in violation of the toxicity, biochemical oxygen demand, total coliform and ultimate oxygen demand limits. Lobeco was ordered to immediately begin and continue to properly operate and maintain its waste treatment facilities so as to maximize treatment.

Lobeco Products, Inc. were protective filers under RCRA. Lobeco Products, Inc. submitted their part A application under RCRA because of treatment in tanks and surface impoundments. It was later determined that the tank treatment was not under RCRA as it was a Waste Water Treatment Unit. Additionally the waste in the surface impoundment was determined to be non-hazardous. Lobeco requested withdrawal of their RCRA notification/application. The withdrawal was approved on October 18, 1984.

D. Process and Waste Disposal History

Active waste management facilities at the site are part of the NPDES water treatment system (extended aeration and activated sludge) and consists of the following:

- Equalization basin
- Aeration basin
- Digester basin
- Clarifiers (two)
- Drying beds
- Holding ponds (east and west ponds)

Inactive or abandoned waste sites on the property include the following: (Ref. No. 5, pp. 12,13,14 & 15).

1. Abandoned Lagoon Site - Soil samples have shown contamination of 6750 ppm of Pb and 54 ppm of TCB (Ref. No. 7, p. 37).

2. Burn Site - Soil samples have shown 250 ppm of PCB's and 19 ppm of Hg and groundwater monitoring wells have shown 114 ppm PCB's and 180 ppm of Trichloroethene (Ref. No. 7, p. 47).

3. Drum Storage Area - Carbon Tetrachloride found at 89 ppm in monitoring well (Ref. No. 7, p. 47).

4. Stressed Vegative Area - Elevated chromium and lead found in soil (Ref. No. 3).

On November 14-15, 1983, the department conducted an assessment of the ambient water quality of Campbell Creek, into which the Lobeco plant effluent discharges. Analysis of water samples for dissolved oxygen, pH, temperature, salinity and specific conductance indicated satisfactory water quality within the context of the parameters examined. However, a total of sixty-six (66) organic chemical compounds were detected in oyster tissue samples, sediment samples and the Lobeco plant effluent. The community structure of hard substrate and soft substrate fauna in Campbell Creek was found to have been moderately to severely impacted, and significantly fewer oysters were observed, relative to the control station. Also, a department study done December 5, 1984 detected PCB's in sediment at the Lobeco outfall and downstream of the outfall (Ref. No. 6, p. 2).

E. Remedial and Removal Actions

To the department's knowledge no removal/remedial actions have taken place to date at the site.

F. Demography/Regional Setting

The Lobeco Products, Inc. site is located in a moderately populated rural area. The area is characterized by mostly flat land (Ref. No. 8).

III. GROUNDWATER PATHWAY

A. Regional Hydrogeology

The results of the hydrogeologic review are as follows:

1. The depth to the water table is five to ten feet based on elevations of nearby streams determined from topographic maps.

2. The aquifer of concern is the (1) Hawthorne - Recent and (2) Tertiary Limestone which is composed of sandy limey clays and light colored fossiliferous clayey limestone. The depth to the aquifer of concern is the same as the depth to the ground water (Ref. No. 2).

3. The composition of the unsaturated zone is Chisolm loamy fine sands containing ten to twenty-five percent clay according to the 1980 Soil Survey of Beaufort County. Soils of this type have an approximate hudraulic conductivity of > 10^{-3} cm/s.

4. A well inventory within a radius of four miles of the site reveals that ground water is used for drinking purposes in the aquifer of concern, with no other source presently available.

5. The nearest domestic well developed within the aquifer of concern is 0.3 mile to the south of the site, whereas the nearest community well is on the site.

B. Ground Water Use

The use made of ground water in the area is drinking water with no other source presently available.

The number of homes within a four mile radius of the site with domestic wells, as identified from topographic quadrangles, are as follows:

Radius	Number of Houses
0-1 Mile	35
1-2 Miles	122
2-3 Miles	176
3-4 Miles	236
	569

C. Ground-Water Impact

Sample analyses from monitoring wells on site indicate contamination of the aquifer of concern with PCB's and volatile organic compounds (Ref. No. 4).

NUS CORPORATION AND SU	REFERENCE # 4	*TELECON NOTE*
CONTROL NO. F4-8904-54	**DATE:** February 8, 1990	**TIME:** 1715
DISTRIBUTION: American Color and Chemical/Venture Chemical File		
BETWEEN: Mr. Tom Knight	**OF:** Div. of Water Quality Asses. & Enfor., SC Dept. of Health & Env. Co	**PHONE:** (803) 524-2274
AND: James Miller, NUS Corporation J.M.		

DISCUSSION:

Called Tom Knight, the state hydrogeologist who is currently working with this site, and asked about the date for the completely executed copy of Amendment to Consent Order 87-65-W. Mr. Knight stated that the document was signed on October 11, 1989. In general, Mr. Knight is very familiar with all aspects of this project. He mentioned that the stressed vegetation area was determined to have been caused from past lumbering activities.

11

REFERENCE # 5

BEFORE THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

IN RE: Tenneco Resins, Inc.
American Color & Chemical Corporation
Lobeco Products, Inc.
Beaufort County

AMENDMENT TO CONSENT ORDER 87-65-W

WHEREAS, the South Carolina Department of Health and Environmental Control (Department) issued Consent Order 87-65-W to Tenneco Resins, Inc., American Color and Chemical Corporation, and Lobeco Products, Inc. (referred to collectively as the Respondents) on July 25, 1987; and,

WHEREAS, On October 19, 1988, the Respondents submitted to the Department a Remedial Action Plan (Plan) including an implementation schedule, in accordance with Order requirements; and,

WHEREAS, by letter of February 27, 1989, the Department approved the Plan, including the implementation schedule, for the removal of high level contamination at the abandoned lagoon and the abandoned burn site; and,

WHEREAS, due to discussions at a meeting on April 13, 1989, the parties have decided to amend the Consent Order to govern the remediation of the abandoned lagoon and abandoned burn site and the discharge of groundwater recovered during this remediation; and,

WHEREAS, the Department and the Respondents understand there remains a need to define the horizon[illegible] and vertical extent of ground-water contamination at certain areas at the Lobeco Products, Inc. facility; and,

WHEREAS, it is in the best interest of the Department, the Public and the Respondents to implement the Plan as expeditiously as possible and that such imple[illegible]entation not be delayed by pro[illegible]cted discussions among the Respondents as to their individual responsibili[illegible] for further defining the extent of contamination.

NUS CORPORATION AND SL	REFERENCE # 6	TELECON NOTE
CONTROL NO. F4-8904-54	DATE: February 7, 1990	TIME: 1415
DISTRIBUTION: American Color and Chemical/Venture Chemical File		
BETWEEN: Ms. Sandra Hursey	OF: SC Dept. of Health & Env. Control (DHEC)	PHONE: (803) 734-5300
AND: James Miller, NUS Corporation J.M.		

DISCUSSION:

Called Sandra Hursey, the Environmental Quality Manager who is currently working with this project, and asked about the scheduled completion date for remediation activities at the site. Ms. Hursey stated that the final DHEC approval for remediation design was given on January 30, 1990. The Respondents to Consent Order 87-65-W have 44 weeks from this date to complete the remediation and submit a completion report to both DHEC and the Environmental Protection Agency. The scheduled completion date may be adjusted if conditions warrant.

REFERENCE # 7

BEFORE THE ENTAL CONTROL

IN RE: Lobeco Products, Inc.
Beaufort County

CONSENT ORDER
86-94-W

Lobeco Products, Inc. (Respondent), a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its wastewater treatment facility.

Section 48-1-50 of the South Carolina Code of Laws, 1976, as amended (Code), authorizes the South Carolina Department of Health and Environmental Control (Department) to issue orders and assess civil penalties for violation of the Pollution Control Act (Act).

In accordance with approved procedures, Department staff has determined that an order should be issued, to include the following Findings of Fact and Conclusions of Law.

Findings of Fact

1. The Respondent, a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its wastewater treatment facility.
2. The Department has issued NPDES Permit #SC0000914 effective July 1, 1985, to Venture Chemicals, Inc., (now Lobeco Products, Inc.) for its wastewater treatment facility. The permit requires, in part:
    a. The effluent from the wastewater treatment facility meet specified effluent limits;
    b. Additional quarterly monitoring for toxic pollutants with results reported with the Discharge Monitoring Reports;
    c. Additional weekly monitoring of PCBs until questions about sources are resolved, then quarterly; results to be submitted with the Discharge Monitoring Reports;

The Report submitted by the Respondent on the discharge toxicity reduction study is inadequate in that it contained numerous generalities without data to support them. In addition, the report did not include a proposal for a wastewater treatment system upgrade.

Conclusions of Law

1. Section 48-1-50 of the Code authorizes the Department to issue orders; assess civil penalties, and require the owner or operator of a disposal system to establish and maintain records; make reports; install monitoring equipment and methods; analyze discharges; and provide such other information as the Department reasonably may require.
2. The Respondent has violated its NPDES permit and Code Section 48-1-90 of the Act in that it has discharged waste into the environment in violation of the discharge permit, i.e., NPDES permit, issued by the Department, specifically, in violation of the toxicity limit.
3. The Respondent has violated Code Section 48-1-110 of the Act in that it has operated a wastewater treatment facility in violation of the discharge permit issued by the Department.
4. The Respondent's violations of the NPDES permit and the Code subject it to the assessment of civil penalties as set forth in Code Section 48-1-330 of the Act of up to ten thousand dollars ($10,000) per day of violation.

NOW, THEREFORE, IT IS ORDERED, CONSENTED TO AND AGREED that the Respondent shall:

1. Within thirty (30) days from the issuance of this Order - Pay a civil penalty of ten thousand dollars ($10,000) to the Department.

Within thirty (30) days from the issuance of this Order - Resubmit a plan of study on the discharge toxicity to include a proposal for a wastewater treatment system upgrade, including ammonia removal and disinfection along with other appropriate functions.

IT IS FURTHER ORDERED AND AGREED that failure to comply with any provision of this Order shall be grounds for appropriate sanctions and further enforcement action.

THE SOUTH CAROLINA DEPARTMENT OF
HEALTH AND ENVIRONMENTAL CONTROL

BY: Michael D. Jarrett
Michael D. Jarrett
Acting Commissioner

BY: Robert G. Gross
Robert G. Gross, Chief
Bureau of Water Pollution Control

DATE: September 29, 1986

WE CONSENT:

Lobeco Products, Inc. — Date: September 29, 1986

Russell W Sherer
Water Quality Assessment and Enforcement Division — Date: 30 September 1986

Attorney for the Department — Date: 10/1/86

REFERENCE # 8

BEFORE THE DEPA[illegible]AL CONTROL

IN RE: Lobeco Products, Inc.
Beaufort County

CONSENT ORDER
88-37-W

Lobeco Products, Inc. (Respondent), a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its waste treatment facility.

Section 48-1-50 of the South Carolina Code of Laws, 1976, as amended (Code), authorizes the South Carolina Department of Health and Environmental Control (Department) to issue Orders and assess civil penalties for violation of the Pollution Control Act (Act).

In accordance with approved procedures, Department staff have determined that an Order should be issued, to include the following Findings of Fact and Conclusions of Law.

Findings of Fact

1. The Respondent, a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its wastewater treatment facility.
2. The Department has issued NPDES Permit #SC0000914 effective July 1, 1985, to Venture Chemicals, Inc., (now Lobeco Products, Inc.) for its wastewater treatment facility. The permit requires, in part:
    a. The effluent from the wastewater treatment facility meet specified effluent limits;
    b. Additional quarterly monitoring for toxic pollutants with results reported with the Discharge Monitoring Reports;

proposed implementation schedule.

12. Since the issuance of Consent Order 86-94-W, the 96-hour flow-through toxicity tests conducted by the Respondent have continued to violate the NPDES Permit LC50 limit if 66%. The 96-hour flow-through and 48-hour static toxicity tests as well as the annual oyster spat recruitment test conducted May 25-June 20, 1987 continue to show an adverse impact on Campbell's Creek due to the Respondent's discharge. In addition, the Respondent has had chronic violations of the NPDES Permit effluent limits for biochemical oxygen demand, total coliform and ultimate oxygen demand.

Conclusions of Law

1. Section 48-1-50 of the Code authorizes the Department to issue orders, assess civil penalties, and require the owner or operator of a disposal system to establish and maintain records; make reports; install monitoring equipment and methods; analyze discharges; and provide such other information as the Department may reasonably require.
2. The Respondent has violated its NPDES Permit and Code Section 48-1-90 of the Act in that it has discharged waste into the environment in violation of the discharge permit, i.e., NPDES permit, issued by the Department, specifically, in violation of the toxicity, biochemical oxygen demand, total coliform and ultimate oxygen demand limits.
3. The Respondent has violated Code Section 48-1-110 of the Act in that it has operated a wastewater treatment facility in violation of the discharge permit issued by the Department.
4. The Respondent has violated Consent Order 86-94-W in that an approvable report on the discharge toxicity was not submitted in a timely manner.
5. The Respondent's violations of the NPDES permit, the Consent Order and the Code subject it to the assessment of civil penalties as set forth in Code

South | REFERENCE # 9 | Health
a | ol

Jack - Jay - place in Jay's file

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

December 18, 1985

Mr. J.M. Meeks, Plant Manager
Venture Chemicals, Incorporated
Post Office Box 815
Lobeco, South Carolina 29931

RE: Notice of Violation
Venture Chemicals, Incorporated
NPDES Permit #SC0000914
Beaufort County

Dear Mr. Meek:

Part III 13.B. of your NPDES Permit requires that you monitor PCB's on a weekly basis with the results reported to the Department when you submit your Discharge Monitoring Reports. However, a review of the files indicates that the weekly sampling has not been conducted.

Please review your permit and submit to my attention within fifteen (15) days of receipt of this notice a statement indicating whether or not you are in compliance with Part I.B.1. of the NPDES Permit; if not, explain corrective action being taken and the date compliance can be expected.

Failure to comply with the conditions of the NPDES Permit violates Sections 48-1-90 and 48-1-110 of the South Carolina Code of Laws, 1976, and makes you amenable to the civil penalties as set forth in Section 48-1-330 of the Code, i.e., a civil penalty not to exceed ten thousand dollars ($10,000.00) per day of such violation.

Pending receipt of a satisfactory response, no further enforcement action will be taken at this time. However, a copy of this letter will be placed in your file and will be used in determining appropriate action to be taken in case of future permit violations. Failure to respond in a timely and satisfactory manner will result in further enforcement action.

RECEIVED
DEC 20 1985
RECEIVED

Sincerely,

Stephen C. Thomas

Sandra L. Hursey /n
Environmental Quality Manager
Enforcement Section
Water Quality Assessment and
Enforcement Division

SLH/jbl
cc: Steve Thomas
District Director

REFERENCE # 10

HISTORICAL OPERATIONAL SURVEY

of the

LOBECO PRODUCTS, INCORPORATED

LOBECO, SOUTH CAROLINA PLANT

February, 1988

LANE
ENVIRONMENTAL SERVICES CORPORATION

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1.0 SUMMARY

A comprehensive search of the operating files at Lobeco Products, Inc., Lobeco, S. C. has been performed to identify chemicals used, stored and manufactured at the Lobeco plant and to determine past waste management and health and safety practices. Similar searches have been conducted of SCDHEC files and the retained files of Tenneco, Inc. and American Color and Chemicals, Inc.

Chemicals used and manufactured have been identified and are listed herein. Historical effluent and solid waste management practices have been established and the source of PCBs found at the site is discussed, as these items relate to the site investigation to be performed.

Fifteen chemical materials are identified as having possibly been associated with the so called "burn site". These are listed in Section 5.2, and are the only materials which are likely to be encountered in undiluted form during the Lobeco Investigation.

Potential hazards are discussed and the limited analytical protocol available is presented.

4.0 WASTES AND DISPOSAL PRACTICES

4.1 Effluent Systems

Plant operations were initially designed to have process wastes, consisting primarily of aqueous product extractions (washes) and cooling water, combine with a low flow sanitary waste stream en route to a settling basin (lagoon), and then discharge to a tidal creek. Discharge into the creek, as approved by the South Carolina Pollution Control Authority, was designed to be only on ebb tide, to assure effective dilution of the effluent stream.

Subsequently, pH neutralization, carbon adsorption, and biological treatment were added to the effluent system as the National Environmental Policy Act and the Federal Water Pollution Control Act (and amendments) required more sophisticated effluent treatment throughout the U.S.

4.2 Solid Wastes

Plant trash was initially burned in a small area to the east of the plant operating area, and later was sent to a local sanitary landfill.

Off-grade products and other process wastes were drummed and stored temporarily in what is now referred to as the "drum storage area". Subsequently, the contents of these drums were incinerated at the "burn area" and the empty containers were disposed of at approved sanitary landfills (Beaufort County Landfill and Hickory Hill Landfill). Empty raw material containers (drums and bags) were likewise sent to these landfills.

4.3 Polychlorinated Biphenyls (PCBs)

Certain of the Lobeco manufacturing processes require higher reaction temperatures than can be obtained with normal steam heating. To provide for these special reaction temperatures, the plant was designed and constructed to use a hot oil circulating system. Initially, as was the "state of the art", the heating oil used was a polychlorinated biphenyl; in this case Arochlor 1248 supplied by Monsanto. Later, the Arochlor 1248 was replaced with a non-PCB containing heating oil.

The Lobeco hot oil system utilized electric heaters in a pump-around loop. Occasionally pump leaks developed and/or electric heating tubes failed, resulting in spills onto the plant floor. When this occurred, the standard procedure was to scoop up as much as possible into drums and flush the residue into the floor drain system which ultimately fed into the effluent system and hence to the lagoon.

5.0 LOBECO SITE STUDY AREAS

As a result of prior concerns and investigations, and as set forth in Consent Agreement 87-65-W between the South Carolina Department of Health and Environmental Control and the present and prior owners, certain portions of the plant site have been designated for further study. These areas are discussed in the following paragraphs.

5.1 Abandoned Lagoon Area

Subsection 4.1 and 4.3 describe the Lobeco effluent handling system and potential chemical constituents. During the active life of the lagoon the process effluent may have contained product and raw material residues extracted in the aqueous wash cycles, and, on occasion, PCBs from in-plant spill incidents.

In addition to providing the holding time necessary to allow the prescribed ebb-tide discharge, the lagoon also served as a settling basin to permit any undissolved particles to settle out. This "settling out" formed a sediment layer on the lagoon bottom which was clearly visible (by color) in the core samples obtained during the G&E Engineering preliminary investigation. It is probable that this sediment layer, which will be defined during the current study, may contain PCB residues.

5.2 Burn Site Area

A list of materials possibly associated with the Burn Site Area (e.g., burned, stored, etc.) has been compiled. These materials are:

Material*	Chemical Name
Amino G	7-amino-1,3-napthalene disulfonic acid
Gamma Acid	2-amino-8-naphthol-6-sulfonic acid
G-Salt	2-naphthol-6,8-disulfonic acid
PNTS	4-nitrotoluene-2-sulfonic acid
R-Salt	2-amino-8-naphthol-6-sulfonic acid
Anthrarufin	1,5-dihydroxy anthraquinone

Cassella Acid	2-naphthylamine-4,8-disulfonic acid
J Acid	2-amino-5-naphthol-7-sulfonic acid
Peri Acid	1-naphthylamine-8-sulfonic acid
CUP	Copper phthalocyanine
DMS	4,4'-dinitrostilbene disulfonic acid
Heat Transfer Oil/Residue	Arochlor 1248
Iron Filings	______
Recovered Aniline	Aniline Oil
Chloral	Trichloroacetaldehyde

*It should be noted that the source of information linking these materials to the Burn Area is employee recollection except for Chloral (which information was found during records search).

5.3 Old Drum Storage Area

As discussed in Subsection 4.2, off-grade products and other process wastes were drummed and temporarily stored in this area. Any chemicals which may be contained in the soil or groundwater at this site would be due to spills or drum leaks and are not likely to be present in any major quantity.

No specific list of such chemicals can be developed, but would likely be similar to the list in 5.2.

5.4 Campbell Creek/Marsh Area

Prior SCDHEC and Venture Chemical studies of the Campbell Creek

REFERENCE # 11

Kirk-Othmer

Encyclopedia of Chemical Technology

Third Edition

Volume 24 Vitamins to Zone Refining

KIRK-OTHMER

ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY

THIRD EDITION

VOLUME 24

VITAMINS
TO
ZONE REFINING

A WILEY-INTERSCIENCE PUBLICATION
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J. Philip Faust, *Olin Chemicals, New Haven, Connecticut,* Water, treatment of swimming pools, spas, and hot tubs each subsequent downstream use tends to add more of these salts to the streams. Inorganic salts can cause diseases and discomforts, affect an industrial product, cause scale in pipelines and other equipment, accelerate algal growth, increase the hardness of water, and enhance metal corrosion. Inorganic salts are removed by ion exchange, selective membranes, evaporation, and certain biological treatments.

Removal of Dissolved Organic Material. Manufacture of textiles, paper, canned goods, and leather, as well as food products such as milk, cheese, and meat, yields a certain amount of dissolved organic matter, resulting in a reduction of dissolved oxygen in the watercourses (see Table 2). Because these solids are amenable to bacterial degradation, waste-treatment methods employ biological means. Activated sludge, trickling filtration, rotating biological contactors, and oxidation pond treatment are used. Activated-sludge treatment consists of aerating biological flocculent growths within the industrial wastes. Surface for biological oxidation is created on the flocculent growths. With sufficient detention time for biological reaction, ample supply of oxygen from pure oxygen or air, and a readily degradable organic matter to serve as bacterial food, activated-sludge treatment is very effective. In trickling filtration, a solid medium such as rock, plastic, or glass supplies the surface for biological oxidation. The surface must be resistant to deterioration and relatively lightweight, and allow for sufficient pore or void space for large volumes of industrial waste. Oxygen for biological oxidation derives from the void area in the medium. As the growth builds up on the medium, some sloughs off and is removed by clarification. After filtration, some seed material is usually recycled to keep the filter bed active. Both activated sludge and trickling filtration can remove 80–90% BOD. Rotating circular contactors, half immersed in wastewater at all times, build biological growths on their surfaces, oxidize organic matter, and slough off stabilized sludge. Oxidation pond treatment is less effective; it requires a large land area and a long detention time, and emanates odors unless properly designed or aerated. It is, however, not expensive to build and operate. Some ponds develop an algal growth, especially in shallow basins, which assists in providing oxygen to the bacteria as well as in removing inorganic nutrients. A reduction of 50–75% BOD can usually be obtained with these waters with a 1–3-d detention time.

Disposal of Sludge Solids. Screening, settling, flotation, biological oxidation, and coagulation all produce various quantities and types of sludges, in addition to an improved effluent. Often the immediate and continual removal and subsequent effective ultimate disposal of these sludges controls the efficiency of the entire treatment process. If these sludges tend to build up in treatment basins and are not removed, they decompose, rise, and find their way into the treatment plant effluent.

Sludge usually still contains 90–95% H_2O, which has to be removed. Filtration and sand drying beds are popular methods for concentration, although centrifugation and lagooning are also used. These processes give sludges with 15–35 wt % solids. In this form, they can be readily disposed.

Ultimate disposal can be by incineration, land fill, high temperature high pressure oxidation, fertilization of farmlands, or barging or pumping to the sea. These methods, however, often cause further pollution problems.

Sludge solids are reused in a few industries, such as in paper and tannery plants.

Joint Treatment with Municipal Sewage. It is often advantageous for an industrial manufacturing plant to deliver its entire wastewater, under control, to a municipal sewage system. Certain state and Federal legislation encourages industries to combine

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NELSON L. NEMEROW
University of Miami

EPA PO[TENTIAL HAZARDOUS WASTE SITE] IDENTIFI[CATION]

REFERENCE # 12

REGION: IV

SITE NUMBER (to be assigned by Hq): SC000010018

NOTE: This form is completed for ea[…]rities for site inspection. The information submitted on this form is based on av[…] forms as a result of additional inquiries and on-site inspections.

GENERAL INSTRUCTIONS: Complete Sections I and III through X as completely as possible before Section II (*Preliminary Assessment*). File this form in the Regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force (*EN-335*); 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME: American Color & Chemical

B. STREET (or other identifier): P.O. Box 815

C. CITY: Lobeco, S.C.

D. STATE: S.C.

E. ZIP CODE: 29931

F. COUNTY NAME: Beaufort

G. OWNER/OPERATOR (if known)

1. NAME: American Color & Chemical

2. TELEPHONE NUMBER: (803) 846-8171

H. TYPE OF OWNERSHIP

☐ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☐ 4. MUNICIPAL ☒ 5. PRIVATE ☐ 6. UNKNOWN

I. SITE DESCRIPTION: Aerated equalization and aeration basin from modified lagoon.

J. HOW IDENTIFIED (i.e., citizen's complaints, OSHA citations, etc.): [illegible]

K. DATE IDENTIFIED (mo., day, & yr.):

L. PRINCIPAL STATE CONTACT

1. NAME: Earl Williams, Division Director DHEC

2. TELEPHONE NUMBER: (803) 758-5[illegible]

II. PRELIMINARY ASSESSMENT (*complete this section last*)

A. APPARENT SERIOUSNESS OF PROBLEM

☒ 1. HIGH ☐ 2. MEDIUM ☐ 3. LOW ☐ 4. NONE ☐ 5. UNKNOWN

B. RECOMMENDATION

☐ 1. NO ACTION NEEDED (*no hazard*)

☒ 3. SITE INSPECTION NEEDED

a. TENTATIVELY SCHEDULED FOR:

b. WILL BE PERFORMED BY: E&E

☐ 2. IMMEDIATE SITE INSPECTION NEEDED

a. TENTATIVELY SCHEDULED FOR:

b. WILL BE PERFORMED BY:

☐ 4. SITE INSPECTION NEEDED (*low priority*)

C. PREPARER INFORMATION

1. NAME: B. J. Garland

2. TELEPHONE NUMBER: (404) 288-7711

3. DATE (mo., day, & yr.): 1-14-81

III. SITE INFORMATION

A. SITE STATUS

☒ 1. ACTIVE (*Those industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if infrequently.*)

☐ 2. INACTIVE (*Those sites which no longer receive wastes.*)

☐ 3. OTHER (*specify*): (*Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.*)

B. IS GENERATOR ON SITE?

☐ 1. NO ☒ 2. YES (*specify generator's four-digit SIC Code*):

C. AREA OF SITE (*in acres*)

D. IF APPARENT SERIOUSNESS OF SITE IS HIGH, SPECIFY COORDINATES

1. LATITUDE (*deg.—min.—sec.*): 32° 23'

2. LONGITUDE (*deg.—min.—sec.*): 8° 4' 40"

E. ARE THERE BUILDINGS ON THE SITE?

☐ 1. NO ☐ 2. YES (*specify*):

Continued From Front

IV. CHARACTERIZATION OF SITE ACTIVITY

Indicate the major site activity(ies) and details relating to each activity by marking 'X' in the appropriate boxes.

'X'	A. TRANSPORTER	'X'	B. STORER	'X'	C. TREATER	'X'	D. DISPOSER
	1. RAIL		1. PILE		1. FILTRATION		1. LANDFILL
	2. SHIP	X	2. SURFACE IMPOUNDMENT		2. INCINERATION		2. LANDFARM
	3. BARGE		3. DRUMS		3. VOLUME REDUCTION		3. OPEN DUMP
	4. TRUCK		4. TANK, ABOVE GROUND		4. RECYCLING/RECOVERY	X	4. SURFACE IMPOUNDMENT
	5. PIPELINE		5. TANK, BELOW GROUND		5. CHEM./PHYS. TREATMENT		5. MIDNIGHT DUMPING
	6. OTHER (specify):		6. OTHER (specify):		6. BIOLOGICAL TREATMENT		6. INCINERATION
					7. WASTE OIL REPROCESSING		7. UNDERGROUND INJECTION
					8. SOLVENT RECOVERY		8. OTHER (specify):
				X	9. OTHER (specify): aeration and equalization basin		

E. SPECIFY DETAILS OF SITE ACTIVITIES AS NEEDED Unlined industrial acid lagoon, permitted 1-10-67. Modified 11-18-77 aerated equalization basin and aeration basin. EPA identified 6 priority pollutants in waste stream, Jan. 7-14, 1978. Also high metals (Fe, Pb, Hg, Ni, Zn). Highly permeable marine sands; artesian limestone aquifer about 60' (18M) deep.

V. WASTE RELATED INFORMATION

A. WASTE TYPE

- [ ] 1. UNKNOWN
- [X] 2. LIQUID
- [ ] 3. SOLID
- [X] 4. SLUDGE
- [ ] 5. GAS

B. WASTE CHARACTERISTICS

- [ ] 1. UNKNOWN
- [X] 2. CORROSIVE
- [ ] 3. IGNITABLE
- [ ] 4. RADIOACTIVE
- [ ] 5. HIGHLY VOLATILE
- [X] 6. TOXIC
- [X] 7. REACTIVE
- [ ] 8. INERT
- [ ] 9. FLAMMABLE
- [ ] 10. OTHER (specify):

C. WASTE CATEGORIES

1. Are records of wastes available? Specify items such as manifests, inventories, etc. below.

2. Estimate the amount (*specify unit of measure*) of waste by category; mark 'X' to indicate which wastes are present.

	a. SLUDGE	b. OIL	c. SOLVENTS	d. CHEMICALS	e. SOLIDS	f. OTHER
AMOUNT	unknown		unknown		unknown	
UNIT OF MEASURE						

'X'	a. SLUDGE	'X'	b. OIL	'X'	c. SOLVENTS	'X'	d. CHEMICALS	'X'	e. SOLIDS	'X'	f. OTHER
X	(1) PAINT, PIGMENTS		(1) OILY WASTES		(1) HALOGENATED SOLVENTS	X	(1) ACIDS		(1) FLYASH		(1) LABORATORY PHARMACEUT.
X	(2) METALS SLUDGES		(2) OTHER (specify):		(2) NON-HALOGNTD. SOLVENTS		(2) PICKLING LIQUORS		(2) ASBESTOS		(2) HOSPITAL
	(3) POTW				(3) OTHER (specify):		(3) CAUSTICS		(3) MILLING/ MINE TAILINGS		(3) RADIOACTIVE
	(4) ALUMINUM SLUDGE						(4) PESTICIDES		(4) FERROUS SMLTG. WASTES		(4) MUNICIPAL
	(5) OTHER (specify):					X	(5) DYES/INKS		(5) NON-FERROUS SMLTG. WASTES		(5) OTHER (specify):
							(6) CYANIDE		(6) OTHER (specify): Pigments		
							(7) PHENOLS				
							(8) HALOGENS				
							(9) PCB				
						X	(10) METALS				
							(11) OTHER (specify)				

 Continue On Page 3

NUS
CORPORATION

TDD No. F4- 8904-54

Site Name: American Color and Chemical Venture Chemical

Your Name: Jim Miller

File Subsection (check one):

- ___ Project Plans ✓ References
- ___ Field Data Records
- ___ Reports ___ Misc.
- ___ Correspondence/Proj. Notes

Correspondence/Report No: ___

Description: state file material

"Rite in the Rain"®

ALL-WEATHER

LEVEL

Notebook No. 311

F4-1608

TDD # F4-8904-54
American Color & Chemical / Ventura Chemical
Lobeco, Beaufort Co., SC
Project Manager: James Miller

LOGBOOK REQUIREMENTS
REVISED - NOVEMBER 29, 1988

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

1. Record on front cover of the Logbook: TDD No., Site Name, Site Location, Project Manager.
2. All entries are made using ink. Draw a single line through errors. Initial and date corrections.
3. Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' signatures.
4. Record weather conditions and general site information.
5. Sign and date each page. Project Manager is to review and sign off on each logbook daily.
6. Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
7. Provide reference to Sampling Field Sheets for detailed sampling information.
8. Describe sampling locations <u>in detail</u> and document all changes from project planning documents.
9. Provide a site sketch with sample locations and photo locations.
10. Maintain photo log by completing the stamped information at the end of the logbook.
11. If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
12. Record I.D. numbers of COC and receipt for sample forms used. Also record numbers of destroyed documents.
13. Complete SMO information in the space provided.

My signature indicates that I have read and understand the work plan for American Color & Chemical/Venture Chemical in Lobeco, Beaufort County, South Carolina.

James Miller James Miller
Mark Adams Mark A. Adams

All equipment used on this site is identified in the Equipment Location Log for TDD # F4-8904-54 and will be retained in the project file.

1130 We are going to the Lobeco Company's Carolina Cove Office on Highway 21 to return their copies of the November 1986 G&E report and the September 1988 RMT report.

James Miller (J.M.) 04/13/89

000001

J.M.
09/13/89 ~~to plant employees: the north production will and the east production will. The water~~

to plant employees: the north production will and the east production will. The water obtained from these wells is mixed, treated, and then distributed throughout the plant.

- How deep are the wells? Greater than 250 feet.

- How many workers are currently employed at the Lobeco plant? Seventy-five.

1215 We are going to pick-up city maps at the Chamber of Commerce.

000003

J.M. 09/13/89

000004

1300 We are eating lunch and we are going to spend the rest of the day obtaining public drinking water information.

1400 Dyke Spencer, from the Beaufort-Jasper Water Authority (BJWA), is showing us where municipal and county hookups are in the area. I showed him the 4-mile radius map, and a map of water lines he had previously drawn for nearby Beaufort County Landfill. Mr. Spencer stated that there were no more water lines in my study area. I asked him about the source for BJWA. He said that BJWA obtains their water from several surface water intakes along an intake canal on the Savannah river. The intake canal is located 21.5 miles from the site. Also, Mr. Spencer indicated that there is currently no hookups for the Marine Corps Air Station located on

G. M. 04/13/89

000005

the south side of the study area. They obtain their water from deep wells.

G. M. 04/13/89

000005

0930 We are reviewing and copying file material at the DHEC office.

1215 We are eating lunch.

1530 We are driving back to the site to finish the well survey. The weather is sunny and the temperature is in the high-70's.

1550 There are no land-related sensitive environments such as national or state wildlife refuges, national monuments, or national parks within 4 miles of this site. Also, there are no day care centers located onsite or in close proximity. The nearest school is James Davis Elementary, and this is shown on the topographic quadrangle maps that cover the area.

J.M. 09/15/89

000011

NUS CORPORATION AND SUI REFERENCE # 14 *TELECON NOTE*

CONTROL NO. F4-8904-54	**DATE:** February 8, 1990	**TIME:** 1335
DISTRIBUTION: American Color and Chemical/Venture Chemical File		
BETWEEN: Mr. Darryl Owens	**OF:** James Davis Elementary	**PHONE:** (803) 846-8311
AND: James Miller, NUS Corporation J.M.		

DISCUSSION:

Called Darryl Owens, the Attendants Clerk at James Davis Elementary, and asked about the student population for this school. Mr. Owens stated that there are currently 436 students attending this school.

NUS 067 REVISED 0685

Reference #15

THE GROUND-WATER RESOURCES OF BEAUFORT, COLLETON, HAMPTON, AND JASPER COUNTIES SOUTH CAROLINA

By
Larry R. Hayes

SOUTH CAROLINA
WATER RESOURCES COMMISSION

REPORT NUMBER 9

1979

#7

The Ground-Water Resources of Beaufort, Colleton, Hampton and Jasper Counties, South Carolina

by

Larry R. Hayes
Hydrologist

U. S. Geological Survey
Water Resources Division

Prepared by
U. S. Geological Survey
in cooperation with
South Carolina Water Resources Commission
Columbia, South Carolina

1979

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The Ground-Water Resources of Beaufort, Colleton, Hampton and Jasper Counties, South Carolina

by

Larry R. Hayes

ABSTRACT

In 1976, Beaufort, Colleton, Hampton, and Jasper Counties used an estimated 7.6 billion gallons of ground water, with about 6.2 billion gallons coming from the principal artesian aquifer. Southwest of the study area the city of Savannah, Georgia and nearby industries pump 75 Mgal/d (million gallons per day) from the principal artesian aquifer. As a result of these withdrawals, water level declines of 20 to about 100 feet have occurred.

With the exception of the Savannah River, the surface water in Beaufort and Jasper Counties is generally too salty for human consumption. In Hampton and Colleton Counties fresh surface water is available but it is not used to any significant extent. The Beaufort-Jasper Water Authority supplies about 5 Mgal/d of treated Savannah River water to the military installations in Beaufort, the residents of the Beaufort-Port Royal area, and some of the residents of Ladies Island.

Sedimentary rocks, ranging in age from Late Crétaceous to Holocene and ranging in thickness from about 2,500 feet in the northern part to about 3,500 feet in the southern part of the study area, store and supply all the ground water used in the area.

Rocks of Tertiary age, consisting of the Black Mingo Formation, Santee Limestone, Cooper Marl, and Hawthorn Formation, are the chief sources of ground-water supplies in the study area. The Black Mingo aquifer is a source of 50 to 250 gal/min (gallons per minute) of good quality water in Colleton and Hampton Counties, but is not used in Beaufort or Jasper Counties.

The Santee Limestone and lower part of the Cooper Marl form the principal artesian aquifer and furnish most of the ground water used in the area.

The principal artesian aquifer is divided into (1) an upper permeable zone, which furnishes about 75 percent of the water pumped from this aquifer in Hampton County and nearly all of the water pumped from this aquifer in Beaufort and Jasper Counties; (2) a middle zone of relatively low permeability, which yields small amounts of water to wells in Hampton and Colleton Counties; and (3) a lower permeable zone, which provides most of the water pumped from this aquifer in Colleton County.

The average transmissivity of the upper permeable zone ranges from about 10,000 ft^2/d (square feet per day) to about 50,000 ft^2/d. The transmissivity of the lower permeable zone ranges from about 500 ft^2/d to about 5,000 ft^2/d. The transmissivity of both zones decreases to the north and east. Yields of wells open to the principal artesian aquifer range from about 50 gal/min to about 2,500 gal/min. Except where saltwater contamination occurs, water from the principal artesian aquifer is usually of good quality. Saltwater contamination of the principal artesian aquifer is usually of good quality occurs from two sources: (1) sea water entering the aquifer through breaks or in areas of relatively high permeability in the overlying confining bed and (2) conate salty water present in underlying formations and in the lower two zones of the aquifer moving upward into the upper permeability zone.

Water containing more than 1,500 mg/L (milligrams per liter) of chloride is present throughout the aquifer at Parris Island, Fripp Island, Edisto Beach, and probably other small sea islands southeast of Beaufort. Salty water is present in the middle and lower permeable zones of the principal artesian aquifer in Beaufort County, in southern Colleton County, and maybe in southern Jasper County.

Water containing about 50 mg/L of chloride is present in the upper permeable zone of the principal artesian aquifer at Hilton Head Island. Salty water is moving laterally toward Hilton Head Island from the northeast and east and vertically upward from the middle and lower permeable zones. Estimates of the rate of salt-water movement towards Hilton Head Island range from 140 to 360 ft/yr (feet per year).

The upper and lower sections of the Hawthorn Formation act as confining beds. The middle section of the Hawthorn is a fairly persistent, sandy, dolomitic limestone (Hawthorn aquifer) and is a source of 50 to 200 gal/min of fairly good quality water in western Beaufort County and in Jasper County.

INTRODUCTION

Ground water is used throughout Beaufort, Colleton, Hampton, and Jasper Counties for domestic, public, agricultural, and industrial purposes. While ground water of sufficient quality and quantity is available almost everywhere in this area, previous investigations have shown that progressive lowering of water levels, impairment of quality, and decrease of quantity in some areas have raised concern that over-pumping or improper development might be depleting the aquifers and aggravating the saltwater contamination problem.

The Ground Water Use Act of 1969 [Section 4.(a)] requires that: "The South Carolina Water Resources Commission (SCWRC) upon the request of a county, municipality or other political subdivision of State government, may declare and delineate from time to time, and may modify, capacity use areas of the State where it finds that the use of ground water requires coordination and limited regulation for protection of the interest and rights of residents or property owners of such areas or of the public interest." Prior to declaring a capacity use area, the act requires that an investigation be made to determine if the water problems are significant enough to warrant such an action.

The implementation of such a study was requested by the public officials of Beaufort, Colleton, Hampton, and Jasper Counties. These officials believed that present as well as projected use and development of the ground-water resources had reached a point where assessment and management were necessary. They also believed that a properly designed and implemented ground-water investigation was needed to determine what must be done to insure the availability of water of sufficient quantity and quality for meeting increasing water demands. The SCWRC agreed that a comprehensive ground-water investigation was needed and asked the U.S. Geological Survey to participate in a cooperative study as a part of the Survey's nationwide interest in coastal aquifers.

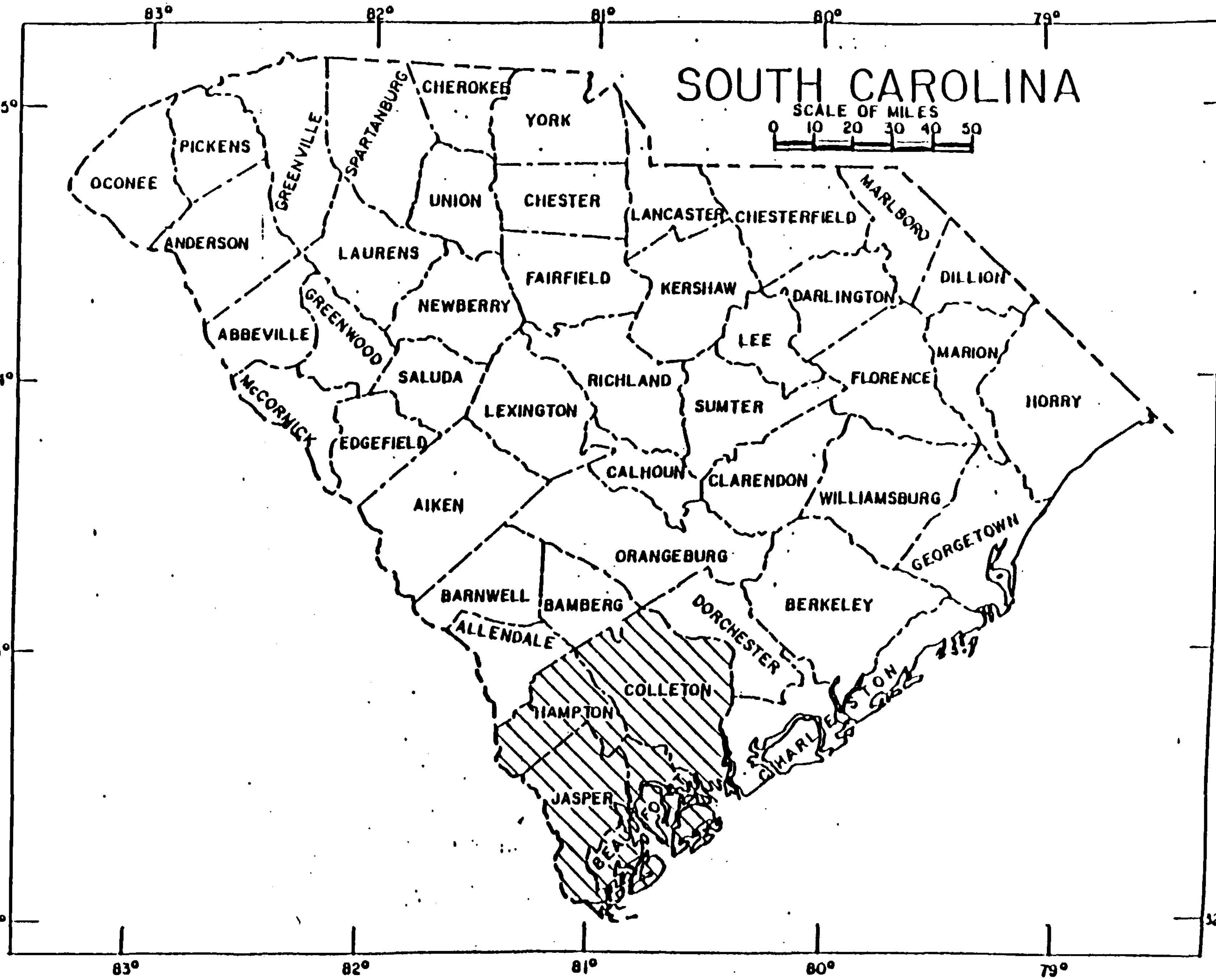

Figure 11. Area of investigation

ACKNOWLEDGMENTS

The author is greatly indebted to representatives of industries, to the well owners, and to water well contractors for their cooperation in supplying information on their ground-water developments and water use. Special thanks is due to Mr. Robert Glover, Hilton Head Plantation, for the lease of a plot of land upon which to drill test wells Bft 786, Bft 787, and Bft 788. Thanks also is due to the officials of Beaufort, Colleton, Hampton, and Jasper Counties as well as the staff of the Lowcountry Council of Governments for their help with this investigation. The assistance provided by South Carolina Development Board, Division of Geology, Shell Oil Co. and Texaco Oil Co. in describing the paleontology and lithology of drill cuttings is greatly appreciated.

A very special note of thanks is due to Louis Nexsen, Larry Drolet, Camille Ransom, Daisy Sammons, and B. C. Spigner, SCWRC, for their valuable assistance with all phases of the study.

GEOGRAPHY

CLIMATE

The climate of the study area is subtropical with hot and humid summers and mild winters. These climatic conditions contribute to a long growing season that, when coupled with the availability of rich land and considerable rain, makes the area agriculturally active. The average length of the freeze-free period is about 280 days.

Maximum temperatures range from 95° to 100°F during July and August; minimum temperatures occasionally range from 20° to 30°F during December, January, and February. The average annual temperature was 65° to 66°F for the period 1972 to 1976 (table 1 and fig. 2). The average annual precipitation for the period of 1972 to 1976 was 50 inches. Precipitation is well distributed; the largest amounts of precipitation occur during June, July and August (fig. 3) primarily as a result of thunderstorm and shower activity.

PHYSIOGRAPHY

The South Carolina Coastal Plain, which lies in the central part of the Atlantic Coastal States, is divided into three regional belts. These belts are roughly parallel to the Atlantic Ocean, extending from the Fall Line to the Atlantic Ocean. The study area lies within the Lower Coastal Plain which is characterized by a series of terraces, ranging from sea level to about 270 feet above sea level. These terraces are highly dissected by numerous streams and contain many shallow depressions. In the study area these depressions may be sinkholes caused either by solution of underlying limestone or by surficial irregularities

Table 1. Average monthly and annual temperature (°F) at Beaufort, Hampton, Hilton Head, Ridgeland, Walterboro, and Yemassee, 1972-76.

Month	Beaufort	Hampton	Hilton Head	Ridgeland	Walterboro	Yemassee
January	54.3	52.8	54.7	52.5	52.1	53.0
February	52.9	52.8	52.2	52.1	50.6	52.3
March	60.1	61.2	60.4	60.5	60.5	60.4
April	64.4	64.7	63.8	62.3	63.7	63.9
May	73.1	71.9	72.0	71.5	71.4	70.5
June	77.3	76.5	76.3	76.2	76.1	76.8
July	81.0	80.2	79.7	79.3	79.7	80.2
August	80.7	79.4	79.2	78.8	79.4	80.0
September	77.2	75.6	76.2	75.2	75.6	75.3
October	66.6	64.1	66.4	65.2	65.0	64.6
November	57.3	56.0	57.3	56.3	55.9	53.5
December	52.1	51.2	51.8	50.4	50.1	50.5
Average Annual	66.4	65.5	65.8	65.0	65.0	65.3

"Modified from" U. S. National Weather Service National Oceanic and Atmospheric Administration, 1977, Climatological Summary for South Carolina.

that were formed on the floor of the ocean or in the shallow water of tidal marshes when the sea stood at a higher level.

Much of the study area is characterized by low flatland inundated with water; by numerous streams, rivers, marshes and lakes; and by moss covered woodland. The area is relatively isolated and is sparsely settled. Transportation within the region is severely restricted by marshes and waterways that impede rapid access from outside of the region. Of the 69 islands in Beaufort County, 20 are inhabited, 18 of which are accessible by bridges or causeways.

POPULATION AND ECONOMY

The Lowcountry area is the least populated region of South Carolina. The 1970 population of 106,521 persons ranked the area lowest in population density with 37.2 persons per square mile. The study area was classified as 32.6 percent urban in 1970. With the exception of Beaufort County, the population of the area has not changed significantly in this century (fig. 4).

Beaufort County is 637 square miles in size and contains four incorporated communities and ten small unincorporated communities. The incorporated area of Beaufort and Port Royal, with a combined population of over 12,000, has the highest population density and the largest industrial and business concentration in the study area. The unincorporated Hilton Head Island resort community, with a 1976 population of about 8,000 persons, is the next largest urban area in Beaufort County.

Colleton County, covering more than 1,000 square miles, is the largest county in the study area. Five incorporated towns and eleven small unincorporated communities are located in the county. With the exception of Walterboro, which has a population of 7,500, the towns are small and rural in nature with less than 500 persons in each.

Hampton County has an area of 562 square miles and contains 15 small towns and communities. The largest town is Hampton, the county seat, with a population of about 3,000 persons.

Jasper County has an area of 662 square miles and contains two small towns, Ridgeland and Hardeeville, and seven community settlements. The town of Ridgeland, the county seat, has only about 1,200 persons. Jasper County is the only county within the study area that is classified as 100 percent rural.

The study area has the lowest average per capita personal income in the state. The largest employment segment in 1970 was federal and local government with 7,130 employees (table 2). From 1965 to 1970, the fastest employment growth in absolute terms was government with 1,600 new positions.

Agricultural employment in the study area is at its lowest level since before the turn of the century and is expected to decline even more in the future (South Carolina Employment Security Commission, 1971). Nevertheless income derived from farm products is still substantial to the economy of the area since total farm income is increasing as a result of improved farming methods and higher prices for products sold. Income from agriculture was up 51.4 percent in 1970 over 1964 (table 5).

Table 5. Value of all farm products of the study area.

VALUE ADDED BY FARM PRODUCTS ($000)

	Value all farm products sold		Value all crops sold		Value all livestock products sold		Percentage change all farm products sold
	1964	1970	1964	1970	1964	1970	
Beaufort	4,778	7,330	3,776	5,569	924	1,761	53.4
Colleton	4,528	7,408	2,735	3,497	1,783	3,911	63.6
Hampton	6,056	8,073	4,512	4,929	1,540	3,144	33.3
Jasper	1,512	2,740	796	1,390	706	1,350	81.2
TOTAL	16,874	25,551	11,819	15,385	4,953	10,166	51.4

Source: U. S. Department of Commerce, 1964 Census of Agriculture, and Department of Agricultural Economics, S. C. Agricultural Experiment Station, Clemson University in Cooperation with U. S. Department of Agriculture, South Carolina, Cash Receipts From Farm Marketing, 1971.

Income from livestock products was up 105.2 percent during this six-year period and value added by crops sold was up only 30 percent. If past trends hold up, the study area's farm economy will soon be dominated by livestock products as opposed to the current domination of crop products.

Soybeans, the biggest money crop in the area, accounted for 36.2 percent of all crop sales in 1970, followed by the production of vegetables at 22.6 percent. Forest products, peaches, corn, tobacco, and cotton account for 9.8, 5.6, 5.0, 4.0, and 2.9 percent of crop sales, respectively.

quality and quantity for domestic or small agricultrual and industrial needs. The yield and quality vary considerably from place to place. Water from these formations may be hard and may contain high concentrations of iron and hydrogen sulfide. Near the coast or saltwater estuaries, water from these deposits may be salty.

HYDROGEOLOGY OF THE PRINCIPAL ARTESIAN AQUIFER

Underlying the study area is an artesian aquifer composed of a series of limestones ranging from Eocene to Oligocene in age. This aquifer extends into southeastern Georgia, Florida, and adjacent parts of Alabama. The aquifer is referred to as the Ocala or principal artesian aquifer in Georgia, as the Floridan aquifer in Florida, and as the principal artesian aquifer in South Carolina.

In the Lowcountry area, the principal artesian aquifer ranges in thickness from less than 400 feet to more than 1,000 feet. The uppermost section of the underlying Black Mingo Formation (which consists of fine, white to yellow sand and red to brown, sandy clay) acts as the lower confining bed. The upper Oligocene (?) section consisting of sandy, calcareous, phosphatic clay and the lower Miocene section consisting of fine, sandy, greenish clay together act as the upper confining bed. The upper confining bed varies in thickness from zero to more than 50 feet. In parts of southern Beaufort County where the upper confining bed is absent, the Hawthorn aquifer is contiguous and hydraulically connected to the principal artesian aquifer.

WATER YIELDING ZONES

The principal artesian aquifer is divided into an upper permeable zone, a middle zone of relatively low yield, and a lower permeable zone. Geohydrologic sections AA' and BB' (fig. 7), CC' (fig. 8), and DD' (fig. 9) show the top of the principal artesian aquifer and the stratigraphic positions of the upper and lower permeable zones. These zones were determined on the basis of lithology, geophysical response, aquifer tests, and current meter tests. The permeable zones as defined herein include all the smaller zones of different yields and no attempt has been made to delineate them. All the smaller wateryielding zones have been combined into one relatively high wateryielding section or "permeable zone."

The upper permeable zone consists of white to light-gray calcitized, indurated, very fossiliferous limestone and varies considerably in thickness and lateral extent. It is more than 200 feet thick in southern Jasper County and western Beaufort County and thins toward the north and northeast, pinching out near the Beaufort-Colleton County line (figs. 7, 8, and 9). The upper permeable zone is very thin in eastern Beaufort County over the Beaufort arch where the top of the principal artesian aquifer is within 25 feet of land surface (figs. 7 and 8). Throughout

Beaufort and Jasper Counties and much of Hampton County, the upper permeable zone of the principal artesian aquifer is the primary source of ground water.

The upper permeable zone is separated from the lower permeable zone by a middle zone of low permeability, consisting of a soft, sandy, clayey limestone ranging in thickness from 200 feet or less in the northwestern part of the study area to more than 700 feet in the southeastern part of the study area (figs. 8 and 9).

The lower permeable zone consists of an indurated, siliceous, slightly-glauconitic, light-gray to creamy-yellow limestone. It ranges in thickness from less than 30 feet in parts of Beaufort County to more than 90 feet in Colleton and Hampton Counties (fig. 8 and 9). This lower permeability zone is the primary source of ground water in Colleton County (except for the city of Walterboro, which obtains water from the Black Creek and Middendorf aquifers) and in northeastern Hampton County, where the upper permeable zone is missing or is very thin.

Eight wells in Beaufort County are known to be open to both the lower and the upper permeable zones. No wells have been found in Jasper County that penetrate below the upper permeable zone; consequently the extent, thickness, and water-bearing characteristics of the lower permeable zone is unknown in Jasper County.

A map showing the top of the principal artesian aquifer in the area was constructed using natural gamma radiation, electric, and lithologic logs (fig. 10). Point C, shown in figure 6, represents the top of the principal artesian aquifer. This point is the top of the water-yielding Oligocene section of the principal artesian aquifer and in most cases the top of the upper permeable zone. The top of the principal artesian aquifer is a highly irregular surface that ranges from less than 20 feet below msl in the Beaufort arch to more than 200 feet below msl in the Ridgeland Trough (fig. 10).

The irregular surface of the top of the principal artesian aquifer may reflect solution occurring as a result of advance and recessions of the Pleistocene Sea. During Pleistocene time when the sea level was much lower than now, the land area extended to the edge of the Continental Shelf and the upper Tertiary sediments were above sea level. At this time, solution cavities and sinkholes were probably formed in the limestone. Numerous circular depressions in the topography of the Beaufort area appear to be the result of settling of sediment filled sinkholes.

HYDRAULIC PROPERTIES

Ground-water hydraulics is concerned with the natural or induced movement of water through permeable formations. Knowledge of the geologic framework and of the hydraulic properties of the formation

Beaufort County accounts for over 75 percent of the total ground-water withdrawal from the principal artesian aquifer in the Lowcountry, with Hilton Head Island accounting for over half of the ground water used in Beaufort County.

Ground-water use in Beaufort County is predominately concentrated in the eastern part of the county and on Hilton Head Island, with golf courses and crop irrigation accounting for over half of the ground water used. Golf course irrigation is heaviest from March through October, and crop irrigation takes place almost exclusively in the months of May, June, September, and October.

The estimated 1976 withdrawal of 650 Mgal in Jasper County was primarily for rural domestic use and for public-supply use in Ridgeland and Hardeeville. Ground-water use in Hampton County is almost equally divided between rural domestic, public supply, and stock use. In Colleton County the largest pumping center is at Walterboro, which pumps about 150 Mgal/yr for public supply and industrial use.

The Savannah area, which includes the City of Savannah and nearby industries, is the largest user of ground water from the principal artesian aquifer in this part of the Coastal Plain area. According to Counts and Krause (1976) the Savannah area pumped an average of 75 Mgal/d in 1970.

POTENTIOMETRIC SURFACE AND GROUND-WATER FLOW

In an artesian aquifer, ground water is always under pressure and moves from points of higher hydraulic pressure to points of lower hydraulic pressure. The rate of movement of water between two points depends upon the hydraulic conductivity and porosity of the aquifer, upon the viscosity of the water, and upon the difference in head pressure between the two points. The slope of the water surface or head change between the two points, generally expressed in feet per mile, is called the hydraulic gradient. By contouring or connecting the heights of measured water levels in feet above or below a common datum in wells tapping an artesian aquifer an imaginary surface is developed which indicates the height to which water will rise in tightly cased wells open only to that particular artesian aquifer.

Before withdrawal of large amounts of water from the principal artesian aquifer, the potentiometric surface was controlled mainly by the hydraulic characteristics of the aquifer and the overlying and underlying confining beds, by the topography and altitude of the outcrop areas, and by natural recharge and discharge. The potentiometric map of 1880 constructed by Warren (1944, p. 26) showed an easterly hydraulic gradient of about 1 ft/mi, with natural discharge occurring in the Port Royal Sound and Parris Island area.

While the potentiometric contour map may be used to determine the general direction of ground-water flow, the actual movement of a single water molecule is very complex and may differ considerably from that which is implied by the two dimensional potentiometric map. The actual flow of ground water is three dimensional and is affected not only by hydraulic gradient but also by changes in aquifer characteristics (such as permeability, porosity, and thickness) and by boundary effects between fluids of different densities (such as a freshwater-saltwater interface). Furthermore, flow characteristics in a limestone aquifer vary widely depending upon the hydrogeologic characteristics of the aquifer.

White (1969) proposed a three part classification of carbonate aquifers based upon recognizable physical features: (1) a diffuse-flow aquifer in which the carbonate rocks have been affected the least by solutional modification; (2) a free-flow aquifer in which ground-water flow paths have been localized by solutional modification into well integrated systems of conduits; and (3) a confined-flow aquifer in which geologic boundaries are the flow-limiting factors rather than hydraulics. Ground-water movement through the diffused-flow system is analagous to flow in a homogeneous aquifer and more nearly follows the "basic" assumptions upon which ground-water flow equations are based. In a free-flow system, flow occurs in distinct conduits or channels while nearby rock may have little porosity or permeability. Flows in these conduits often have high velocities and may be turbulent.

The principal artesian aquifer generally functions as a confined diffuse-flow aquifer. Consequently, flow equations that assume laminar flow in an isotropic and homogeneous medium cannot be rigorously applied to the principal artesian aquifer. Nevertheless, if the limitations of basic flow equations as regards a particular set of geohydrologic conditions are considered, these flow equations and potentiometric maps may be used to indicate the general direction and average velocity of ground-water flow.

Calculations of the average velocity of ground-water movement indicate that water moves very slowly in the principal artesian aquifer. The average velocity of ground-water flow may be computed by the following equation:

$$\bar{v} = \frac{-K\ dh/dl}{\theta} \qquad \text{(Lohman, 1972)}$$

where:

$\bar{v}$ = average velocity, in feet per day
K = hydraulic conductivity, in feet per day
dh/dl = change in head with respect to change in distance, in feet per foot
θ = porosity, as a decimal fraction
\- = the minus sign indicates that flow is in direction of decreasing head

The potentiometric map of December 1976 (fig. 19) is similar to Siple's map of June 1959 with the exceptions: (1) the cone of depression centered at the Burton Well Field is absent; (2) the potentiometric high at the Marine Corps Air Station has changed in shape and increased in size; (3) the regional zero potentiometric contour has moved about three miles to the northeast; and, (4) a small but relatively deep cone of depression is present southeast of Lobeco.

The cone of depression that was present in the vicinity of the Burton Well Field in 1959 is no longer present because the pumpage in this area ceased almost entirely when the U.S. Marine Corps facilities at Parris Island, the Marine Corps Air Station, and Capehart Housing changed from ground-water to surface-water use in January 1965. The regional zero contour has moved to the northeast as a result of increased pumpage at Hilton Head and Savannah, and has been accompanied by a gradual steepening of the slope of the potentiometric surface toward Savannah and of a gradual increase in the size of the cone of depression. The small but relatively deep cone of depression near Lobeco occurs as a result of large withdrawals (about 500,000 gal/d) from two closely spaced wells where the principal artesian aquifer has a relatively low transmissivity (less than 5,000 ft^2/d).

Since 1880, the potentiometric surface in the area east and southeast of Burton (which includes Beaufort, Ladies Island, St. Helena Island, and numerous small sea islands) has shown little change, with water levels generally ranging between zero and 5 feet above msl. This suggests that recharge has been balanced by discharge for some time. It also suggests that, since very little pumping was taking place in this vicinity before the 1960's, natural discharge from the aquifer must have taken place through breaks in the confining bed or in regions where the hydraulic conductivity of the confining bed is relatively high. Evidence of this is shown by test drilling at Brickyard Point on the northern end of Ladies Island. Also, numerous wells in the vicinity of Brickyard Point and near the estuaries separating the sea islands contain salty water (fig. 22). This salty water is probably entering the aquifer where the confining bed is either thin or missing, and pumping has locally reduced the potentiometric surface below msl.

WATER QUALITY

The quality of ground water is largely controlled by the soluble minerals of the aquifer. Materials lying above or below the aquifer may also contribute dissolved substances. The concentrations of dissolved substances generally increase with greater depths and greater distances from recharge areas.

Ground water is generally more highly mineralized than surface water because of the relatively slow movement of ground water and because of its more intimate contact with soluble minerals. Surface water always contains some suspended inorganic sediment and varying amounts of organic

A main conclusion of this study concerning the saltwater encroachment in the upper permeable zone of the principal artesian aquifer is that the contamination at Hilton Head and Parris Island results primarily from ocean water entering the aquifer. If this conclusion is correct, analyses of aquifer water showing different degrees of contamination plotted on the trilinear diagram should generally not deviate too far from the predicted theoretical positon, or if they do deviate, these deviations should be explainable.

Points 2, 3, 4, 11, 12, and 13 fall reasonably close to a straight line plot (line A-B, fig. 28) and indicate a simple mixture of water from the upper permeable zone and water from Port Royal Sound. Points 1, 5, 9, and 10 fall somewhat above line A-B and points 6, 7, and 8 fall below line A-B.

Point 1 represents an analysis of water from a well in an area receiving local recharge from the overlying water table aquifer. Point 5 represents a water analysis from a well showing contamination, in part, from the vertical movement of salty water from below. Points 9 and 10 represent analyses of water from wells that are near the saltwater recharge areas underlying Battery Creek. Point 6 represents an analysis of water from a well that is open to the middle zone of the aquifer immediately underlying the upper permeable zone, and point 8 represents an analysis of water from a well that is receiving recharge from Coosaw River and from the overlying water table. Point 7 represents the typical sodium-bicarbonate type water from the Middendorf aquifer at Parris Island. None of these points represents a simple mixture of water from the upper permeable zone and water from Port Royal Sound. Consequently the points deviate from line A-B.

Analyses of water quality data plotted on the trilinear diagram does in part support the conclusion that saltwater contamination in the upper permeable zone of the principal artesian aquifer primarily results from a mixing of ocean water with aquifer water. However, the plotted data also indicate that in some cases the source of the salty water is not simply modern ocean water or else that there has been alteration of the chemical quality of the mixture of modern ocean water and aquifer water by ion exchange.

SUMMARY AND CONCLUSIONS

The Lowcountry area is characterized by low flat land, much of which is inundated with water; by numerous streams, rivers, marshes and lakes; and by moss covered woodland. It is relatively isolated and sparsely settled. Average per capita personal income is the lowest in the State.

Water in quantities adequate for most domestic, public-supply, and agricultural needs is generally available from one or more aquifers. In 1976 Beaufort, Colleton, Hampton, and Jasper Counties used an estimated

7,600 Mgal of ground water. About 6,200 Mgal or 82 percent of the ground water used by these four counties came from the principal artesian aquifer. Of this water, about 77 percent or 4,800 Mgal were used in Beaufort County, with Hilton Head Island accounting for about 64 percent of the water use in Beaufort County. Golf course and crop irrigation accounted for over half of the water usage from the principal artesian aquifer. To the southwest of the study area, the City of Savannah, Georgia and industries in the Savannah area pump more than 25,000 Mgal/yr from the principal artesian aquifer.

As a result of the large ground water use in Savannah, water-level declines of more than 100 feet have occurred in the extreme southwestern tip of Jasper County. Throughout most of Jasper County and western Beaufort County, the decline has been more than 20 feet. In Hampton County and eastern Beaufort County, the decline generally has been less than 10 feet; around Walterboro, Colleton County, declines of 10 to 30 feet have occurred; declines in the rest of Colleton County are less than 10 feet.

Surface water is abundant throughout the area, but in Beaufort and Jasper Counties (with the exception of the Savannah River) this surface water is generally too salty for human consumption. In Hampton and Colleton Counties fresh surface water is available but is not used to any significant extent. The Beaufort-Jasper Water Authority supplies the military installations in Beaufort, the Beaufort-Port Royal area, and some residents of Ladies Island with treated surface water from the Savannah River.

Underlying the study area are a series of unconsolidated and semi-consolidated sedimentary rocks ranging in age from Late Cretateous to Holocene. These rocks, which range in thickness from less than 2,500 feet in the northern part to more than 3,500 feet in the southern part of the study area, store and transmit all the ground water used in the area.

The oldest penetrated rocks in the study area were formed during Late Cretaceous time. These Upper Cretaceous deposits are, in ascending order, the Middendorf Formation (equivalent to and locally known as the Tuscaloosa Formation), the Black Creek Formation, and the Peedee Formation. No wells have penetrated the Upper Cretaceous section in Hampton and Jasper Counties. Consequently, the geohydrology of the Cretaceous rocks is unknown in these two counties.

Walterboro, Colleton County has two wells open to the upper part of the Middendorf Formation that have natural flows at the land surface of 1,200 gal/min and 1,400 gal/min of high quality water. Wells open to the Middendorf Formation at Parris Island, Hilton Head Island, and Fripp Island have natural flows at land surface of about 75 gal/min of highly mineralized water that has a temperature of around 38°C.

Although the Black Creek Formation is a productive aquifer in other parts of the state, its potential as an aquifer in the study area is unknown. A water sample taken during drilling of well 3ft 457 contained 1,100 mg/L of chloride. While it appears unlikely that this formation will yield significant quantities of freshwater in Beaufort County and possibly Jasper County, the Black Creek Formation may be capable of yielding large quantities of good quality water in Colleton and Hampton Counties.

The Peedee Formation is an important aquifer in Georgetown and Horry Counties, but does not appear to be of significant value as an aquifer in the study area.

The Tertiary System consists, in ascending order, of the Black Mingo Formation of Paleocene and Early Eocene (Wilcox) age, the Santee Limestone of Middle and Late Eocene (Claiborne and Jackson) age, the Cooper Marl of late Eocene and Oligocene age, the Hawthorn Formation of Miocene age, and the Duplin Marl of Pliocene age. The Tertiary formations are the chief sources of ground-water supplies in the study area.

The Black Mingo aquifer is a source of moderate quantities of good quality water in Colleton and Hampton Counties. Wells open to this aquifer in these counties have natural flows of 50-250 gal/min at land surface. The water-bearing characteristics of this formation are unknown in Jasper County. In Beaufort County the Black Mingo Formation is unlikely to yield large quantities of fresh water.

The Santee Limestone is part of the principal artesian aquifer and furnishes much of the ground water used in the area. Except where salt-water contamination has taken place, the Santee Limestone is capable of yielding from 200 to more than 2,000 gal/min of good quality water.

In Colleton County and in parts of northeastern Hampton County, the Cooper Marl is not used extensively as an quifer. In much of Hampton, Beaufort and Jasper Counties, however, the lower part of the Cooper Marl is considered to be part of the principal artesian aquifer and capable of yielding more than 200 gal/min of good quality water.

The upper and lower sections of the Hawthorn Formation act as confining beds. The middle section of the Hawthorn is a fairly persistent, sandy, dolomitic limestone (Hawthorn aquifer) and is a source of 50 to 200 gal/min of good quality water in western Beaufort County and in Jasper County.

The water-bearing characteristics of the Pliocene to Holocene deposits are not known. Wells tapping the Pliocene-Holocene deposits are reported to yield water of acceptable quality and quantity for domestic or small agricultural and industrial need. The yield and quality vary considerably from place to place. Water from these formations may be hard and contain high concentrations of iron and hydrogen sulfide. Near the coast or saltwater estuaries, water from these deposits may be salty.

About 82 percent of the ground water used comes from the principal artesian aquifer, which is composed mainly of rocks of the Santee Limestone and lower part of the Cooper Marl. The principal artesian aquifer is divided into three zones: (1) the upper permeable zone, which furnishes most of the water pumped from the aquifer in Hampton County and almost all of the water pumped from the aquifer in Beaufort and Jasper Counties; (2) a middle zone of relatively low hydraulic conductivity, which yields small amounts of water to wells; and (3) the lower permeable zone, which provides about all of the water pumped from the aquifer in Colleton County.

Aquifer tests show that, in general, transmissivities of the principal artesian aquifer decrease to the north and northeast and increase toward the southwest. Transmissivities range from about 30,000 ft^2/d to 50,000 ft^2/d west of Broad River and range from about 2,000 ft^2/d to 15,000 ft^2/d east of Broad River.

The average transmissivity of the upper permeable zone of the principal artesian aquifer in western Beaufort County and southern Jasper County is about 50,000 ft^2/d; in eastern Beaufort County the average transmissivity is probably less than 10,000 ft^2/d.

The transmissivity of the upper permeable zone in northern Jasper County and southwestern and southeastern Hampton County ranges from 10,000 ft^2/d to 30,000 ft^2/d, with transmissivity decreasing to the northeast and east.

The transmissivity of the lower permeable zone of the principal artesian aquifer in northern Colleton County and northeastern Hampton County ranges from 5,000 ft^2/d to as low as 500 ft^2/d, with transmissivity generally decreasing to the north. The average transmissivity of the lower permeable zone of the principal artesian aquifer in southern Colleton County is estimated to be 5,000 ft^2/d.

The coefficient of storage of the principal artesian aquifer ranges from 3×10^{-5} to 3×10^{-3}. The higher values generally occur where the overlying confining material is thin or relatively permeable, allowing leakage into the principal artesian aquifer from the overlying Hawthorn aquifer. Consequently the higher storage values are apparent values and should be considered as upper limit figures only, and subject to considerable error.

Yields of wells open to the principal artesian aquifer vary from less than 50 gal/min to more than 2,500 gal/min. The specific capacities of wells in the study area range from more than 250 (gal/min)/ft) at Hilton Head Island to less than 5 (gal/min)/ft) in Colleton County.

It is estimated that about 40 Mgal/day of recharge enters the principal artesian aquifer in the outcrop area 30 to 40 miles to the west and northwest of the study area. Approximately 5 to 10 Mgal/day of recharge is believed to be entering the principal artesian aquifer within the boundaries of the study area by leakage through overlying or underlying confining beds.

Water from the principal artesian aquifer is generally of suitable quality for most uses. In Beaufort County, however, the chloride concentration usually ranges between 25 to 75 mg/L and in more seriously contaminated areas may range from 500 to more than 5,000 mg/L.

Saltwater contamination is believed to be occurring from two sources: (1) sea water entering the aquifer through breaks in, or in areas of relatively high hydraulic conductivity of, the overlying confining material and (2) unflushed salty water in the lower part of the aquifer moving upward into the upper permeable zone. Saltwater contamination has also occurred as a result of the movement of saltwater into defective or improperly cased wells located near saltwater bodies.

Analyses of water quality data suggest that saltwater contamination in the upper permeable zone of the principal artesian aquifer primarily results from a mixing of modern ocean water with aquifer water. However, the data also indicate that in some cases contamination results from a source of salty water other than modern ocean water or else that there has been alteration of the chemical quality of the aquifer water by ion exchange.

Water containing more than 1,500 mg/L of chloride is present throughout the aquifer at Parris Island, Fripp Island, Edisto Beach, and probably other small sea islands southeast of Beaufort. Salty water is present in the lower part of the principal artesian aquifer in Beaufort County, in southern Colleton County, and probably in southern Jasper County.

Slightly salty water (chloride concentration generally between 50 and 100 mg/L) is present in the upper part of the principal artesian aquifer at Hilton Head Island. Salty water is moving laterally towards Hilton Head Island from the northeast and possibly from the Atlantic Ocean, where saltwater may be entering the aquifer along the sea bottom. Also, salty water present in the sediments underlying the upper permeable zone is moving upward into the upper permeable zone of the aquifer in response to heavy pumping at Hilton Head Island. The salty water entering the upper permeable zone is diluted by freshwater recharge. With the present rate of pumping and existing hydraulic gradients, it probably will be many years before the freshwater resources of Hilton Head Island will be grossly contaminated by saltwater. However, increased pumping at Hilton Head Island and to the north and west of the Island would increase the rate of encroachment and lessen the time before the ground-water resources became seriously contaminated.

Estimates of the rate of saltwater movement at hilton Head Island based on regional and local hydraulic gradients range from 140 to 370 feet per year. The lower rate is believed to approximate the rate of regional encroachment, on the assumption that all calculated movement represents encroachment. The higher rate may occur near centers of heavy pumping for a few months each year, but during the remainder of the year the rate is probably lower.

In general the actual depth to a freshwater-saltwater contact is greater than that predicted by the Ghyben-Hertzberg principle. Hubbert's modified version of the Ghyben-Hertzberg equation may under certain conditions give a reasonable approximation of the depth to a freshwater-saltwater contact. However, the only accurate way to define the interface between freshwater and saltwater is through a set of test wells all located at the same site but open to the aquifer at different depths.

The effects of additional development of the ground-water resources on water levels and on saltwater contamination require careful consideration. The following suggests some of the management considerations that would aid in the long-range protection of the ground-water resources of the study area.

The ground-water problems in the study area warrant consideration of comprehensive and positive water management. The success of any planning and management programs, however, will depend upon continued availability of reliable data. The continued collection of pumpage data throughout the area and periodic water-level measurements in the existing network of observation wells will aid in monitoring changes in water levels due to pumping. The periodic collection and analysis of representative water samples from varying depths in the principal artesian aquifer would provide data about the zone of diffusion and the movement of salty water in the aquifer.

Numerous methods have been used to control saltwater encroachment. These include (1) reduction of pumping, (2) redistribution of major pumping centers, (3) water conservation and economical use, (4) artificial recharge, and (5) conjunctive use of water from different sources. The simplest solution would be to reduce pumping, but this may not be possible to any large extent because of existing water demands. However, the use of treated sewage effluent for irrigation use (if acceptable from a health standpoint) might be one way of reducing pumpage. This, combined with water conservation, may be the most economical and practical way of reducing saltwater encroachment in the study area.

Recharge to an aquifer with water pumped from surface-water sources has been used widely in California and to a lesser extent in other parts of the United States. Methods range from collecting storm runoff in pits to construction of channels and pipelines from distant streams to the recharge basins or injection wells. Because recharge would have to be accomplished through injection wells and because there are no nearby freshwater recharge sources in Beaufort County, artificial recharge would be an expensive undertaking.

It might be feasible in a limited area, such as Hilton Head Island, to use water from the Middendorf aquifer for recharge into the upper permeable zone of the principal artesian aquifer to form a hydraulic barrier between the Hilton Head Island wells and the source of salty water. The hydraulic barrier thus generated may prevent salty water from entering the aquifer. The relatively high hydraulic head in the Middendorf aquifer would eliminate the need for any pumping mechanism. A properly constructed and developed well in the Middendorf aquifer might supply a natural recharge flow of about 1 Mgal/d. On the negative side, however, the water from the Middendorf aquifer is high in some mineral constituents and has a high temperature; consequently, the quality of water from the principal artesian aquifer would be adversely affected.

Predicting the changes in water quality and water levels in response to changes in recharge and discharge is one of the most important aspects of ground-water management. This may be accomplished by the use of analytical or computer modeling techniques. Models are designed to establish a reasonable correspondence between their properties and those of the prototype aquifers; they can simulate ground-water flow, storage, recharge, pumping, natural discharge, impervious boundaries, and transport of solutes in ground water. Electric analog and digital computer models have been used for ground-water management studies. In recent years, the electric analog model has been supplanted by the digital computer, which uses essentially the same logic as the analog model. The principal difference is that a digital computer calculates values, whereas an electric analog measures the same values. The computer technique has generally been found more desirable than the electric analog method, mainly because it is more flexible, more convenient, and less expensive.

The usefulness of the digital model as a management tool is well documented in many ground-water reports, and the use and development of such a model should be considered for the study area. The digital model developed by Counts for the Savannah area, which includes part of the present study area, could probably be adapted for use in the entire Lowcountry study area.

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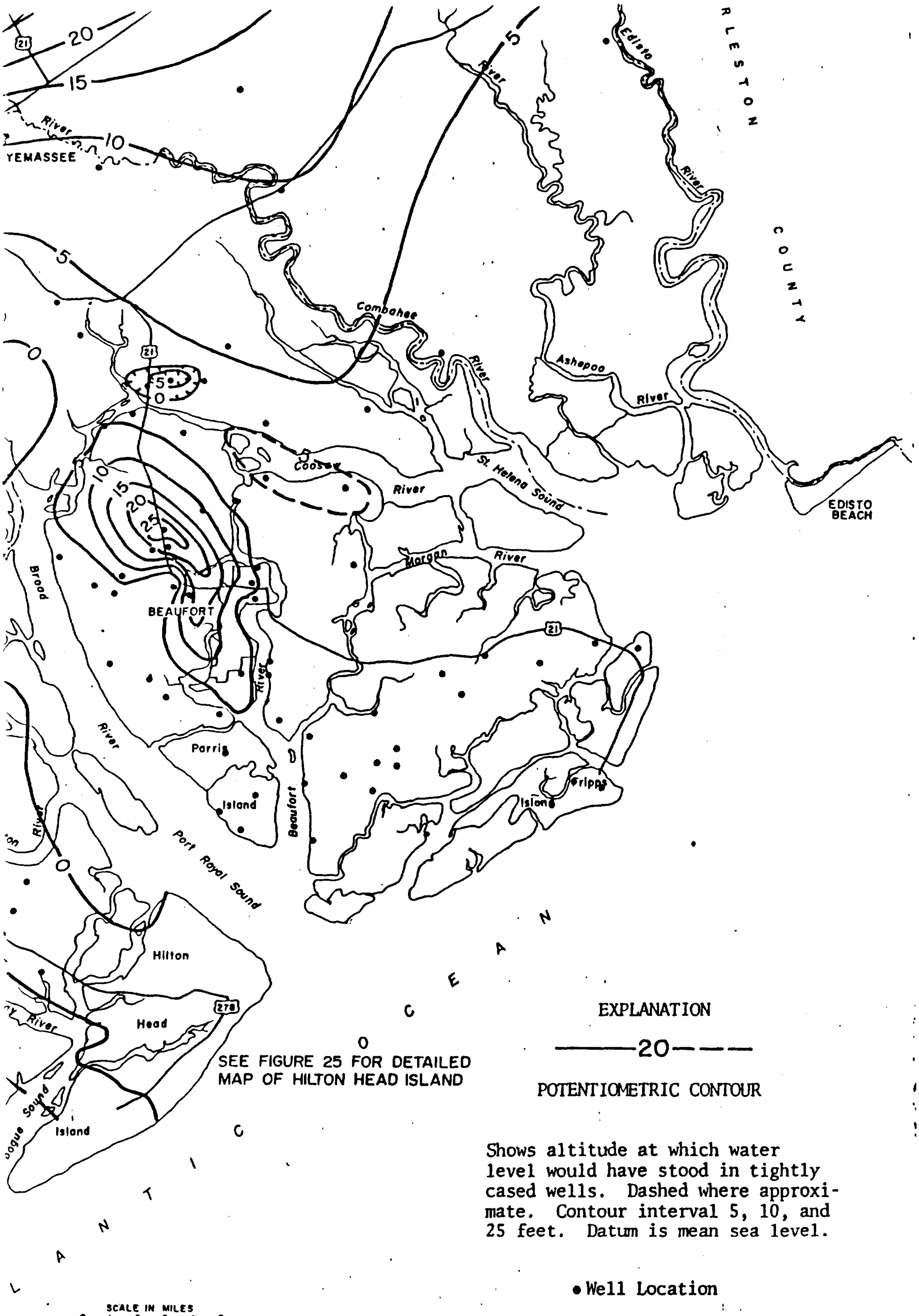

EXPLANATION

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POTENTIOMETRIC CONTOUR

Shows altitude at which water level would have stood in tightly cased wells. Dashed where approximate. Contour interval 5, 10, and 25 feet. Datum is mean sea level.

• Well Location

\L ARTESIAN AQUIFER, DECEMBER, 1976.

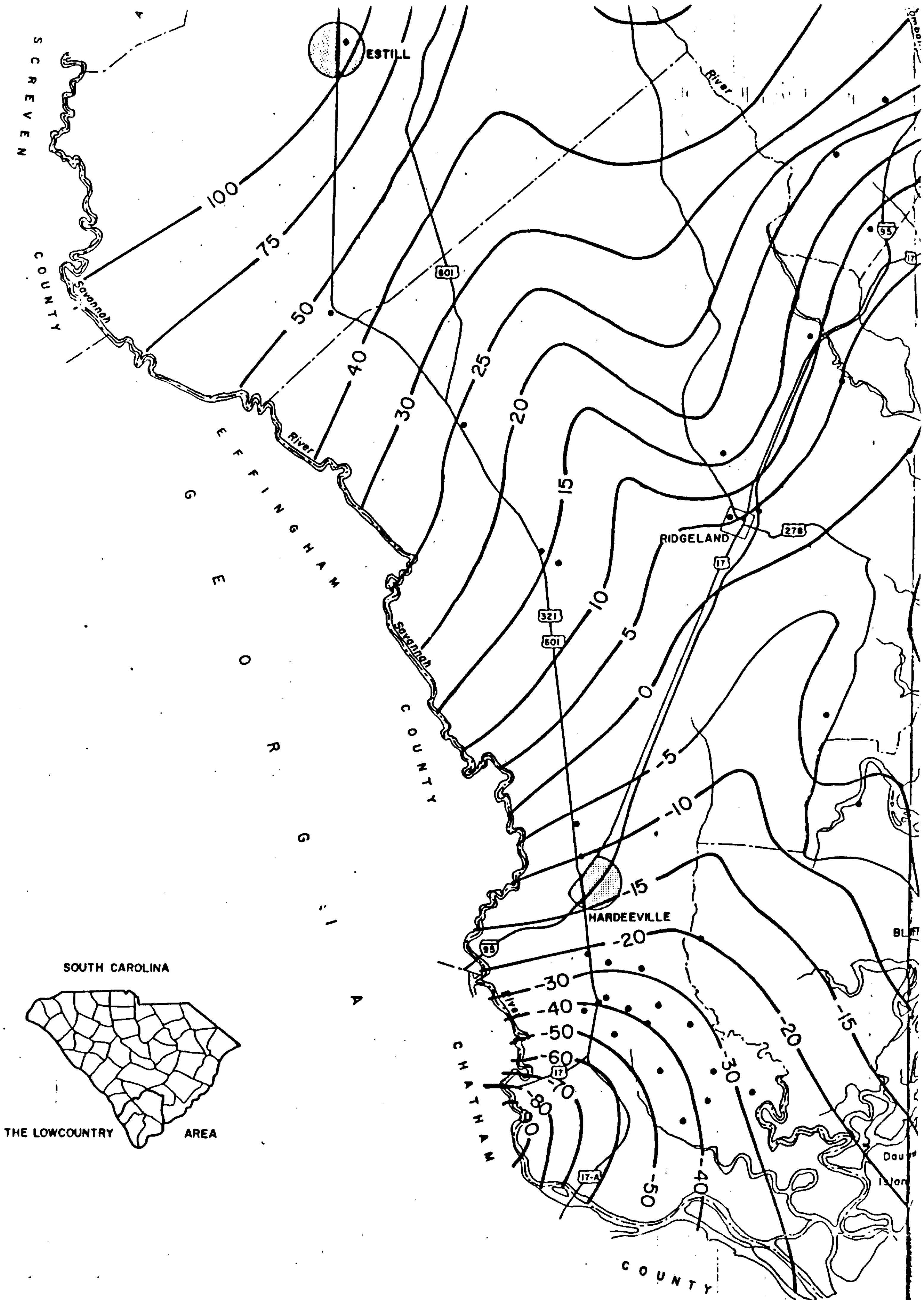


FIGURE 19. POTENTIOMETRIC SURFACE OF PR

REFERENCE # 16

)IL SURVEY OF

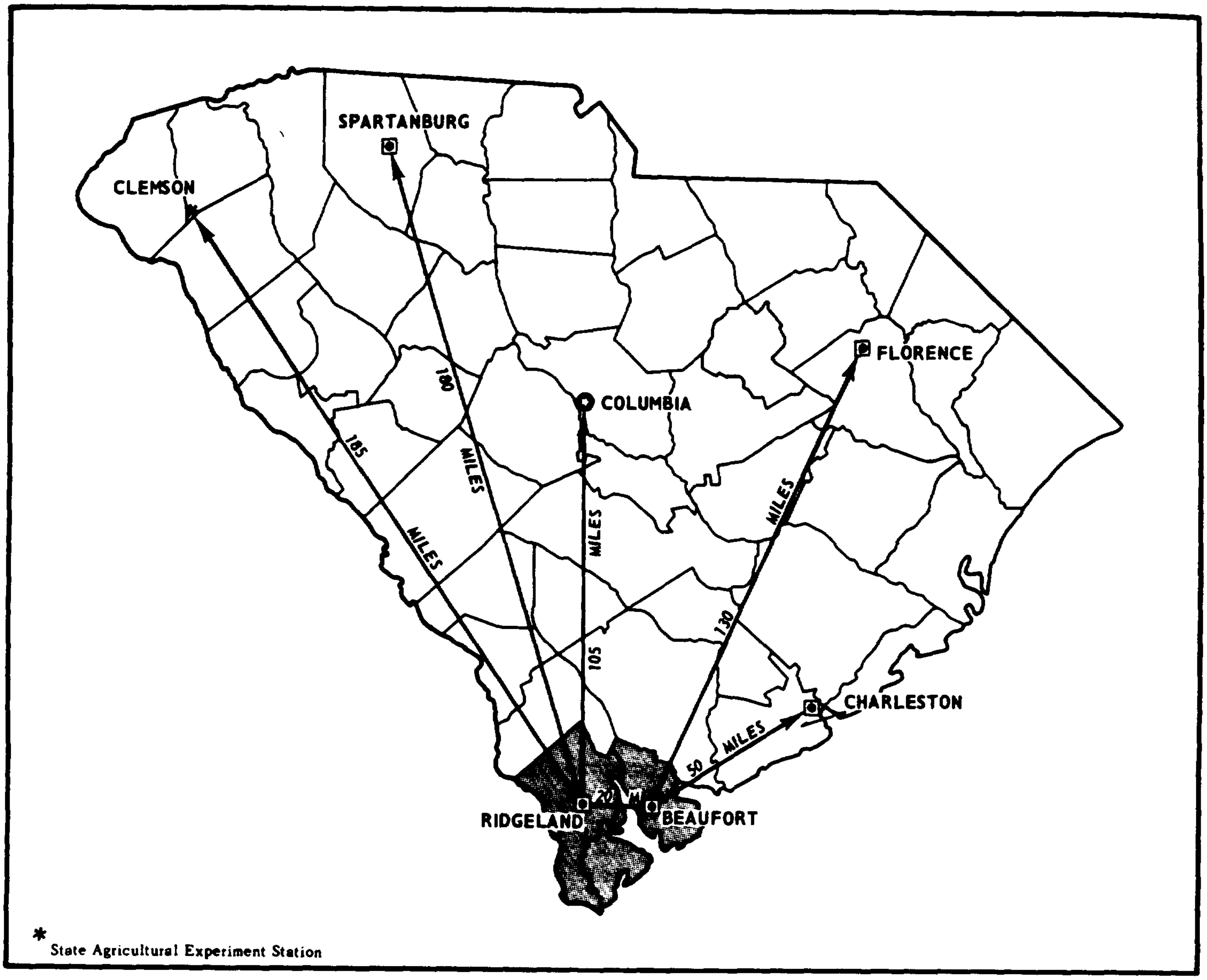
Beaufort and Jasper Counties South Carolina

United States Department of Agriculture
Soil Conservation Service

In cooperation with
South Carolina Agricultural Experiment Station and
South Carolina Land Resources Conservation Commission

Contents

Issued January 1980



Location of Beaufort and Jasper Counties in South Carolina.

SOIL SURVEY OF BEAUFORT AND JASPER COUNTIES, SOUTH CAROLINA

By W. M. Stuck, Soil Conservation Service

Soils surveyed by W. M. Stuck, C. B. Ware, Jr., and W. M. Steedly

United States Department of Agriculture, Soil Conservation Service, in cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission

BEAUFORT AND JASPER COUNTIES are in the southeastern part of South Carolina in the Atlantic Coastal Plain (See opposite page). The total area is approximately 1,250 square miles, or 800,000 acres. The area of Beaufort County is 581.25 square miles, or 372,000 acres, and the area of Jasper County is 668.75 square miles, or 428,000 acres. Beaufort, the county seat of Beaufort County, had a population of 9,425 in 1970 and is growing rapidly. Ridgeland, the county seat of Jasper County, had a population of 1,165 in 1970 and is growing moderately.

About 11 percent of the survey area is cropland, 2 percent is pasture, 57 percent is woodland, 11 percent is urban and nonfarm areas, and 19 percent is land that is flooded daily or occasionally by saltwater. The principal crops are corn, soybeans, small grains, and truck crops. Forest products are a major source of income. Several large plantations are in the area, and they are managed primarily for wildlife. Timber production, however, is a secondary but important consideration.

General nature of Beaufort and Jasper Counties

Climate; settlement, history, and development; geology; and physiography, relief, and drainage of Beaufort and Jasper Counties are discussed in this section.

Climate

By Robert L. Janiskee, Department of Geography, University of South Carolina, with the assistance of Michael Bell.

Beaufort and Jasper Counties lie in the southernmost region of South Carolina where the climate is milder than it is anywhere else in the State. This low lying coastal area has numerous islands, inlets, streams, and marshes and a temperature regime which clearly reflects the influences of its maritime and southerly location. The climate is decidedly subtropical, with long and rather hot summers followed by short and mild winters. Precipitation is abundant, averaging about 49 inches per year and remaining within the range of 40 to 58 inches during most years. Precipitation in the amount of one-tenth inch or more falls on an average of about 77 days. The annual distribution shows a major maximum of about 7 inches in July and a major minimum of about 2 inches in November. The period of April through October, which includes the growing season for most crops in this area, receives an average of about 34 inches of rain. This is about 70 percent of the annual total. Additional temperature and precipitation data, as recorded near Beaufort, Beaufort County, during the period 1949-1972, and at Ridgeland, Jasper County, during the period 1949-1973, can be found in tables 1, 2, 3, and 4.

The prevailing wind is southwesterly at about 8 miles an hour. Average windspeed tends to be highest in March. The average is 10 miles per hour from the northeast during that month. Relative humidity in midafternoon averages about 49 percent in spring and about 53 percent at other times. The average maximum, usually observed at dawn, is about 84 percent. Heavy fog occurs about 37 days of each year. The sun is visible during about 63 percent of the daylight hours. It ranges from a low of 56 percent in January to a high of 70 percent in April. About 110 clear days (sunrise to sunset) occur each year. The average evaporation rate (pan measured) is in the range of 55 to 60 inches per year.

Summers are long, very warm, and rather humid. Maximum daily temperatures tend to be near or above 90 degrees F, and minimum daily temperatures tend to be in the 65 degrees F to 70 degrees F range. Temperatures in excess of 100 degrees F are usually recorded a few days each year. The highest temperature during the period of record, 107 degrees F, was recorded in June 1950 at Ridgeland in Jasper County. Maritime tropical air persists in the area for extended periods during summer. The abundant supply of warm, moist, relatively unstable air produces frequent scattered showers and thunderstorms. About 54 thunderstorms occur in an average year, 16 of them in July. Hailstorms are infrequent and usually of little consequence. The tropical storm season is generally considered to be the period from July through October. Hurricanes are rare to the area, but tropical storms bringing winds of up to 50 miles per hour occur an average of about every two or three years. The last hurricane was in September, 1959; its center came within 10 miles of the the town of Beaufort, where the highest winds were about 55 miles per hour. An occasional tornado occurs during the middle to latter part of summer. Many of the "tornadoes" observed in this period, however, are actually waterspouts which do not come ashore.

Autumn begins warm, humid, and showery, but a change to a warm, relatively dry, and pleasant Indian summer tends to take place in October and continue into November. The first freezing temperatures in the area can be expected in the middle of November, but the onset of frost tends to be quite variable from year to year and from place to place. Tropical storms or hurricanes occasionally bring heavy rains and strong winds to the area during this season.

The winter season is quite short and mild. It is also relatively dry, accounting for only about 20 percent of the average annual precipitation. Average daily maximum and minimum temperatures are about 63 degrees F and 38 degrees F, respectively. The average winter temperature is about 50 degrees F. Freezing temperatures occur about 27 days of each year. The coldest temperature during the period of record, 9 degrees F, was recorded at Ridgeland in Jasper County in January 1970. Winter precipitation normally comes in the form of rain associated with fronts and traveling cyclones. Measurable snowfall seldom occurs. Freezing rain (glaze) occurs some winters, but damaging ice storms are rare.

Spring is a season of rapid transition between a rather uniform winter and a rather uniform summer. March is typically a month of heavy rains and warming temperatures. April tends to be rather dry, but scattered thunderstorm activity begins in April and May as spring wanes and summer begins. April and May are the months of greatest tornado hazard, though the tornado season in this region is roughly March through October.

As shown in tables 3 and 4, the last freezing temperature usually occurred in mid to late March during the period of record. The length of the frost-free growing season averages approximately 246 days in Jasper County and about 249 days in Beaufort County. Coastal locations in both counties typically have 280 to 290 frost-free days. "Growing degree days," which are equivalent to "heating units," are tabulated for each county in tables 1 and 2. Beginning in spring, growing degree days accumulate in the amount by which the average temperature each day exceeds a base temperature, in this case 50 degrees F, below which growth is minimal for the principal crops in the area. The normal monthly accumulation is used to schedule single or successive plantings of a crop within the limits of the frost-free season extending from the last freeze in spring to the first freeze in fall. In March, growing degree days begin to accumulate rapidly. Annual growing degree days average about 5,900 in Jasper County and 6,300 in Beaufort County. In both counties inland locations record fewer growing degree days than coastal locations.

Settlement, history, and development

The first nonindigenous settlement of Beaufort and Jasper Counties occurred in 1521 when Spanish explorers settled on Port Royal Island. In 1562 French Huguenots sought refuge on Parris Island and built a fort there. Neither of these settlement attempts endured. The fort of the French Huguenots was destroyed by the Spanish in 1564. In 1663 the English, under Captain William Hilton, landed on Port Royal and declared the area to be England's, but again the Spanish destroyed the settlement. By 1690, however, there were enough English settlers on Port Royal Island that the King of England was making land grants to them. The town of Beaufort, the second oldest town in South Carolina, was chartered in 1710.

The first settlers in Beaufort and Jasper Counties found the area almost completely wooded and densely populated with many species of wildlife. Many settlers became traders in furs and skins. Lumber and other forest products were also a major industry of the early settlers. In 1680 rice was introduced into the area, and by 1719 the colonist merchants, traders, and farmers had built up great wealth, thereby laying the foundation for the highest culture the area has ever known.

Around 1739 indigo was introduced, and it was a very profitable crop as long as the English Government kept the bounty on it. The removal of this bounty during the Revolutionary War, however, caused a rapid decline in profits. Around 1785 Sea Island long-staple cotton became a major cash crop. This superb cotton sold for two dollars a pound in Europe in 1780. It became a victim of the boll-weevil in 1813. The worst hurricane this area has ever known occurred in 1893. It destroyed most of the dikes and other water control devices necessary for the production of rice. This crop never again regained its prominence.

Following the Civil War (1861-65), the economy was on a very low plane. A number of crops were grown, including corn, cotton, tobacco, rice, truck crops, and livestock, but none reached the prominence of rice, indigo, or Sea Island long-staple cotton of the prior years. Truck crops were a large and profitable industry in Beaufort County during the early part of the twentieth century.

Today's farming is highly diversified. Soybeans, corn, truck crops, and small grains are the main crops. Livestock, particularly beef cattle, is an important industry in both counties. Forest products are a major source of income, particularly in Jasper County. The seafood industry, including the provision of shrimp, crabs, fish, and oysters, contributes to the economy of both counties. Urban development and numerous recreational facilities have become a major part of the industry on the sea islands.

ime required for a soil to develop de- :he intensity of other soil forming fac- Beaufort and Jasper Counties range young, to mature. On the higher eleva- ls, most of the soils have well developed easily recognized. Where the parent y sandy or flooded, little horizonation Alluvial soils, deposited adjacent to y have not been in place long enough ı development.

of soils

t is dug into a soil, several layers or ıt. The differentation of horizons is the l forming processes. These include the rganic matter, the leaching of soluble l translocation of iron, the formation of sical weathering, such as freezing and ical weathering of primary minerals or

rocesses are continually taking place in number of active processes and the ivity vary from one soil to another.

:hree major horizons called A, B, and C orizons may be further subdivided by ripts and letters to indicate changes An example would be the B2t horizon ı layer within the B horizon that has rom the A horizon.

; the surface layer and has the largest ganic matter. Where it is undisturbed, .1 horizon. Where the soil has been ed, it is called the Ap horizon. The soils are examples of soils that have a ored A1 or Ap horizon.

also the zone of maximum leaching or and iron in the profile. Where con- has taken place, an A2 horizon is low the A1 horizon. Normally, the A2 st colored horizon in the soil. It is well oils as Bonneau and Ocilla.

below the A horizon and is commonly t is the horizon of maximum accumula- of clay, iron, aluminum, or other com- ıed from the A horizon. Norfolk, e are among the soils that have a well on. Some soils, such as Chipley and formed a B horizon, and the C horizon ıder the A horizon. The C horizon is als that are little altered by the soil but they may be modified by weather-

moderately well drained soils in Beau- ınties have a yellowish brown or reddish subsoil. These colors are mainly due to thin coatings of iron oxides on the sand, silt, and clay particles. A soil is considered well drained if it is free of gray mottles (a chroma of 2 or less) to a depth of at least 50 inches below the surface. Among the well drained soils in this county are Norfolk, Chisolm, and Eddings. Moderately well drained soils are wet for short periods and are generally free of gray mottles to a depth of about 15 to 20 inches. Goldsboro and Nemours are examples of moderately well drained soils.

The reduction and transfer of iron is associated with the wetter, more poorly drained soils. This process is called gleying. Poorly drained to very poorly drained soils, such as the Rains and Paxville soils, have a grayish subsoil and underlying material which indicates reduction and transfer of iron. Moderately well drained to somewhat poorly drained soils have yellowish brown and gray mottles indicating the segregation of iron. Lynchburg soils are among the somewhat poorly drained soils in this survey area.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Clay. As a soil separa limeter in diamete percent or more percent silt.

Clay film. A thin coa gregate or lining skin.

Coarse textured (ligh

Compressible. Excess

Concretions. Grains, colors consisting grains. The comp surrounding soil. compounds in con

Consistence, soil. Th can be crushed b consistence are—

Loose.—Noncoher mass.

Friable.—When between thumb a lump.

Firm.—When m thumb and forefi

Plastic.—When can be pressed ir thumb and forefi

Sticky.—When w somewhat and pu al.

Hard.—When dr with difficulty be

Soft.—When dry very slight press

Cemented.—Har

Control section. Th The thickness va is 40 or 80 inches

Corrosive. High risk concrete.

Cover crop. A close- tect the soil bet grown between t

Drainage class (na periods of satur opposed to alter cial drainage or ing of channels natural soil drai

Excessively dra Excessively drai or shallow. Som wetness.

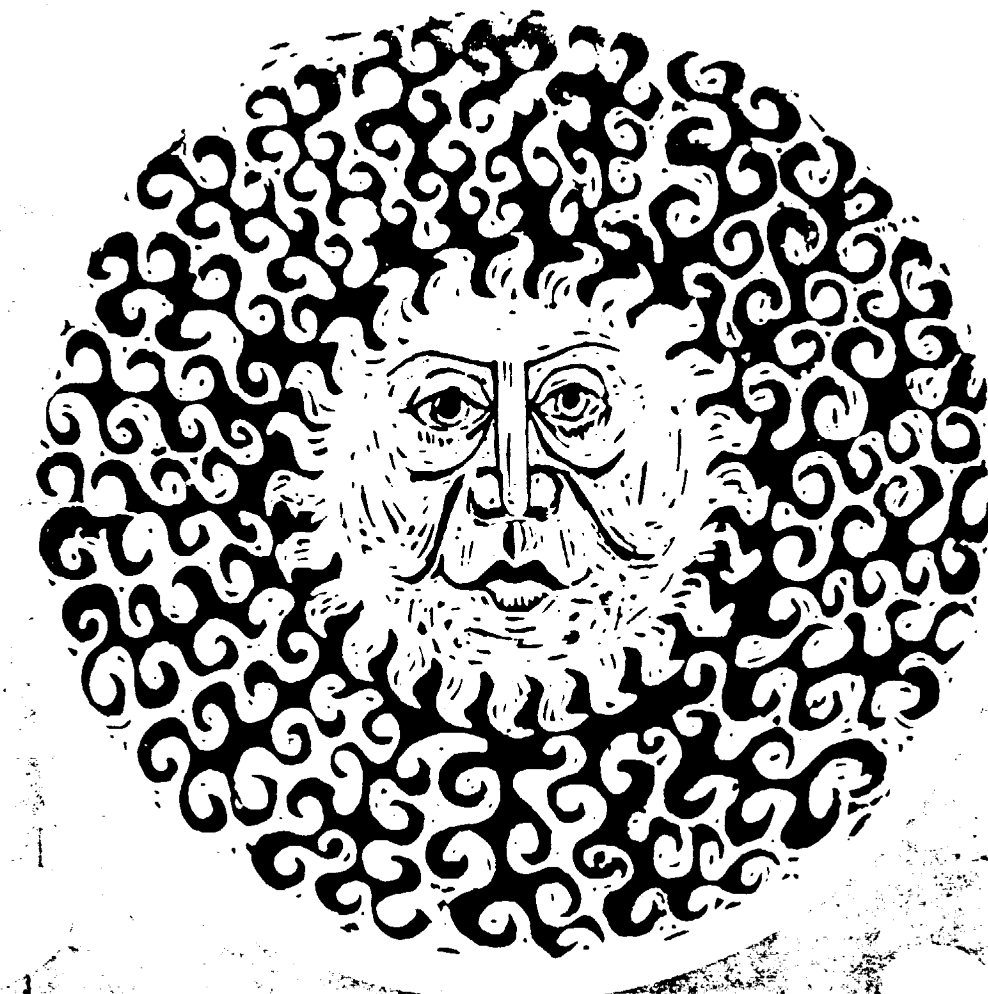
Somewhat exce rapidly. Many s rapidly pervious the water they related to wetne

Well drained.— rapidly. It is a season, and wet periods during monly medium t

Moderately we somewhat slowl are wet for or periodically for fected. They c directly below both.

OVERSIZED

DOCUMENT



CLIMATIC ATLAS OF THE UNITED STATES

U.S. DEPARTMENT OF COMMERCE • Environmental [illegible] istration • Environmental Da[illegible] Service

U.S. DEPARTMENT OF COMMERCE
C. R. Smith, Secretary

ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
Robert M. White, Administrator

ENVIRONMENTAL DATA SERVICE
Woodrow C. Jacobs, Director

JUNE 1968

REPRINTED BY THE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
1983

PREFACE

The purpose of this atlas is to depict the climate of the United States in terms of the distribution and variation of constituent climatic elements. Climate has a profound, often controlling, effect upon the life, mood, health, and activity of all of us.

Climate may be considered the collective state of the earth's atmosphere at a specific place for a long period of time (usually several decades). The short-term variations of the state of the atmosphere are called "weather." Weather is the product of the interaction of numerous natural elements; the long term statistical valuations of these various elements collectively define the climate. For many planning, engineering, and scheduling purposes it is more important to know the climate of a certain city, State, resort area, etc., than to know what the weather happens to be there today.

The Climatic Maps of the United States present in uniform format a series of analyses showing the national distribution of mean, normal, and/or extreme values of temperature, precipitation, wind, barometric pressure, relative humidity, dewpoint, sunshine, sky cover, heating degree days, solar radiation, and evaporation. The map projection has been standardized to allow accurate comparison and correlation of the various climatic elements and their patterns.

The individual analyses were originally prepared to meet the demand for climatic information from commercial, industrial, agricultural, research, and educational institutions, as well as from the general public. Each sheet, or set of sheets, was made available as soon as printed. Now the entire set - a total of 40 large sheets containing 271 climatic maps and 15 tables - has been collected and bound into this comprehensive atlas. (Individual sheets and sets may still be purchased separately).

It should be remembered that these analyses are not forecasts of temperature, precipitation, etc., but rather reflect collective atmospheric conditions that occurred over periods of years; often observed conditions for any given day, week, month - or even year - will differ sharply from those indicated in the analyses.

The climatic maps in this atlas were prepared primarily by John L. Baldwin, Chief of the Domestic Climatology Branch of the Environmental Data Service, ESSA, an agency of the U.S. Department of Commerce, with some map contributions from the Hydrologic Services Division and the former Solar Radiation Section of the Weather Bureau. Appreciation is due Dr. Helmut E. Landsberg, former Director of the Environmental Data Service, and to the National Academy of Science Advisory Committee on Climatology for advice and guidance.

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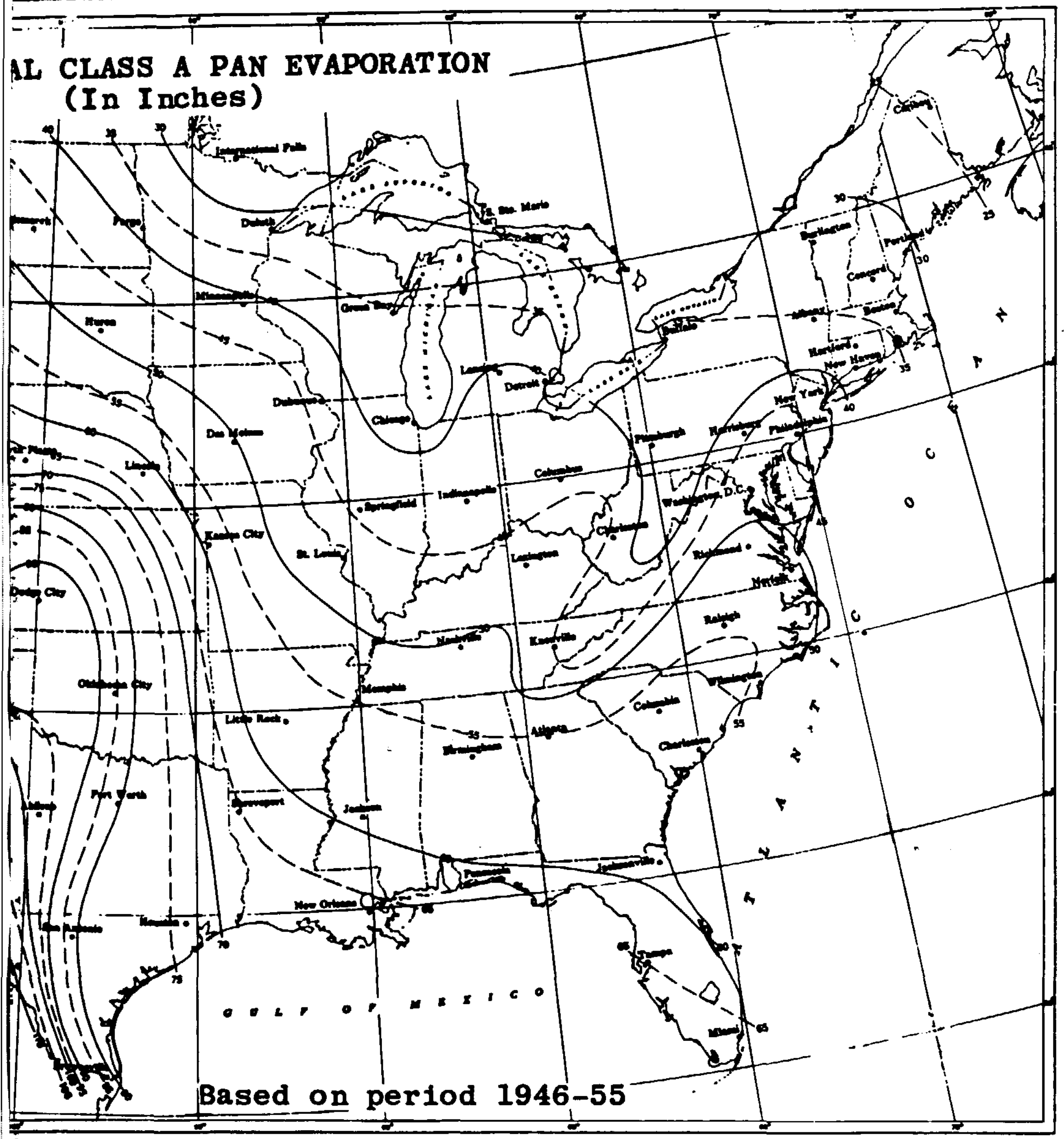

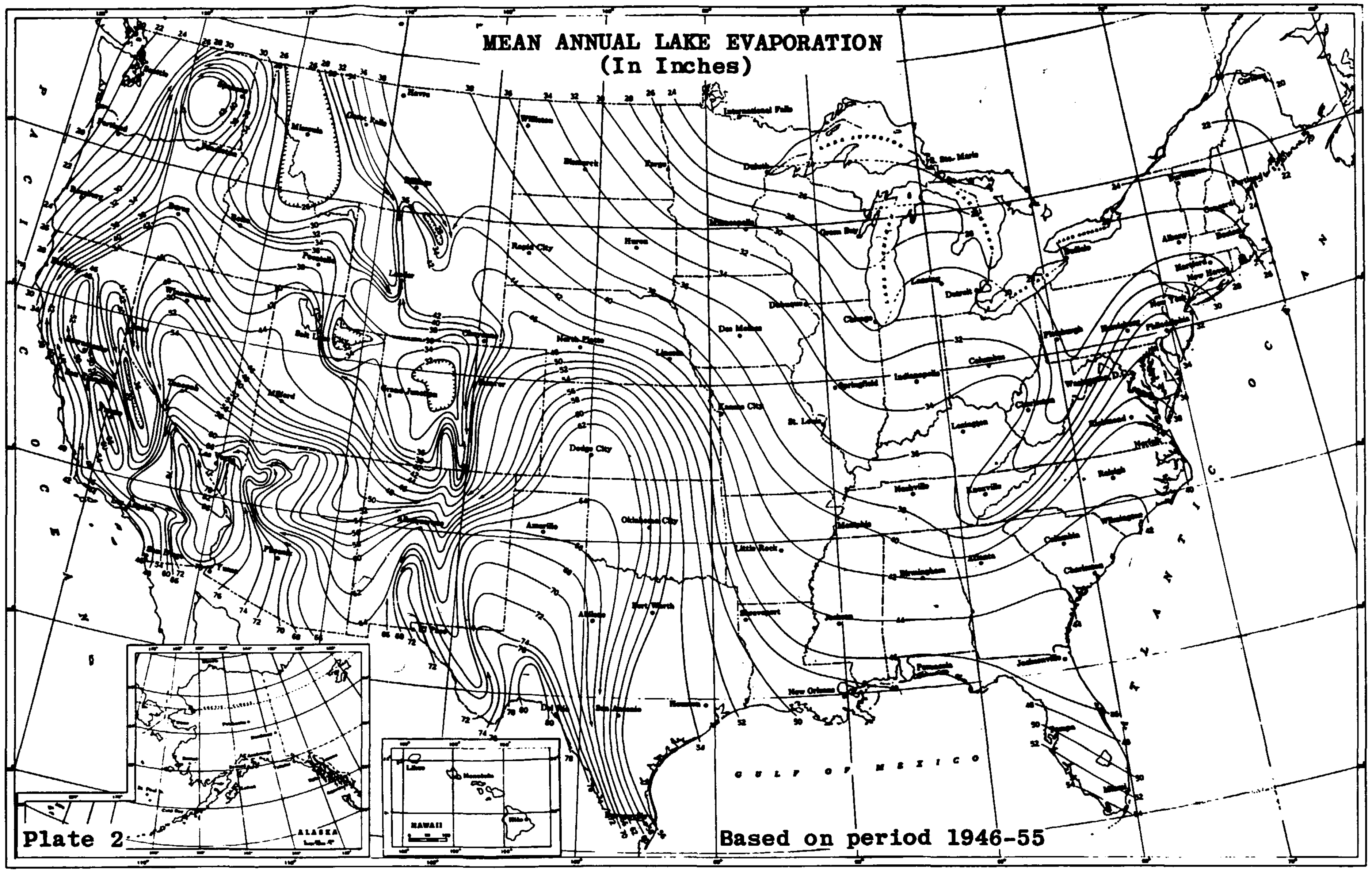

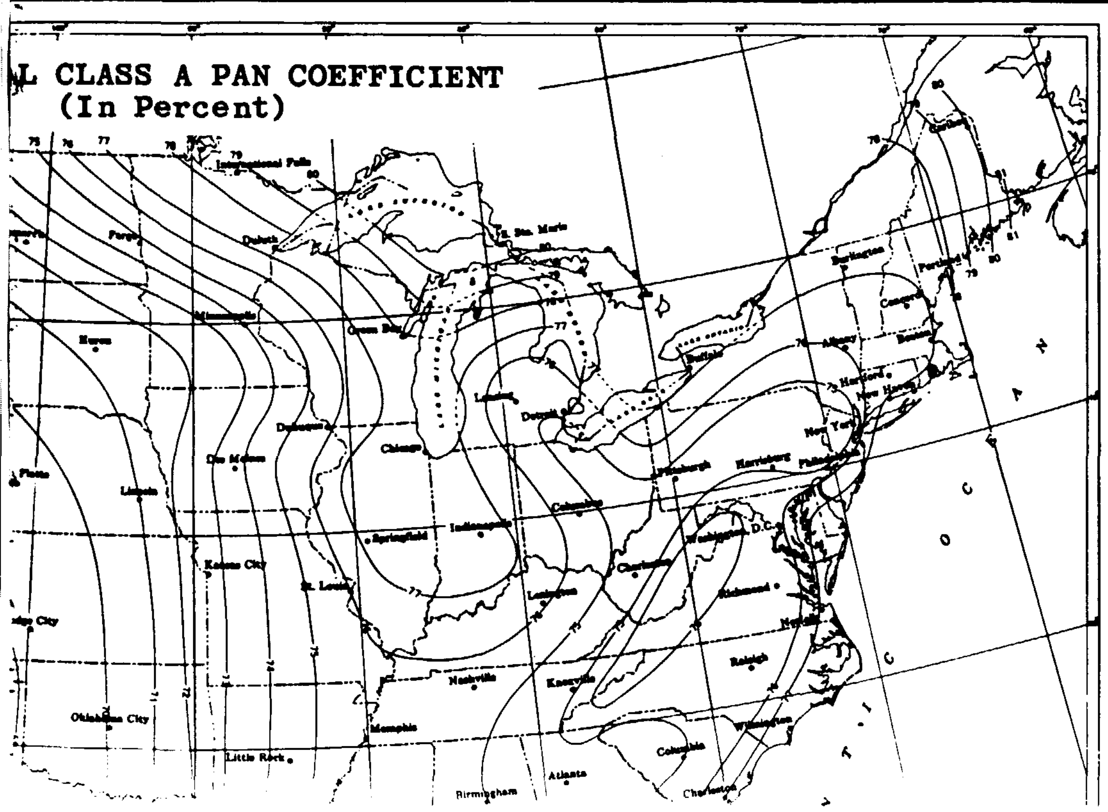

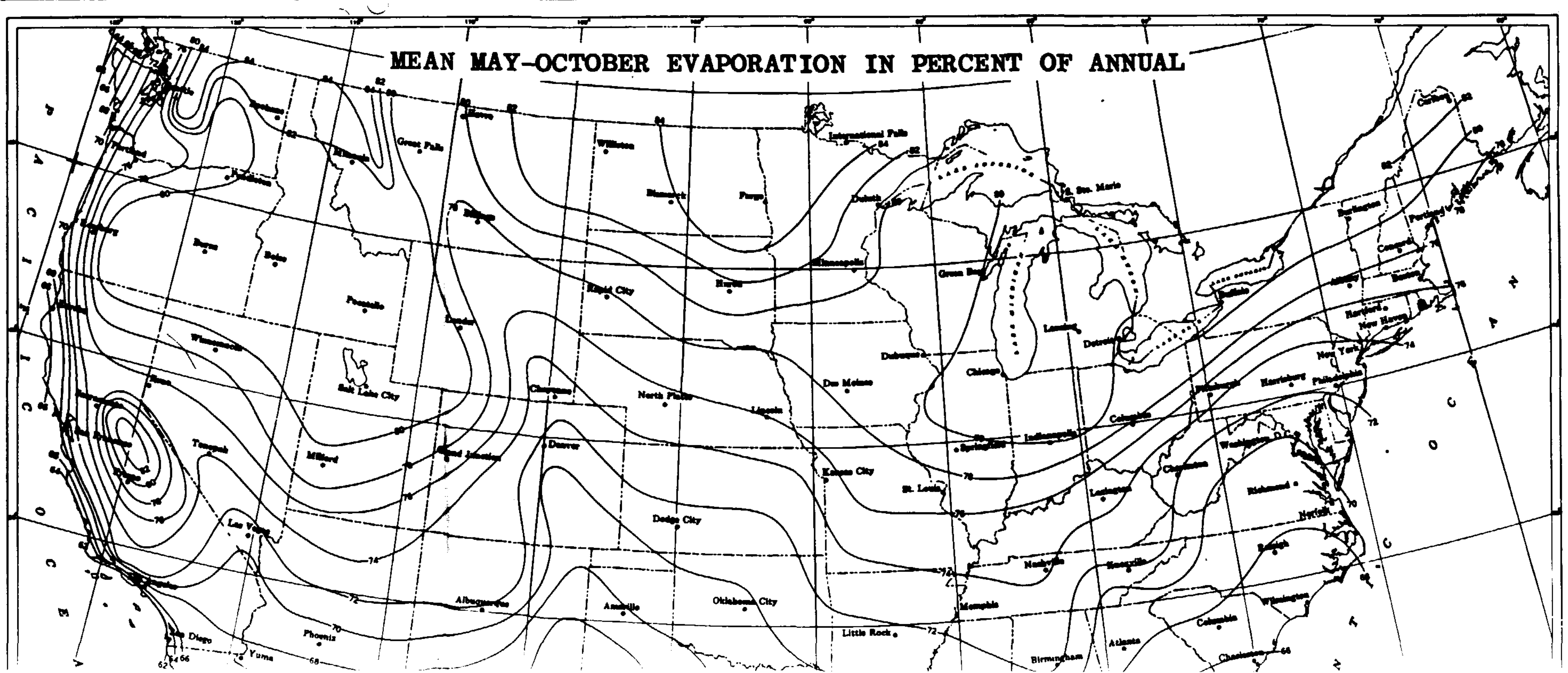

REFERENCE # 19

South Carolina Department of Health and Environmental Control

Water Pollution Control

PERMIT

TO DISCHARGE WASTEWATER IN ACCORDANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

THIS CERTIFIES THAT

Venture Chemicals, Inc.

has been granted permission to discharge wastewater from a facility located at

Lobeco, South Carolina, Beaufort County

to receiving waters named

Campbell Creek to Whale Branch to Coosaw River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976) and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."

James A. Joy, Jr., P.E.

DIRECTOR, DIVISION OF INDUSTRIAL & AGRICULTURAL WASTEWATER
BUREAU OF WATER POLLUTION CONTROL

Issued: MAY 23 1985

Expires: JUN 30 1990

Effective: JUL 1 1985

Permit No.: SC0000914

MAY 28 1985

materials, a method for containment, a description of training, inspection and security procedures, and emergency response measures to be taken in the event of a discharge to surface waters or plans and/or procedures which constitute an equivalent BMP. Sources of such discharges may include materials storage areas; in-plant transfer, process and material handling areas; loading and unloading operations; plant site runoff; and sludge and waste disposal areas. The BMP plan shall be developed in accordance with good engineering practices, shall be documented in narrative form, and shall include any necessary plot plans, drawings, or maps. The BMP plan shall be maintained at the plant site and shall be available for inspection by EPA and Permit Issuing Authority personnel.

7. If this permit requires continuous measuing of the pH of the effluent, the permittee shall maintain the pH of such effluent within the range set in the permit, except excursions from the range are permitted subject to the following limitations:

   a. The total time during which the pH values are outside the required range shall not exceed 7 hours and 26 minutes in any calendar month; and,

   b. No individual excursion from the range of pH values shall exceed 60 minutes.

8. The permittee shall notify the Agency at least 30 days before the intended manufacture of a new product or use of a new raw material. If such new product or raw material is to enter the wastewater stream, approval shall be obtained from the Agency before beginning operations, and the permit may be modified to include monitoring requirements and/or limits for the new chemical.

9. The discharge is to occur only on outgoing tide and is not to enter the stream less than ½ hour after tidal outflows begin. It is to be terminated early enough during the tidal cycle that the plume of the discharge is washed completely into Whale Branch. Adequate monitoring and timing equipment, with recording, must be maintained to show that the discharge meets the above.

10. Ultimate oxygen demand (UOD) is defined for this permit as 1.5 times 5-day BOD plus 4.5 times total ammonia. UOD is to be reported as pounds per tidal cycle, with BOD_5 and ammonia composited over one complete tidal cycle (about 12 consecutive hours).

11. The permittee shall monitor all parameters consistent with conditions established by this permit on the first Wednesday of every calendar month, unless otherwise approved by the Department. Additional monitoring necessary to meet the frequency requirements of this permit (Part I.A.- Effluent Limitations and Monitoring Requirements) shall be performed by the permittee.

12. Waste activated sludge, after drying, shall be disposed of in an Agency approved landfill as authorized by the Department.

13. The Company shall carry out monitoring, with results reported with Discharge Monitoring Reports, for the following:

a. Quarterly:

2-amino-9,10-anthracenedione	Dichloromethane(methylene chloride)
aniline	Diphenylhydrazine
9,10-anthracenedione	formaldehyde
arsenic	mercury
benzene	1,1'-sulfonyl bis(4-chloro)benzene
cadmium	1,2,3-trichlorobenzene
copper	

b. Weekly, until questions about sources are resolved, then quarterly:

PCB's

The permit may be reopened to revise monitoring or to add limits if so indicated by analyses.

14. Toxicity shall be measured using Mysidopsis bahia in accordance with the U.S. Environmental Protection Agency document, Methods for Measuring the Acute Toxicity of Effluent to Aquatic Organisms or other method approved by this office; testing shall be conducted annually during February, June and October. Toxicity shall not occur at less than an effluent concentration of 66 percent. Reports are to be submitted no later than 30 days after completion of tests, except that a violation is to be reported within 5 days after completing the test. Revision of these requirements may be made administratively after 1 year, if appropriate after review of all biological information required by the permit.

15. The Company shall develop and submit a program to improve effluent quality and thereby eliminate adverse effects in Campbell Creek and receiving waters. Study plans shall be submitted for approval for each aspect of the program. The program shall include:

a. Monthly effluent toxicity tests on oyster larvae, consisting of 48-hour static tests, to begin in May, 1985.

b. A survey of oyster spat recruitment in Campbell Creek, along with control stations, during June or July of each year, beginning in 1985.

c. A study plan to reduce discharge toxicity, to be submitted by May 31, 1985. The study is to evaluate methods of reduction, including chlorine-related toxicity, and to develop an engineering report proposing any needed facilities. The chlorine toxicity evaluation is to be submitted by September 30, 1985, and the overall report of evaluation and recommendations by October 31, 1985. The reports are to include schedules for placing proposed systems into operation, and an approved schedule shall become a part of this permit.

d. A complete macroinvertebrate assessment of Campbell Creek, along with control stations, to be conducted annually in November or December, beginning in 1985.

e. The South Carolina Department of Health and Environmental Control and the permittee acknowledge that the methods of testing and evaluating as defined in paragraphs a. and b. above are new requirements not heretofore imposed by the Agency on any permittee in South Carolina. Amendments to or modifications of testing methodology and or frequency may be necessary as experience is gained and effluent quality is improved; and, after a year of monitoring, the requirements may be revised administratively as indicated by the biological evaluations.

16. The company shall perform analyses of oysters for organics (volatiles and acid and base/neutral extractables) and metals (arsenic, cadmium, chromium, copper, lead, and nickel) each year in September and report the results to DHEC within 45 days after sampling. Samples shall be taken from the mouth of Campbell Creek, near the confluence of Huspah Creek and Whale Branch, and from the mouth of Haulover Creek.

NUS CORPORATION AND SUI REFERENCE # 20 **TELECON NOTE**

CONTROL NO. F4-8904-54	**DATE:** December 14, 1989	**TIME:** 1020
DISTRIBUTION: American Color and Chemical/Venture Chemical File		
BETWEEN: Mr. George Nelson	**OF:** Low Country District, SC Dept. of Health & Env. Control	**PHONE:** (803) 522-9097
AND: James Miller, NUS Corporation J.M.		

DISCUSSION:

Called George Nelson, who is familiar with tidal flow in the Lobeco area (see attached memorandum), for flow reversal information in Campbell Creek and associated water bodies. Mr. Nelson stated that flow reversals are common in these water bodies because there is very little, if any, freshwater input involved. The reversals occur in the Coosaw River, the Broad River, Whale Branch, and in all tributaries that are hydrologically interconnected. The area at the mouth of Huspa Creek is a tidal node, and tidal water from both sections of Whale Branch backs up into Huspa Creek during each flood tide.

South Carolina Department of Health and Environmental Control

REFERENCE # 21

2600 Bull Street
Columbia, S.C. 29201

April 10, 1984

TO: Luke Hause
Director of Shellfish & Recreational Waters

FROM: Russell E. Berry REB
Shellfish Manager
Low Country District

THRU: Marshall Dixon
District Director
Low Country District

Shellfish growing water samples in area 14, in Whale Branch and the Huspah Creek area, have been sporadically unacceptable for areas open to shellfish harvesting. The source of contamination has not been conclusively identified.

There are two permitted discharges into tributaries of the waters of this area. These discharges are James J. Davis Elementary School and Venture Chemical Company. In trying to determine the source of contamination, I have increased sampling frequency in this area and sampled the discharges.

Sampling results of both waste treatment plants indicate that bacteria are being discharged in great enough numbers to be a possible cause of bacterial water quality problems. Both waste treatment systems provide chlorination. James J. Davis Elementary School provides a flow thru tablet type chlorination. Venture Chemical Company periodically adds HTH to the final polishing pond. The chlorination at Venture is used whenever high fecal coliform levels are detected thru self-monitoring.

Because of the chemical nature of the waste discharge at Venture Chemical, I am concerned that chlorination may result in the production of THMs or chlorinated hydrocarbons. However, some type of disinfection is necessary. There are no established limits for bacteria on the second phase of Venture Chemicals permit. The limits on James J. Davis Elementary are for fecal coliform only.

Upon further investigation at Venture Chemical it appears that two plant upsets have occurred in the Waste treatment system since January 1, 1984. On March 29, 1984, I accompanied Jay Kook on an inspection at Venture Chemical. We met with Pat Garrett, the treatment plant operator. Pat Garrett stated that it takes 10 days to three weeks for the treatment system to get back into efficient operation and provide adequate treatment. To rejuvenate the system after the "plant upsets", waste sludge from domestic plants and acclimated "super bugs" are used to seed the plant.

Pat Garrett stated that the flows at the Venture plant have increased from 0.150 MGD to a maximum of 0.350 MGD. Before 12/15/83, flows ranged from 0.125 MGD to 0.150 MGD. As of 1/1/84, flows ranged from 0.300 MGD to 0.350 MGD. The DMRs of James J. Davis School indicate that their flow is approximately 0.003 MGD.

At the Venture site they are producing one type of pesticide and a component of another pesticide. This waste is being discharged into Campbell Creek then to Whale Branch and Huspah Creek (see EPA Dye Study). This waste discharge at the time of plant "up-sets" is not being sufficiently treated. The two materials being produced are "Krenite" and "intermediate 1292." The "intermediate 1292" is produced for Pittsburgh Paint and Glass. I am concerned that the waste from this production of these products may possibly be concentrated in the food chain.

I have consulted with Marshall Dixon on this matter. Until we can isolate and eliminate the source of bacterial contamination and address some of the concerns about possible chemical contamination we concur with the FDA's recommended closure zone as a preventative health measure.

Thank you for your help in this matter.

cc: Marshall Dixon
Jay Kook
Area 14 File
Venture File
Jim Joy
Russ Sherer

REFERENCE # 22

South Carolina
State Water Assessment

South Carolina

STATE WATER ASSESSMENT

Report No. 140

H.Stephen Snyder
Project Manager

Steven J. de Kozlowski
Assistant Project Manager
and Project Biologist

Teresa W. Greaney
Project Geologist

Joseph A. Harrigan
Project Engineer

Mable K. Haralson
Public Information Director

H. Thomas Shaw
Project Cartographer

George E. Siple
Consulting Hydrogeologist

Freddie L. Collins
Civil Engineer Associate

Debra L. Miller
Engineering Technician

South Carolina Water Resources Commission
3830 Forest Drive, P.O. Box 4440
Columbia, South Carolina 29240

September 1983

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Summary

South Carolina's average streamflow is about 33 billion gallons per day. This water, along with the water stored in surface reservoirs and underground aquifers, must be properly managed to meet the State's current and future water needs. Good water availability data, water quality data, and water use data are necessary for responsible water resource management. In addition, the proper legal and institutional framework must be in place to utilize these data. Currently, the quality and extent of South Carolina's water data base varies considerably with the type and source of the data and the geographic location of the resource. Utilization of these data for planning and management purposes is also difficult.

Water law in South Carolina is relatively undeveloped; lacks a coherent policy in regards to water resource management; and is widely dispersed throughout State and Federal constitutions, statutes, regulations, and common law. The riparian reasonable use doctrine is the basis for surface-water law and is inappropriate in many respects for settling water use conflicts. Some of the more consistent water law concerns include: 1) insecurity of riparian rights; 2) limitations on water use (interbasin transfer); 3) protection of the resource for public interests; and 4) adequate legislation for responsible water management during droughts and other water crises. To date, no law has defined the extent of riparian lands or the authority to make interbasin transfers of water. Except for the Ground Water Use Act of 1969, South Carolina has no statutory or case law delineating ground-water rights.

Examination of water availability data reveals several broad trends. Both surface and ground-water availability correlate with the general physiography and geology of South Carolina. Streams in the Blue Ridge and Upper Coastal Plain Provinces tend to have well-sustained base flows with only moderate variability; streams in the lower Piedmont and Lower Coastal Plain generally have poorly sustained base flows and are highly variable. Ground-water yields in the Blue Ridge and Piedmont Provinces are usually low except along poorly identified fracture zones; however, well yields throughout the Coastal Plain are good to excellent with variable water quality.

The State's surface-water data base is relatively good. However, ground-water data are extremely limited throughout the Blue Ridge and Piedmont, the northern Pee Dee area, and some Upper Coastal Plain counties. This problem is compounded by the lack of coordination among agencies which collect ground-water data and the need to compile and analyze the large quantity of raw data already collected. Only portions of Horry, Beaufort, Jasper, Barnwell, and Aiken Counties have a sufficient data base to permit meaningful ground-water management efforts.

The quality of our waters is relatively good. An estimated 84 percent of the State's major river miles meet Federal water quality goals and 86 percent meet State water quality standards most of the time. The most widespread water quality problem is fecal coliform bacteria contamination with 74 percent of the State's water quality monitoring stations indicating unacceptable levels. This problem has caused the closing of 33 percent of the State's estuarine shellfishing waters. Other water quality problems include low dissolved oxygen concentrations in Coastal Plain streams, high suspended solids levels in Piedmont streams, and elevated nutrient levels and eutrophic conditions in lakes throughout South Carolina.

Between 1970 and 1980, gross water use in South Carolina almost doubled to its present 5,780 mgd. About 437 mgd, or 7.6 percent, of this water is consumed (not returned to available supplies). The largest gross use is for cooling water in the production of thermoelectric power (4,370 mgd or 75.6 percent), followed by self-supplied industry (905 mgd or 15.7 percent) and public supply (380 mgd or 6.6 percent). Ninety-six percent of the State's water needs are supplied by surface waters. Excluding the large use by thermoelectric power plants, surface water still supplies 85 percent of the State's total water needs. The largest consumer of water is self-supplied industry which accounts for 38 percent of total consumption, followed by public supply (24 percent) and agricultural irrigation (13 percent).

Statewide gross water use is projected to increase 48 percent to about 8,550 mgd by 2020. The largest increases are expected in agricultural irrigation and thermoelectric power production. These two uses, particularly irrigation, are also expected to play a significant role in a projected 300 percent increase in consumptive water use. Irrigated cropland is expected to increase from its present 120,000 acres to about 600,000 acres by 2020.

Various regional and local water problems exist, or have the potential to occur, throughout the State. All current and projected surface-water needs may not be adequately met by surface-water supplies during low flows in the Saluda, Catawba-Wateree, and Combahee-Coosawhatchie River Sub-basins. Heavy ground-water withdrawals are causing water level declines in the vicinities of the cities of Florence, Darlington, Sumter, Georgetown, Myrtle Beach, Charleston, and Beaufort, South Carolina and Savannah, Georgia. Projected large increases in ground-water use for agricultural irrigation may strain currently productive aquifer systems and cause water level declines in the counties of Dillon, Marion, Florence, Orangeburg, and Aiken. In addition, without proper management, saltwater could contaminate all coastal aquifer systems.

The Saluda River Sub-basin exhibits the most numerous and widespread water resource problems of all sub-basins in the State. Current surface-water demand periodically exceeds available supplies and rapidly growing water demands coupled with limited surface and ground-water availability indicate potential water use conflicts in the future. Variable and frequently low streamflows in the Saluda River below Lake Greenwood restrict navigation, fish migration, and fish habitat. Surface water quality problems are widespread with high levels of fecal coliform bacteria, nutrients, biochemical oxygen demand, and turbidity the major contributors. Lake Greenwood has been identified as the most eutrophic lake in the State. The Little Saluda River and Reedy River exhibit poor water quality and have been identified as two of the worst water quality problem areas in South Carolina. Hydrogeologic knowledge for most of the sub-basin is at the field data level. In general, ground-water yields in the Saluda River Sub-basin are limited. Ground-water quality problems exist in numerous wells due to high levels of iron, copper, and lead. In the vicinity of Leesville, water from the Tertiary Sands Aquifer System contains naturally-occurring radioactivity at levels in excess of acceptable drinking water standards.

Hydroelectric power comprises about 25 percent of total generating capacity and provides seven percent of all electricity in South Carolina. In 1980, this non-withdrawal use used about 63,200 mgd; more than ten times all withdrawal uses combined. Numerous potential hydropower sites have been identified in the State with most occurring in the Broad River Sub-basin. Although hydroelectric power is important to current and future development in South Carolina, permanent impoundment of low-lying lands and highly fluctuating discharges may adversely impact the environment and some water and land use activities.

Commercial navigation, once existing practically statewide, is now limited to coastal waters. Heavy shoaling in harbors and inlets due to shifting sands and sedimentation requires continuous and costly dredging. In addition, suitable dredge material disposal sites are few and decreasing in number.

The maintenance of sufficient instream flow enhances water quantity and quality and benefits fish and wildlife populations and instream uses such as navigation, hydropower generation, and recreation. Minimal discharges from hydroelectric power facilities on the Saluda and Catawba-Wateree Rivers and heavy irrigation water withdrawals on the Edisto River and tributaries of the Salkehatchie River cause occasional low flows which restrict some water use activities. Projected increases in water use coupled with a general lack of recognition and understanding of minimum flow requirements, may increase instream flow problems in the future.

Large quantities of sediment enter South Carolina's surface waters each year filling navigation channels and lakes. Excessive sedimentation impairs municipal, industrial, and recreational water use; destroys aquatic habitat; and adversely impacts desirable aquatic organisms. Over 18 million tons of soil are eroded each year in South Carolina and contribute to the sedimentation problem. Agriculture, silviculture, mining, and construction activities increase soil erosion. Agriculture contributes about 85 percent of total soil loss. Most erosion in the State occurs in the Piedmont. While "best management practices" have been developed to control erosion caused by several land use activities, implementation is primarily voluntary and adequate legislation to properly control erosion and sedimentation has not been developed.

Large populations of noxious aquatic plants infest about 50,000 acres of rivers and lakes throughout the State and are especially troublesome in Coastal Plain waters. These nuisance weeds are able to out compete desirable native species and can interfere with almost all withdrawal and instream water use activities. Hydrilla, an extremely prolific and difficult to control submersed aquatic plant, was recently discovered in Lake Marion and poses a serious threat to all waters of the State. Control of aquatic weeds in public waters is coordinated and funded through the South Carolina Aquatic Plant Management Council. However, sufficient funds are not available to properly control the spreading aquatic weed problem in South Carolina.

South Carolina's coastal waters are an important and increasingly popular resource for municipal, industrial, and recreational uses. Increased development in coastal areas has resulted in limited available waterfront space, increased point and non-point sources of pollution, limited access points to public waterfront areas, and development in unstable erosion-prone beachfront areas. The South Carolina Coastal Council has developed and implemented a Federally approved Coastal Zone Management Program to protect and manage coastal resources.

Numerous lakes, rivers, and coastal waters provide a wide variety of water-based recreational opportunities with the coastal Grand Strand area being the most popular followed by other coastal areas and the major lakes. The Santee-Cooper Lakes, Lake Murray, and Lake Wylie are the most popular major lakes in the State. Fecal coliform bacteria contamination, high levels of PCB's, extremely low streamflows, aquatic weed infestations, and limited public access restrict recreational use of some public water bodies in the State.

Rivers or portions of rivers with outstanding scenic, recreational, geological, fish and wildlife, historical, or cultural values can be protected under the State Scenic Rivers Program or the National Wild and Scenic Rivers Program. The Chattooga River in Oconee County is the State's only National Wild and Scenic River and a five-mile stretch of the Middle Saluda River in Greenville County is the only State Scenic River. Portions of the Congaree, Little Pee Dee, and Ashley Rivers are eligible for inclusion in the State Scenic Rivers Program, and a portion of the lower Saluda River is under study. The inclusion of an eligible river in the State Scenic Rivers Program is primarily dependent on the voluntary granting of scenic easements by riparian landowners. This factor has probably limited the number of State Scenic Rivers.

Wetlands are important natural areas which help maintain water quality, modify flooding, and act as feeding, nesting, and nursery areas for fish and wildlife. Most wetland areas in South Carolina are in the Coastal Plain and an unknown quantity of these important areas are lost each year due to increased development. Some unique wetland areas have been identified and are protected under the South Carolina Wildlife and Marine Resources Department's Heritage Trust Program. However, the extent of wetland loss, the rate at which it is taking place, and the possible consequences to the State's ecology and economy are not known.

Water use in South Carolina is projected to increase substantially, reducing available supplies and increasing competition. Use of water conservation measures can save water; reduce water, energy, and treatment costs; and reduce water use conflicts. Numerous water saving devices and methods are now available for residential, municipal, agricultural, and industrial water uses.

While 213 communities in South Carolina have identified flood prone areas, 166 of these communities participate in the National Flood Insurance Program. The U.S. Geological Survey, U.S. Army Corps of Engineers, and the Federal Emergency Management Agency provide flood insurance studies to local communities. The Federal Emergency Management Agency monitors construction activities in flood plains to ensure local government compliance with Flood Damage Reduction Ordinances. Most flood related programs in South Carolina are run by Federal agencies and no comprehensive statewide flood-plain management program currently exists. The State government has severely limited authority over flood-plain management and other flood related matters and the need for increased State involvement has not been fully assessed.

Introduction

"On a major low country stream, three proposals are being considered at present.

(a) A municipality anticipates eventually using about one third the flow of a stream for domestic consumption.

(b) A proposed group irrigation project involving upwards of 35,000 acres would need to use a substantial portion of the streamflow.

(c) A farmer owning about 7,500 acres would also like to develop an irrigation program from the same stream.

There may be many other water users similarly situated above these. How can the needs of these interests best be met? By what legal means can each of them be assured a dependable water right to protect his supply? If there isn't enough for all, what rights, if any, are superior to others."

-The Beneficial Use of Water
in South Carolina, 1952

These words, written over thirty years ago (Busby, 1952) and based on an actual situation, could just as easily have been in yesterday's newspaper. The facts may be different, but the questions would be the same. What are our water rights in South Carolina? Can investors in our water resources be assured of an adequate yield for their investment? Who has priority of water use? Many other questions surely come to mind to the large water user. South Carolina is still operating under the same principles of water law that guided our decisions 30 years ago, and a hundred years before that.

You may be assured, however, that although our basic water laws have not changed, our water usage has. In 1955 South Carolina used about 950 million gallons of water per day (mgd). By 1980 the figure had grown six-fold to almost 5,800 mgd, earning the State the dubuous title of the "second fastest growing water use state in the Nation", second only to Florida (Viessman and Demoncada, 1980). During almost the same period (1960-1980), water consumption increased over 200 percent.

South Carolina is not running out of water. The State is faced, however, with the task of supplying rapidly increasing numbers of municipal, industrial, recreational, electric power, and agricultural water users with the required quantity and quality of water at the right time and right place. Moreover, this must be accomplished with an uncodified legal framework which originated under circumstances far different than today's acute demands on our natural resource base. The State can no longer afford to allow our unguided momentum to carry us into the future. Rather, South Carolina must have an established water resource policy and plan, based on current data and backed by adequate laws, to guide our progress through the upcoming decades.

This report represents the first of two phases in the development of a State Water Plan for South Carolina. Phase I is an inventory of South Carolina's water resources. Water quantity and quality, current uses, future demands, and problems and opportunities are assessed. Phase II will develop a State program to address known and potential problems and opportunities.

This report has five major sections. The first is a brief socio-economic and physical environmental overview of South Carolina. The second is a discussion of South Carolina's water law which points out specific problems and advantages in the State's current legal framework. The third is a statewide hydrologic overview addressing water availability and use within the State. The fourth is a detailed hydrologic description which analyzes the water supply and demand for each of the State's fifteen river sub-basins. The fifth section discusses special water resource topics including navigation, water conservation, hydropower production, aquatic weeds, water-based recreation, and scenic rivers.

Many regional and local water resource studies have been completed in South Carolina. Background studies have been completed by the South Carolina Water Resources Commission and the U.S. Department of Agriculture for the Ashley-Combahee-Edisto River Basin and Santee River Basin and both a background study and management plan have been developed for the Pee Dee River Basin. A comprehensive master water plan has been prepared for the Savannah River Basin by the U.S. Army Corps of Engineers. Water quality management plans have been developed for all major river basins by the South Carolina Department of Health and Environmental Control. Ground-water management plans have been developed and implemented by the South Carolina Water Resources Commission in Beaufort, Colleton, Jasper, Horry, and Georgetown Counties and a portion of Marion County. In addition, there have been many studies and plans addressing site-specific water resource concerns. However, a need existed to coalesce these many diverse and often independent studies to provide a better statewide perspective of South Carolina's water resources. This document attempts to meet that need. More specifically, this study attempts to increase the State's water resource management capabilities by:

- Assessing State water law.
- Assessing the surface- and ground-water resources of the State.
- Projecting future water resource use and demands.
- Identifying statewide and regional water resource problems and opportunities.

AUTHORITY

The South Carolina Water Resources Planning and Coordination Act of 1967 contains broad policies and goals with respect to water resource planning, development, and use. The General Assembly found in part:

> ...that it is in the interest of the public welfare that a coordinated, integrated state water resources policy be formulated and means provided for its enforcement, that plans and programs for the development and enlargement of the water resources of the State be devised and promoted and that other activities designed to encourage, promote, and secure the maximum beneficial use and control of such water resources be coordinated by a commission which, in carrying out its functions, shall give proper and adequate consideration to the multiple aspects of the beneficial use and control of such water resources with an impartiality of interest except that which is designed to best protect and promote the public welfare generally (Act 62, Section 2(b), 1967 Acts and Joint Resolutions).

The Act established the South Carolina Water Resources Commission and made that agency responsible for implementing the policies declared in the Act, including the development and coordination of State water policy. In addition, several other State agencies have statutory responsibilities in specific areas of State water policy, including the Department of Health and Environmental Control, the Coastal Council, the Land Resources Conservation Commission, and the Wildlife and Marine Resources Department. Other State and Federal agencies have interests in the State's water resources and have been consulted during the preparation of this document.

CONDUCT OF THE PROJECT

The State Water Assessment was prepared under the general guidance of the South Carolina Water Resources Commission, which is composed of 18 members. Ten of the members are appointed by the Governor for staggered three year terms: three members representing agriculture, three representing industry, three representing municipalities, and one representing saltwater interests. The remaining eight members of the Commission represent the executive offices of various State agencies and institutions: Department of Agriculture, Clemson University, Department of Health and Environmental Control, Department of Highways and Public Safety, Forestry Commission, Development Board, Land Resources Conservation Commission, and the Wildlife and Marine Resources Department.

A State Water Plan Policy Committee was appointed by the Commission to work more directly with the project staff to establish direction and resolve issues. The Committee was composed of four appointed Commissioners and a representative each from the Land Resources Conservation Commission and the Department of Health and Environmental Control. The project staff consisted of a project manager and of water resource professionals and technicians from the staff of the South Carolina Water Resources Commission.

Assisting the Policy Committee and the project staff was a Technical Advisory Committee composed of representatives from the following State and Federal agencies with interests in water resources planning and management:

S.C. Coastal Council
S.C. Wildlife and Marine Resources Department
S.C. Department of Health and Environmental Control
S.C. Land Resources Conservation Commission
Governor's Office
State Development Board
State Forestry Commission
Clarks-Hill Russell Authority
S.C. Department of Agriculture
U.S. Geological Survey
U.S. Army Corps of Engineers
Soil Conservation Service
U.S. Fish and Wildlife

while the Lower Coastal Plain lies between the Surry escarpment and the present coastline (Fig. 5). These latter two regions exhibit moderate to low relief and are marked by several terraces (Brandywine, Coharie, Sunderland, Wicomio, Penholoway, Talbot, Pamlico, and Recent), each representing former sea levels (Cooke, 1936).

Metamorphic and igneous rocks similar in type and age to those in the Blue Ridge and Piedmont underlie the sediments of the Coastal Plain as an irregular surface that dips to the south and southeast (Fig. 7). These rocks include granite, diorite, chlorite, hornblende schist, quartz-feldspar gneiss, and hornblende gneiss of Pre-cambrian to Permian age. Subsurface data indicate several major structural features of the basement rock, the most prominent of which is the Cape Fear Arch. This structure is a southeastward plunging basement anticline with an axis roughly paralleling the North Carolina-South Carolina border and intersecting the North Carolina coast at Cape Fear. Buried saprolite of variable thickness separates the crystalline rock from the overlying sedimentary rocks throughout the Coastal Plain. The saprolite layer in the southwestern portion of the Coastal Plain ranges from 40 to 80 feet thick. Several troughs composed of Triassic sediments have been identified in the crystalline bedrock beneath Coastal Plain sediments. One trough, the Dunbarton Basin, is located beneath the Savannah River Plant in Aiken and Barnwell Counties (Siple, 1967; Marine and Siple, 1974). The sediments in this basin consist of clastic red siltstone, sandstone, and some limestone pebbles and are overlain by Coastal Plain deposits (Fig. 7).

Coastal Plain deposits consist of consolidated and unconsolidated sediments of alluvial and marine origin which thicken from a few feet at the Fall Line to over 4,000 feet at the coast near Beaufort (Fig. 8 and Table 7).

Three formations of late Cretaceous age are recognized over a large part of the Coastal Plain--the Middendorf*, Black Creek, and Peedee Formations.

The Black Creek Formation is composed of two members, the upper Snow Hill Marl member and the lower member which has not been named. The Snow Hill Marl is composed of light gray sand interbedded with dark gray marine clays and some green sands. The lower member is composed of dark gray to black laminated clays with white to gray phosphatic, lignitic, and glauconitic sand. The formation is exposed along Black Creek a few miles above Darlington. Elsewhere in the northwestern Coastal Plain the formation lies buried beneath thin (1 to 30 feet) deposits of Pleistocene age. The Black Creek Formation near Sumter occurs between the elevations of approximately 50 feet above mean sea level to 200 feet below mean sea level. In Orangeburg, the Black Creek Formation lies between approximately 300 to 550 feet below mean sea level. Its maximum thickness elsewhere ranges from about 600 to 800 feet. The formation dips generally to the southeast (Fig. 7).

The Peedee Formation is the youngest of the Upper Cretaceous formations in South Carolina. This formation crops out in Florence, Williamsburg, Horry, and Georgetown Counties with the best exposures along the Pee Dee River. The Peedee Formation consists of dark gray clay interbedded with fine to medium micaceous and glauconitic sand and streaks of hard shelly limestone and siltstone. The top of the formation ranges from about 100 feet below mean sea level in the Orangeburg area to more than 1,600 feet below mean sea level in Beaufort County. The thickness of the formation ranges from a few feet near the updip limit to 600 feet in the Beaufort area. In the Charleston area, data indicate that the thickness is 500 to 700 feet.

Due to limited available data, the Ellenton Formation is of uncertain age and geographical extent. When first described in 1967, this formation was thought to be of Late Cretaceous age based on its stratigraphic position (Siple, 1967a). Subsequent investigations indicate that this formation is possibly of Early Paleocene age, equivolent to deposits of Midway age extending from Aiken County to the coast (David Prowell, U.S. Geological Survey, Atlanta, Georgia, personal communications, February 1983). The Ellenton Formation consists of dark gray to black mica-

* In previous reports of the S.C. Water Resources Commission, the name Tuscaloosa was preferred over that of the Middendorf, principally because the former was the more widely recognized and accepted name and because of inconsistent assumptions offered in support of the latter. However, the type section of the Middendorf Formation located in Chesterfield County, South Carolina does not include lithic units typical of the Tuscaloosa Formation in the southern and western parts of the southeastern Coastal Plain, including in part the Hamburg beds of Sloan (1904, 1908). Therefore, the authors of this report recognize the Middendorf as a distinct formation similar to, but different from, the more widespread Tuscaloosa Formation. Formations and aquifer systems in South Carolina identified as the Tuscaloosa in earlier reports are synonymous to the Middendorf as used in this report. In addition, in down-dip areas near the coast, deposits older than Middendorf (i.e. Early and Late Cretaceous age) are included in the Middendorf for purposes of ground-water analysis.

The Middendorf Formation is composed of light-colored crossbedded kaolinitic sands with lenses of white, tan, red, and purple kaolinitic clays exposed at the surface in South Carolina in Marlboro, Chesterfield, northern Darlington, northern Lee, Kershaw, western Sumter, Richland, northern Calhoun, eastern Lexington, and northern Aiken Counties. The thickness of the Middendorf Formation ranges from a few feet at the Fall Line to 1,500 feet in Beaufort County. The top of the unit occurs at a depth of about 50 to 100 feet below land surface in the northern part of the Coastal Plain to 2,500 feet below land surface in Beaufort County. This indicates a coastward dip and general thickening of the sediments from northwest to southeast across the Coastal Plain.

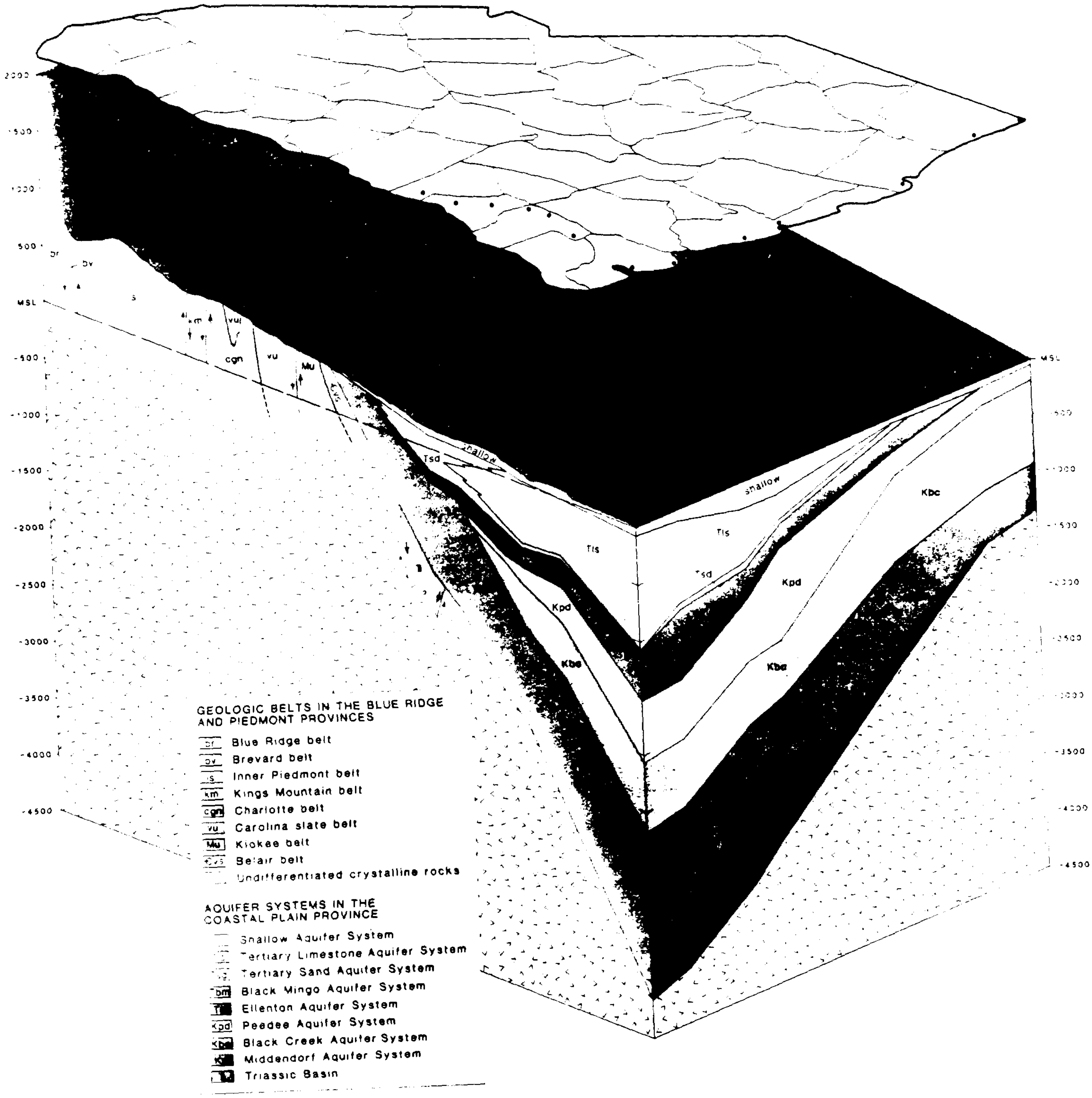

Figure 7.
Generalized structure of formational units and aquifer systems in South Carolina.

Table 7.

Description of geologic formations in the Coastal Plain.

SYSTEM	SERIES	GROUP	FORMATION	DESCRIPTION OF FORMATION	AQUIFER SYSTEM NAME	DESCRIPTION OF AQUIFER POTENTIAL AND WATER CHARACTERISTICS
Quaternary	Recent		Recent	Light-gray and tan fine to coarse lenticular sand and interbedded clay of marine and continental origin.	Shallow Aquifer System (in Lower Coastal Plain)	Water occurs primarily under water-table conditions and semi-confined conditions locally of minor importance as an aquifer. Water may be high in iron, sulfate, or nitrate, but is generally soft. High yields from river terrace deposits may be developed. Usually this unit supplies ground water to shallow (-100 feet) drilled and dug wells primarily in rural areas for domestic use. Minor to limited ground-water source.
	Pleistocene		Pamlico Talbot Penholoway Wicomico Sunderland Coharie Brandywine	Light-gray, tan, orange, red and black clay, interbedded with sand and gravel. Deposits form a thin cover over a large portion of the Coastal Plain.		
Tertiary	Pliocene		Waccamaw	Blue-gray to yellow and brown sandy shell marl and fine sand.		Supplies ground water to shallow (less than 100 ft.) wells for domestic use in the rural areas in the northeastern part of the State. Poor to minor ground-water source.
			Duplin Marl*	Buff sandy, friable shell marl occurring in isolated patches in lower half of Coastal Plain.		Minor ground-water source because of its limited extent and thickness. Water is moderately hard and may be high in iron.
	Miocene		Hawthorne	Hard brittle shale resembling silicified fuller's earth, with fine sandy phosphatic marl and soft limestone.		Because of its low permeability is not considered a major aquifer. However, it does provide sufficient water for domestic purposes and for limited industrial use. Water is hard. Minor ground-water source.
	Oligocene		Cooper	Light-brown to grayish-green phosphatic marl, heavily microfossiliferous, with fine grained sand. Basal part may be Jackson in age.		Principally a confining bed. The lower section acts as a poor aquifer in the southeastern part of the State. Water is quite hard and high in iron low in fluoride. Minor ground-water source.
	Eocene	Jackson	Barnwell	The Barnwell consists typically of deep-red to brown fine to coarse massive sandy clay and clayey sand. It appears to represent a residuum derived from solution of a sandy limestone.	Tertiary Sand Aquifer System	Does not yield large quantities of water. Can be used for domestic needs where the sand is sufficiently coarse and free from silt and clay. Water is soft. Minor ground-water source.
		Claiborne – Upper	Castle Hayne Limestone	Buff-gray tough or crumbly fossiliferous limestone underlain by soft fine-grained granular limestone. Equivalent in down-dip areas to the Ocala Formation in extreme southern S.C., along with Georgia and Florida.	Tertiary Limestone Aquifer System	A major source of water in Beaufort and Jasper Counties. Yields of 500 to 2000 gpm. Water is moderately hard, low in iron and chloride. Water from lower part of of aquifer may be high in chloride.
		Claiborne – Middle	McBean	The McBean Formation consists of fine to medium grained massive greenish-yellow and red quartz sand, green glauconitic marl, silicified beds of coquina, and clayey sand interbedded with red, brown, ochre, and yellow clay laminae. Littoral to neritic environment gradational with some estuarine or continental.	Tertiary Sand Aquifer System / Tertiary Limestone Aquifer System	The beds of sands and limestone in the lower part in Aiken and Barnwell Counties are fairly permeable and yield moderate quantities of water to industrial and municipal wells. Water is soft but may be high in iron content. Moderate to major ground-water source.
			Santee Limestone	The Santee limestone is a nearly pure white to creamy-yellow fossiliferous and partly glauconitic limestone containing numerous Bryozoa.	Tertiary Limestone Aquifer System	In the southeastern part of the State yields 500 gpm in eastern Colleton County to 2000 gpm in western Hampton, Jasper, and western Beaufort Counties. Water is moderately hard to hard with pH 7.1-7.9; salt water intrusion is thought to be occurring at places near the coast. Major ground-water source.
			Warley Hill Marl	Fine green to yellow glauconitic sand overlain by yellow to reddish-yellow sandy clay.	Tertiary Sand Aquifer System	Minor to poor ground-water source because of its small extent and low permeability.
		Claiborne – Lower	*Congaree*	Well to poorly sorted sand, fuller's earth, brittle *siltstone, and light-gray to green shale alternating* with thin-bedded fine-grained sandstone.		The Congaree is the basal, and most productive unit of the Orangeburg Group (including the Barnwell, McBean, and Wharly Hill formations, northwest of the Citronelle Scarp). Yields range from 100 to 600 gpm, and the water is generally soft high in iron, low in fluoride with a pH between 4.0 and 7.9
		Wilcox	Black Mingo	Partly indurated fine white to yellow sand and sugary sandstone or bioclastic limestone. Cement is white and calcareous to siliceous. Underlain by gray to black laminated shales containing numerous macro-fossils in some areas. Basal beds may be Midway in age.	Black Mingo	Yields are uncertain, but some permeable layers may produce up to 200 gpm in Clarendon, Williamsburg and Berkeley Counties. Mainly a confining bed. Water is moderately to very hard and low in iron, chloride, fluoride and the pH is 7.3 to 7.7 Limited to minor ground-water source.
	Paleocene	Midway	Ellenton	Dark-gray to black sandy lignitic micaceous clay containing disseminated crystals of gypsum. Medium to coarse sand and gravel.	Ellenton	Geographic distribution not fully mapped. Known to occur from Savannah to Edisto basins and southeast Allendale County. Water is generally high in sulfate and iron. Moderate to major ground-water source.
Cretaceous	Upper Cretaceous	Navarro	Peedee	Dark-green to gray micaceous, glauconitic, argil*laceous sand interbedded with impure limestones and* massive dark clays. Deposited under open marine conditions probably at depths of not less than 100 fathoms.	Peedee	Several hundred gpm have been reported around *the City of Orangeburg. In the Low Country,* yields up to 500 gpm have been reported. Water is generally soft, but high in iron and sulfate. Limited to moderate ground-water source.
		Taylor	Black Creek – Snow Hill Marl	Light-gray sand and dark clays interbedded with green sand and marine clay. Transitional zone between the deeper marine Peedee Formation and the more shallow marine Black Creek deposits.	Black Creek	This is a major aquifer of public and industrial supply within Orangeburg, Florence, eastern Marion, Clarendon, Williamsburg, Horry, and Georgetown Counties. Yields range from 400 to 1100 gpm. Water is soft with an excess of iron. Excessive fluoride is present in the coastal region. Excessive chlorides are present in the lower part of the Black Creek Aquifer System, along the coast. Major ground-water source.
		Austin	Black Creek – Unnamed	Dark-gray to black laminated lignitic clays interbedded with white to gray phosphatic, glauconitic sand. Deposited in shallow marine estuarine, and paludal environment.		
		Eagleford to Woodbine	Middendorf (*Tuscaloosa*)	Gray, buff and red arcosic cross-bedded sand and gravel, interbedded with lenses of white and purple clay and kaolin. Mixed continental and marine environment characterized by fluvial, deltaic, and littoral deposits.	Middendorf (Tuscaloosa)	A potential source of large quantities of water in the coastal plain. The permeability is relatively high and yields up to 3400 gpm can be obtained from individual wells. Water is soft and low in total solids in Aiken, Barnwell, Richland, Sumter, Florence, Marion, and Dillon Counties. In the Low Country area it is covered by 2000 to 2600 ft. of younger formations. The water is higher in total dissolved solids near the Coast, more than 1000 mg/L, and fluoride, more than 4.0 mg/L. In the Coastal regions of the State the water becomes excessively salty. Extensive major aquifer.

* Previously considered as Miocene in age.

Combahee-Coosawhatchie River Sub-basin

GENERAL OVERVIEW

The Combahee-Coosawhatchie River Sub-basin is located in the southern Coastal Plain region of the State. The sub-basin extends approximately 95 miles inland from the Atlantic Ocean and includes all of Beaufort County and portions of Aiken, Allendale, Bamberg, Barnwell, Colleton, Hampton, and Jasper Counties (Fig. 129). The areal extent of the basin is approximately 3,270 square miles, 10.5 percent of State land area.

Population

The 1980 population of the sub-basin was estimated at 139,400, 4.5 percent of the State's total population (Table 119). By the year 2020 the sub-basin population is expected to reach 233,400, an increase of 67.4 percent. The highest rate of population growth during this time period is anticipated for Beaufort County, with a projected increase of 97 percent.

In general, this is a rural area with the exception of Beaufort County which is more urbanized and contains the affluent retirement and resort community of Hilton Head Island.

The major centers of 1980 population in the sub-basin were Hilton Head Island (11,344), Beaufort (8,651), Walterboro (5,914), Barnwell (5,556), Laurel Bay (5,238), Allendale (4,362), Denmark (4,138), Bamberg (3,633), and Hampton (3,086).

Economy

The counties in the region had an average median family income of $12,484 in 1980, which was $4,000 lower than the State average. The per capita income of the region in 1979 ranged from $8,720 in Beaufort County which ranked first among the State's 46 counties, to $4,543 in Allendale County, which ranked 45th. None of the remaining sub-basin counties had a per capita income as high as the State average.

During 1979, the annual average employment of non-agricultural wage and salary workers in the sub-basin totaled 50,500. The percentage breakdown by type of employment was: manufacturing, 27 percent; government, 23 percent; wholesale and retail trade, 19 percent; services and mining, 16 percent; construction, 7 percent; finance, insurance, and real estate, 5 percent; and transportation and public utilities, 4 percent.

In the sectors of manufacturing, mining, and public utilities, the sub-basin counties had a relatively low annual product value of $632 million during fiscal year 1978-79, which was 2.9 percent of the State total.

Agricultural productivity is not as pronounced in this portion of the State. Only Hampton County ranked in the top one-third of South Carolina counties for cash crop receipts from farm marketing in 1979, with a total value of almost $16 million. Of the remaining sub-basin counties, all but Jasper ranked in the top 50 percent of cash crop receipts.

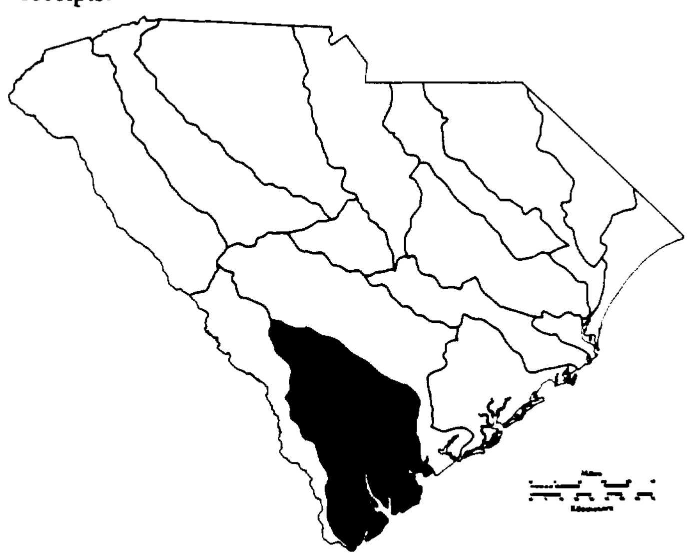

Figure 129.
Location of the Combahee-Coosawhatchie River Sub-basin in South Carolina.

Table 120.
Selected streamflow characteristics at U.S. Geological Survey gaging stations in the Combahee-Coosawhatchie River Sub-basin, South Carolina.

Gaging Station		Drainage Area	Period of Record		Average Flow				
							90%[a]	7Q10[b]	
Number	*Name/Location*	*(mi²)*	*Dates*	*Total Years*	*cfs*	*cfs/mi²*	*cfs*	*cfs*	*cfs/mi²*
1755	Salkehatchie River near Miley	341	Feb 1951-Present	29	356	1.04	95	33	0.10
1765	Coosawhatchie River near Hampton	203	Feb 1951-Present	29	189	0.93	3.7	0.03	0.0001
1768.75	Great Swamp near Ridgeland	48.8	Oct 1977-Present	3	42.8	0.88	*[e]	*	*

[a] Flow equaled or exceeded 90 percent of the time.
[b] Seven day low flow with a 10 year recurrence interval.
[c] Minimum daily flow for period of record.
[d] Instantaneous maximum flow for period of record.
[e] * Indicates statistic not calculated.

of 600 acres and a volume of 3,600 acre-feet. These and all other lakes larger than 200 acres are presented in Table 121. The total surface area of all lakes larger than ten acres is about 7,000 acres and total volume is approximately 29,000 acre-feet.

Currently, no hydroelectric power sites exist in the sub-basin and no potential sites have been identified.

The U.S. Army Corps of Engineers has been involved in numerous navigation projects within the sub-basin (Table 122). These projects were concentrated primarily in coastal waters; however, none are currently active.

The Willow Swamp region of Colleton and Bamberg Counties is the site of the only completed Soil Conservation Service flood control project within the sub-basin. It includes 37.1 miles of channel improvement. The Upper New River of Beaufort and Jasper Counties is the site of construction which will include 28 miles of channel improvement. These projects and other problem areas are presented in Table 123 and Figure 132.

Water Quality

The major portion of freshwaters in this sub-basin have Class A water use designations, suitable for primary contact recreation (Fig. 133). All other freshwater bodies are designated Class B. Coastal waters are primarily designated Class SA, indicating saltwaters suitable for harvesting of clams, mussels, and oysters for human consumption. All other tidal waters in this sub-basin are designated Class SB. Water quality limited segments which require advanced treatment of wastewater discharges include all or part of the Coosawhatchie River, Black Creek, Lemon Creek, Buckhead Creek, Inland Creek, Great Swamp and several minor tributary streams (Fig. 134). Water quality in the Combahee-Coosawhatchie Sub-basin is generally adequate for most designated water use activities. However, due to natural conditions, such as drainage from extensive swamplands, high summer water temperatures, and slow moving waters, water bodies throughout this sub-basin experience chronic low dissolved oxygen concentrations.

The Coosawhatchie River exhibits generally satisfactory conditions with lower water quality during portions of the year (S.C. Department of Health and Environmental Control, 1980b). Water quality problems in this river include high mercury and fecal coliform bacteria concentrations and low dissolved oxygen levels. While the source of mercury contamination is unknown, dissolved oxygen and fecal coliform bacteria problems are attributed to natural conditions and/or non-point source pollution. Contraventions of State dissolved oxygen standards in this river often occur during the summer months (U.S. Geological Survey, 1979, 1980, 1981; S.C. Department of Health and Environmental Control, 1980b). A fish kill in July 1980 of about 1,200 eel, bream, and catfish was attributed to low dissolved oxygen concentrations in this river (S.C. Department of Health and Environmental Control, unpublished fish kill records).

The Salkehatchie River has in the past experienced depressed dissolved oxygen levels and elevated fecal coliform bacteria concentrations (S.C. Department of Health and Environmental Control, 1975c). These water quality problems were attributed primarily to non-point sources and some municipal point source discharges. Current assessments, however, indicate that this river has generally good water quality and has exhibited a slight improvement in dissolved oxygen levels during recent years (S.C. Department of Health and Environmental Control, 1980b).

Chemical and physical water quality parameters indicate that water quality in the tidally influenced coastal waters is satisfactory with decreased quality during portions of the year. Problem conditions include high concentrations of metals and fecal coliform bacteria and low dissolved oxygen values. These problem conditions have been attributed primarily to natural conditions and non-point source runoff. Biological data from these coastal waters indicate fair to good conditions with no noticeable trends (S.C. Department of Health and Environmental Control, 1980b). High concentrations of fecal coliform bacteria levels have resulted in the closing of shellfish grounds in waters near Beaufort, Hilton Head Island, and Turtle Island (Fig. 134).

Table 123.
Flood control projects in the Combahee-Coosawhatchie River Sub-basin, South Carolina.

Map No.	*Project/Watershed Name*	*County*	*Responsible Agency*[a]	*Status*
13	Willow Swamp	Colleton/Bamberg	SCS	Completed 1974
14	Upper New River	Beaufort/Jasper	SCS	Under construction
15	Sanders Branch/ Crooked Creek	Hampton	SCS	Terminated
16	Sheldon Watershed	Beaufort	SCS	Terminated
17	Ehrhardt	Bamberg	SCS	Identified problem area
18	North Hilton Head	Beaufort	SCS	Identified problem area

[a] SCS indicates Soil Conservation Service

Sources: U.S. Department of Agriculture, 1980, 1983.
U.S. Army Corps of Engineers, 1982c.

occurs at a depth of 830 feet in Colleton County and about 1,500 feet near Beaufort. The aquifer is about 300 and 500 feet thick, respectively. Fine grained sediments, such as clay or clayey limestone within the Peedee, function more as confining beds than as aquifers and probably contain mineralized water in coastal Beaufort and southern Colleton and Jasper Counties. The occurrence of freshwater in the Peedee Aquifer System was reported in a well in northern Beaufort County (Siple, 1960). This well has been subsequently filled in and duplicate analyses of freshwater from the Peedee Aquifer have not been obtained.

The top of the Black Mingo Aquifer System in Hampton and Colleton Counties occurs at a depth of approximately 600 feet, and in Beaufort County at depths of 860 to 1,100 feet. The thickness of sediments is about 400 feet. Wells thought to be screened in the Black Creek or Ellenton Aquifer Systems have natural flows of 50 to 250 gpm of good quality water in Hampton and Colleton Counties. In Beaufort and Jasper Counties, the water-bearing properties of the Black Mingo System are not known.

The Tertiary Limestone Aquifer System is the main source of ground water in the sub-basin. More than 4,000 wells approximately 50 to 250 feet deep tap this aquifer system and provide over 80 percent of the ground water used in this area. The thickness of the Tertiary Limestone Aquifer System ranges from 400 feet in Hampton and Colleton Counties to more than 900 feet in Beaufort County, and probably more than 1,000 feet in southern Jasper County.

The Tertiary Limestone Aquifer System in the southern coastal counties was differentiated by Hayes (1979) into two permeable zones, the Upper Unit and the Lower Unit, separated by a zone of low permeability. The Lower Unit is about 30 feet thick in Beaufort and Colleton Counties. In Jasper County, the thickness and water bearing characteristics of the Lower Unit are unknown. The transmissivity of the Lower Unit in northern Colleton and Hampton Counties is estimated to range from 500 to 5,000 ft^2/day. Wells drilled into the Lower Unit are usually open to the Upper Unit. The Upper Unit of the Tertiary Limestone Aquifer System is the major source of ground water in the sub-basin. Wells which tap this unit range from 50 feet deep in the vicinity of Beaufort to more than 200 feet deep in Jasper County. The hydraulic properties of this unit vary considerably. The permeability of the aquifer system as a whole decreases from southwest (Jasper County) to the northeast (southern Colleton County) where the Upper Unit is absent.

The large volume of water pumped from the Tertiary Limestone Aquifer System by the City of Savannah has lowered water levels in the aquifer from the original potentiometric surface of 10 to 35 feet above mean sea level in 1880, to approximately 150 feet below mean sea level in 1980. The decline of water levels has changed or reversed the original direction of ground-water movement from a direction toward Port Royal Sound to one toward the center of pumpage at Savannah. Continued dewatering of the Tertiary Limestone Aquifer System will affect the area near the cone of depression, centered at Savannah, by causing compaction of overlying confining beds and possibly land-surface collapse.

The Shallow Aquifer System (Hawthorne, Duplin, and Pleistocene sediments) occurs discontinuously throughout the sub-basin. Wells less than 25 feet to about 100 feet deep tap these sediments. The hydrologic characteristics of the Shallow Aquifer System are unknown; however, this system is an important source for domestic water supplies in coastal areas.

Water Quality

In general, water quality from all aquifer systems in the northern extremes of the sub-basin is good and suitable for most uses. However, as these systems down dip toward the coast, water quality generally deteriorates. High water temperatures, chlorides, and dissolved solids in the deep-lying Middendorf and Black Creek Aquifer Systems make these systems undesirable sources of ground water in the southern portion of the sub-basin. Brackish water in the Peedee Aquifer System also discourages use of this ground-water source. The Black Mingo Aquifer System exhibits occasional high iron concentrations which affect the taste and use of this water in some areas of the sub-basin.

The most utilized aquifer system in the sub-basin is the Tertiary Limestone Aquifer System. The concentration of major chemical constituents varies among wells. Hardness is usually below 140 mg/L, total dissolved solids below 200 mg/L, and pH ranges from 7.5 to 8. Chloride concen-

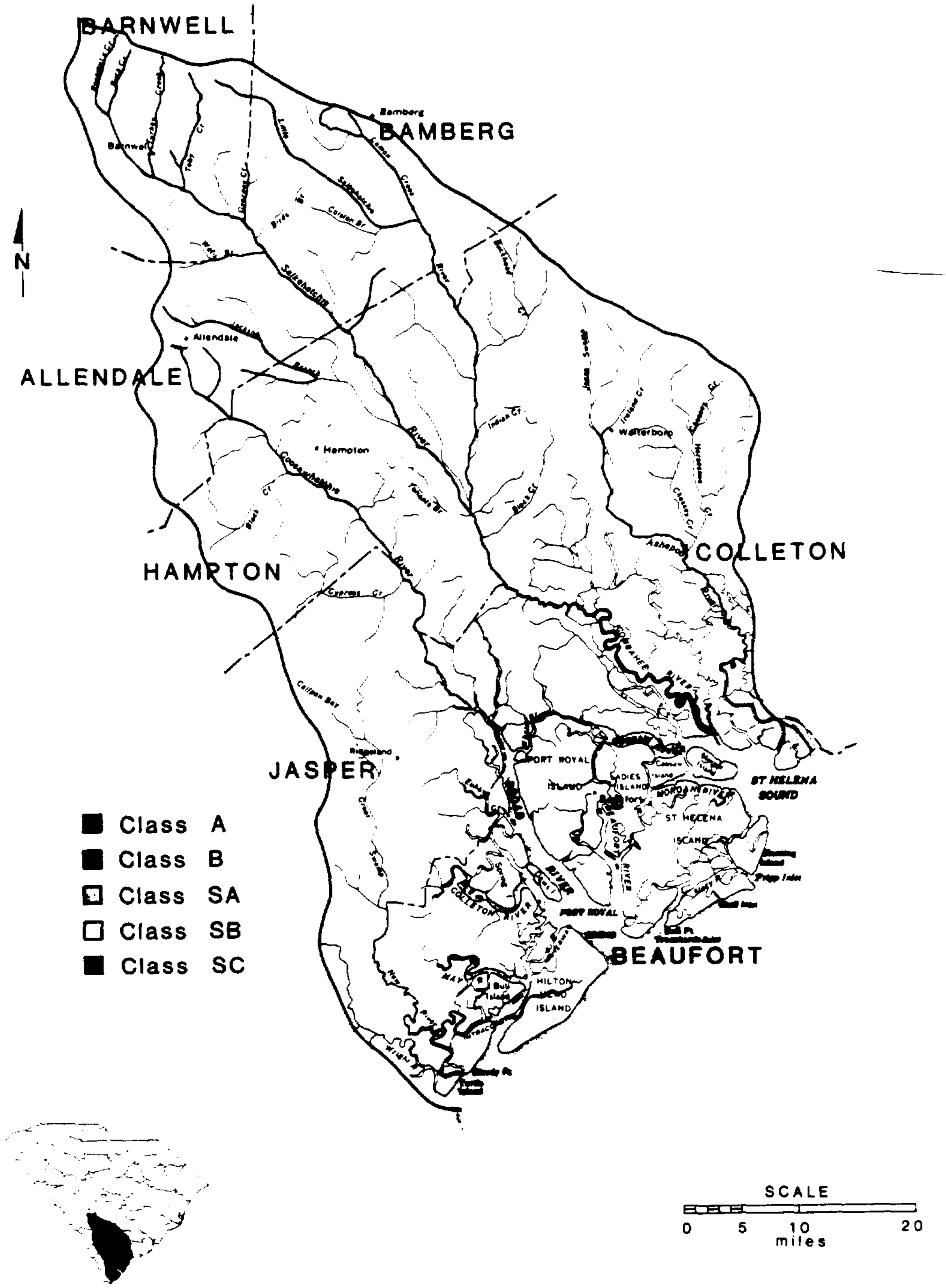

Figure 133.
Surface-water quality classifications in the Combahee-Coosawhatchie River Sub-basin, South Carolina (S. C. Department of Health and Environmental Control, 1980a).

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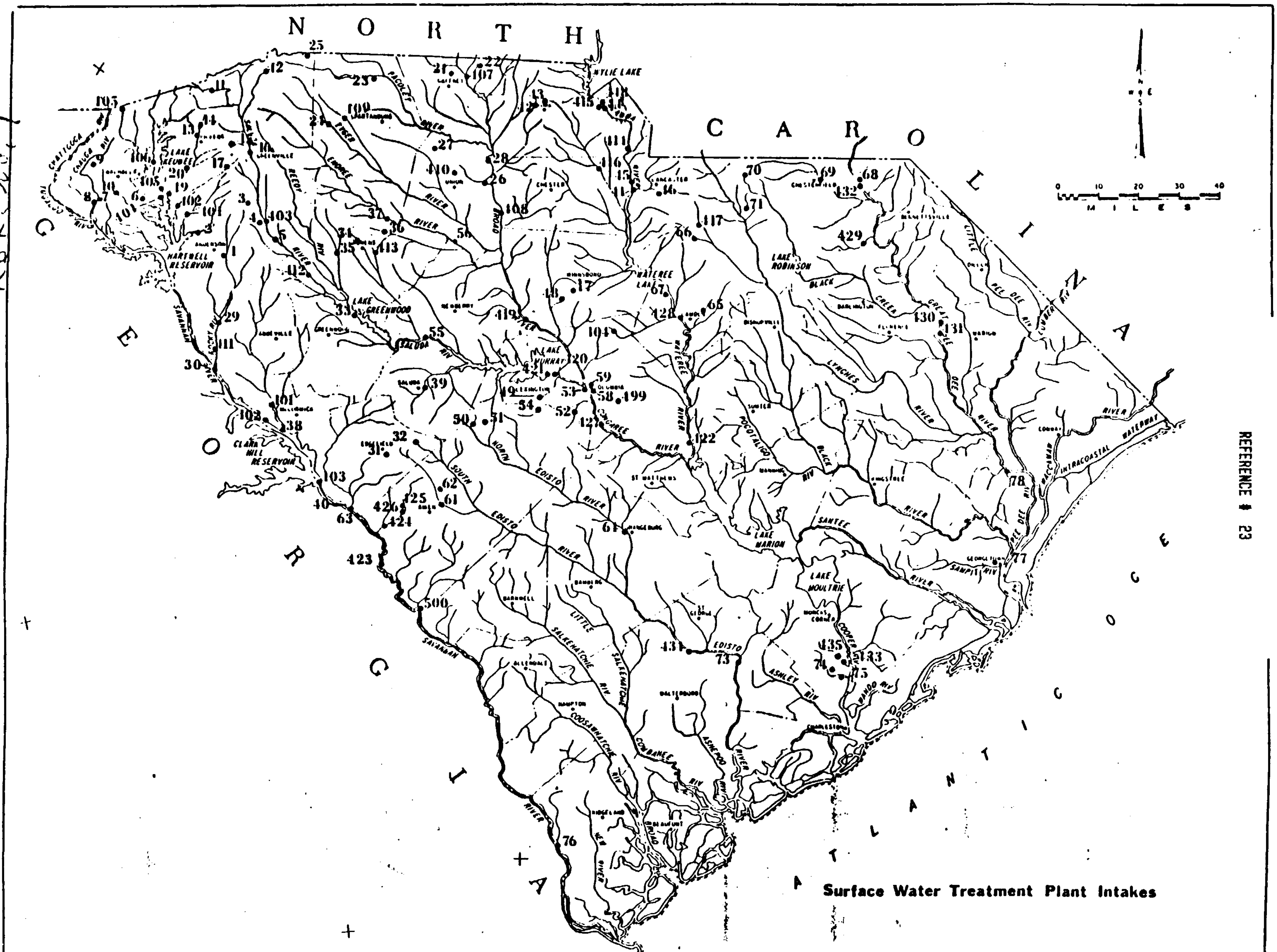

Surface Water Treatment Plant Intakes

REFERENCE # 23

NUS CORPORATION AND SUE	REFERENCE # 24	TELECON NOTE
CONTROL NO. F4-8904-54	DATE: December 27, 1989	TIME: 1115
DISTRIBUTION: American Color and Chemical/Venture Chemical File		
BETWEEN: Mr. Bill Seaborn	OF: SC Dept. of Health & Env. Control	PHONE: (803) 524-9760
AND: James Miller, NUS Corporation J.M.		

DISCUSSION:

Called Bill Seaborn about shellfish harvesting closure zones along the surface water migration pathway for this site. According to Mr. Seaborn, the areas that are currently closed include:

- Campbell Creek;
- McCalleys Creek;
- Brickyard Creek;
- unnamed tributary near Halfmoon Island; and
- the area along Whale Branch between the mouth of the unnamed tributary and the railroad trestle that crosses Huspa Creek.

The closure zones also include the wetlands located within 1000 feet of the banks for each of these.

ENDANGERE SPECIES

U.S. FISH AND WILDLIFE SERVICE

REGION 4 - ATLANTA

Index

PREFACE

The materials in this notebook are provided as an aid to anyone having a continuing need for current information on Federally listed endangered and threatened species found within Region 4 of the U.S. Fish and Wildlife Service. This area includes the Carolinas, Georgia, Florida, Alabama, Tennessee, Kentucky, Mississippi, Arkansas, Louisiana, Puerto Rico, and the Virgin Islands.

Recipients of the notebook are placed on a permanent mailing list and will automatically receive updated information whenever listing or other changes occur. Questions or comments pertaining to the notebook should be directed to the Endangered Species Office, U.S. Fish and Wildlife Service, Richard B. Russell Federal Building, 75 Spring St., S.W., Atlanta, Georgia 30303; telephone 404/221-3583 or FTS 242-3583. Other questions pertaining to endangered species matters should be addressed to one of the Service field stations listed at the end of this Preface.

The notebook is divided into two primary sections. Materials in the first section provide quick reference as to what species are listed, proposed, or under review, the states where they occur, the location of critical habitat areas, and other related information. The second part of the notebook contains species accounts which briefly discuss such things as the status, range, life history, and management needs of listed species. Please note that the range maps for these species generally reflect current distribution, but in many cases they reflect distribution rather broadly and should only be interpreted in relation to other information included in the species account.

The Endangered Species Act - General

Passage of the Endangered Species Act of 1973 gave the United States one of the most far-reaching laws ever enacted by any country to prevent the extinction of imperiled animals and plants. Under the law, the Secretary of the Interior (acting through the U.S. Fish and Wildlife Service) has broad powers to protect and conserve all forms of wildlife and plants he finds in serious jeopardy. The Secretary of Commerce, acting through the National Marine Fisheries Service, has similar authority for protecting and conserving most marine life.

Congress addressed the question of why we should save endangered species in the preamble to the Endangered Species Act, holding that endangered and threatened species of fish, wildlife and plants "are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people." In making this statement, Congress was summarizing a number of convincing arguments advanced by thoughtful scientists, conservationists, and others who are greatly concerned by the disappearance of wildlife.

Protecting endangered species and restoring them to the point where their existence is no longer jeopardized is the primary objective of the U.S. Fish and Wildlife Service's Endangered Species Program.

The Listing Process

The Fish and Wildlife Service follows a formal "rulemaking" procedure in determining which species should be placed on the U.S. List of Endangered and Threatened Wildlife and Plants. The Act defines an "endangered" species as one that is in danger of extinction throughout all or a significant portion of its range. A "threatened" species is defined as one that is likely to become endangered within the foreseeable future.

A "rulemaking" is the process used by Federal agencies (and many states) to propose and later adopt regulations which have the effect of law, and apply to all U.S. residents. The proposed rule is published in the Federal Register, a daily Government publication, to provide for public notification and a period for comments. The proposal is then reevaluated, and if adopted it is published again as a final rule. Endangered or threatened species are placed on the list, reclassified, or deleted through this process.

Protection Under the Act

Section 9 of the Act prohibits the illegal possession, import, export, or interstate or foreign sale of listed species (including their parts and products). It is also illegal to kill, harrass, harm, or remove listed species of animals from the wild. Taking of plants is prohibited only on Federal lands. Under Section 7 of the Act, Federal agencies are required to insure that actions they authorize (by permit), fund, or carry out do not jeopardize the existence of listed species or adversely affect critical habitat.

Penalties for violations can range from a warning and seizure of illegally held wildlife specimens and products to a maximum of $20,000 and/or a year in jail for criminal offenses.

Critical Habitat

The Endangered Species Act, as amended, calls for the conservation of what is termed "critical habitat"--the areas of land, water, and air space an endangered or threatened species needs for survival. These areas include such things as food and water, breeding sites, cover or shelter, and sufficient habitat to provide for normal population growth and behavior. Critical habitat is usually included with the proposal to list a species. However, if it is determined separately at a later date, the rulemanking procedure is the same as for classifying a species as endangered or threatened.

One of the primary threats to most species is the destruction or modification of essential habitat areas by uncontrolled land and water development. Accordingly, the law requires all Federal agencies to insure that actions they authorize (by permit), fund, or carry out do not jeopardize the existence of listed species or adversely affect critical habitat.

It should be emphasized, however, that not all Federal actions will necessarily be detrimental to critical habitat. There may be many kinds of actions which can be carried out within a critical habitat area without reducing the species' numbers or distribution, or otherwise posing jeopardy to it.

In summary, the designation of critical habitat does not create a nature preserve or refuge. It does not affect private, local, or state projects unless Federal funds or permits are involved. It does provide a means by which listed species can be protected from adverse impacts resulting from Federal action.

Consultation

Section 7 of the Act requires all Federal agencies to review their actions, and if they determine that their actions may affect a listed species or its habitat, they must enter into consultation with the Fish and Wildlife Service. During the course of such consultation the involved agency and the Fish and Wildlife Service will try to determine a course of action which will allow for completion of the agency's project and at the same time not jeopardize the species. Most consultations accomplish this goal.

In the case of a conflict, the Act provides a means whereby under certain conditions the affected Federal agency may be exempted from the requirements of Section 7. Exemption applications must be submitted to the Secretary of the Interior for consideration. If the Secretary decides the application meets exemption criteria, it is then passed on to a seven-member cabinet-level Endangered Species Committee for a final decision.

Conservation and Recovery

A main aim of the Service's Endangered Species Program is to restore populations of listed species to a point where they are no longer in danger of extinction and are again self-sustaining members of their ecosystem. Recovery plans for a number of these species are already being carried out. The plans may recommend the acquisition of land, new research, captive breeding, or may call for special wildlife and habitat management techniques.

In addition to overseeing the development and implementation of recovery plans, the Fish and Wildlife Service utilizes the authorities and funding provided under the Act to provide for technical assistance, management, law enforcement, land acquisition, research, status surveys, and financial assistance to state agencies which have entered into a cooperative agreement with the Service.

Permits

The Service's Wildlife Permit Office can issue permits for certain activities involving endangered or threatened species. Permits for endangered species are issued only for scientific or breeding purposes. In addition to these purposes, permits for threatened species may be issued for educational activities, zoo exhibitions, and other special purposes.

<u>U.S. Fish and Wildlife Service Endangered Species Field Offices - Region 4</u>

U.S. Fish and Wildlife Service (serves KY, NC, SC, TN)
100 Otis Street, Room 224
Asheville, NC 28801
Phone: 704/259-0321
FTS 672-0321

U.S. Fish and Wildlife Service (serves AL, AR, LA, MS)
Jackson Mall Office Center
300 Woodrow Wilson Avenue, Suite 316
Jackson, MS 39213
Phone: 601/960-4900
FTS 490-4900

U.S. Fish and Wildlife Service (serves GA and FL)
2747 Art Museum Drive
Jacksonville, Florida 32207
Phone: 904/791-2580
FTS 946-2580

U.S. Fish and Wildlife Service (serves PR and VI)
Post Office Box 491
Boqueron, PR 00622
Phone: 809/851-7297

Federally Listed Species by State

SOUTH CAROLINA

(E=Endangered; T=Threatened; CH=Critical Habitat determined)

Mammals	General Distribution
Cougar, eastern (*Felis concolor cougar*) - E	North, East
Manatee, West Indian (*Trichechus manatus*) - E	Coastal waters
Panther, Florida (*Felis concolor coryi*) - E	South, West
Whale, finback (*Balaenoptera physalus*) - E	Coastal waters
Whale, humpback (*Megaptera novaeangliae*) - E	Coastal waters
Whale, right (*Eubalaena glacialis*) - E	Coastal waters
Whale, sei (*Balaenoptera borealis*) - E	Coastal waters
Whale, sperm (*Physeter catodon*) - E	Coastal waters

Birds	
Eagle, bald (*Haliaeetus leucocephalus*) - E	Entire state
Falcon, American peregrine (*Falco peregrinus anatum*) - E	Northwestern mountains
Falcon, Arctic peregrine (*Falco peregrinus tundrius*) - T	Coast, western mountains
Plover, piping (*Charadrius melodus*) - T	Coast
Stork, wood (*Mycteria americana*) - E	Coastal swamps
Warbler, Bachman's (*Vermivora bachmanii*) - E	East, South
Warbler, Kirtland's (*Dendroica kirtlandii*) - E	East, North
Woodpecker, ivory-billed (*Campephilus principalis*) - E	East
Woodpecker, red-cockaded (*Picoides* (=*Dendrocopos*) *borealis*) - E	Entire state

Reptiles:	
Alligator, American (*Alligator mississippiensis*) - T(S/A)*	Coastal plain
Snake, eastern indigo (*Drymarchon corais couperi*) - T	Extreme Southeast

*Alligators are biologically neither endangered nor threatened. For law enforcement purposes they are classified as "Threatened due to Similarity of Appearance." Alligator hunting is regulated in accordance with State law.

Turtle, Kemp's (Atlantic) ridley (*Lepidochelys kempii*) - E	Coastal waters
Turtle, green (*Chelonia mydas*) - T	Coastal waters
Turtle, hawksbill (*Eretmochelys imbricata*) - E	Coastal waters
Turtle, leatherback (*Dermochelys coriacea*) - E	Coastal waters
Turtle, loggerhead (*Caretta caretta*) - T	Coastal waters

Fishes:

Surgeon, shortnose (*Acipenser brevirostrum*) - E	Coastal rivers

Plants:

Isotria medeoloides (small whorled pogonia) - E	Oconee County
Lindera melissifolia (pondberry)	Berkeley County
Oxypolis canbyi (Canby's dropwort) - E	Bamburg, Colleton, Richland, Barnwell Counties
Ribes echinellum (Miccosukee gooseberry) - E	McCormick County
Sagittaria fasciculata (bunched arrowhead) - E	Greenville County
Trillium persistens (persistent trillium) - E	Tallulah-Tugaloo River System, Oconee County

CRITICAL HABITAT INDEX

Alabama	- Etheostoma boschungi, "slackwater darter"
	Peromyscus polionotus ammobates, "Alabama beach mouse"
	Peromyscus polionotus trissyllepsis, "Perdido Key beach mouse"
	Speoplatyrhinus poulsoni, "Alabama cavefish"
Arkansas	- Percina pantherina, "leopard darter"
Florida	- Ammospiza maritima mirabilis, "Cape Sable sparrow"
	~~Ammospiza maritima nigrescens, "dusky seaside~~ sparrow"
	Crocodylus acutus, "American crocodile"
	Peromyscus polionotus allophrys, "Choctawhatchee beach mouse"
	Peromyscus polionotus trissyllepsis, "Perdido Key beach mouse"
	Rostrhamus sociabilis plumbeus, "Everglade kite"
	Trichechus manatus, "Florida manatee"
Georgia	- Percina antesella, "amber darter"
	Percina jenkinsi, "Conasauga logperch"
Kentucky	- Myotis sodalis, "Inidana bat"
	Palaemonias ganteri, "Kentucky cave shrimp"
Louisiana	- No designations
Mississippi	- Grus canadensis pulla, "Mississippi sandhill crane"
North Carolina	- Hudsonia montana, "mountain golden heather"
	Hybopsis monacha, "spotfin chub"
	Menidia extensa, "Waccamaw silverside"

Puerto Rico	-	Agelaius xanthomus, "yellow-shouldered blackbird"
		Anolis roosevelti, "giant anole"
		Cyclura stejnegeri, "Mona ground iguana"
		Eleutherodactylus jasperi, "golden coqui"
		Epicrates monensis monensis, "Mona boa"
		Eretmochelys imbricata, "hawksbill sea turtle"
		Sphaerodactylus micropithecus, "Monito gecko"
South Carolina	-	No designations
Tennessee	-	Etheostoma boschungi, "slackwater darter"
		Hybopsis cahni, "slender chub"
		Hybopsis monacha, "spotfin chub"
		Myotis sodalis, "Indiana bat"
		Noturus baileyi, "smoky madtom"
		Noturus flavipinnis, "yellowfin madtom"
		Percina antesella, "amber darter"
		Percina jenkinsi, "Conasauga logperch"
Virgin Islands	-	Ameiva polops, "St. Croix ground lizard"
		Dermochelys coriacea, "leatherback sea turtle"

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Campbell Creek System, Beaufort County

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Introduction

Beginning in 1972, the Chemical Oceanography Section of the Marine Resources Research Institute (MRRI) has been involved with specific environmental problems as related to South Carolina's marine resources. Initially this section focused its activities on determining trace metals concentrations in various estuarine systems along our coast. Other work included cooperations on evaluations of permit requests as reviewed by the Environmental Evaluations Section of the Office of Fisheries Management. In response to concerns expressed by commercial shrimpers, crabbers, and others, the Marine Resources Division (MRD) purchased a gas chromatograph (GC) in November 1984 to analyze samples for organic pollutants, especially certain pesticides and herbicides. The GC provided the means to include numerous organic pollutants in addition to the metals already analyzed at MRRI, both types of analyses to be used to complement ongoing studies of the Department of Health and Environmental Control (DHEC).

In response to a request from the Environmental Evaluation Section, the Chemical Oceanography Section collected oysters from Campbell Creek during August 1983 as part of an evaluation of Venture Chemical Company's permit request. Preliminary analyses performed at the College of Charleston indicated very complex mixtures of organic compounds were present in the oysters. Our metals analyses showed cadmium levels of 1.5-2.0 ppm and elevated levels of lead (> 2.0 ppm). (The NOAA Laboratory at Ft. Johnson found 1.5 ppm cadmium in oysters from the same group). Subsequent meetings with DHEC led to two separate studies by DHEC in 1983 and 1984 on contaminant levels in Campbell Creek (Marcus and Swearingen 1984, 1985).

At the request of commercial crabbers in Beaufort County, we initiated a study in the Campbell Creek - Whale Branch area in June, with samples being taken through early October (Table 1). Crab, oyster, sediment, and water samples were collected at Campbell Creek (WB04, WB05, WB06) and at three stations in Whale Branch (WB01, WB02, and WB03) (Figure 1).

Results and Discussion

The initial goal to be addressed by this study was that of environmental health, as expressed by Beaufort County crabbers, who noted that crab catches had declined over the last three years and suspected that pollution was a contributing factor. Based on high PCB levels in the sediments of Campbell Creek as reported by DHEC (Marcus and Searingen 1985), samples were analyzed for PCB's as well as pesticides.

Pesticide residues were detected in most samples typical of other parts of the state. No obvious problems were noted with respect to any of the commonly-occurring compounds. Our chromatograms, however, indicated high levels of complex PCB mixtures in sediments as per DHEC's study and in both crabs and oysters. Due to the complex mixture of PCB's and the fact that we found Aroclor 1232 in most samples, our values are reported as Aroclor 1232, although Aroclor 1242, 1254, and 1260 were present in many samples (Table 1). Due to low solubilities no quantifiable amounts of PCB's were detected in water samples and, hence, no concentrations are listed in Table 1. Since PCB's are fat soluble and can be highly concentrated by estuarine organisms, much higher concentrations can be found in tissue samples than in water samples. Bioconcentrations factors greater than 230,000 for blue crabs, greater than 670,000 for speckled trout have been reported (Duke et al. 1970, Nimmo et al. 1975). Our data illustrate significant bioconcentration by both blue crabs and oysters, e.g. water samples were less than 0.4 ng, whereas crab samples had individual PCB peaks up to 1000 ng or more in some cases (actual net concentrations were much lower on a μg/g basis).

Toxicity studies conducted on freshwater fish (sheepshead minnows) indicate that concentrations of 6.1 μg/g for Aroclor 1254 were lethal to 50% of the fish tested (Hansen et al. 1973). Sheepshead minnow fry from embryos containing 7.0 μg/g PCB's began dying a few hours after hatching. Our results were up to 7.73 μg/g in crab tissue (Table 1). Even though the effects of elevated PCB concentrations in marine organisms may not be well known, concentrations as high as we measured in Campbell Creek may be toxic or lethal to shrimp and finfish, if not blue crabs in particular. In addition, the bioaccumulation of PCB's may be harmful to mammals feeding on PCB-contaminated fish and shellfish. Platonow and Kalstad (1973) found that reproduction in ranch mink fed a diet with 0.64 μg/g of Aroclor 1254 was almost eliminated, whereas in another study (Ringer et al. 1972) a level of 2 μg/g PCB's precluded the survival of rank mink offspring. As a consequence, other estuarine organisms or mammals (including humans) could experimence some harmful effects from eating estuarine organisms highly-contaminanted by PCB's.

With the above background, MRD contacted DHEC about the elevated PCB concentrations in blue crabs from Campbell Creek, feeling that an environmental and possibly a health hazard existed in Campbell Creek. Additional work needs to be conducted in the Campbell Creek-Whale Branch area on a larger scale to determine the extent of environmental degradation. Other studies should also be performed to discover what levels of PCB's and other pollutants within the respective organisms are harmful as opposed to concentrations in water.

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Table 1.

Values of Aroclor 1232 found in crabs, oysters, and sediments collected from sample sites in Huspah Creek, Whale Branch, and Campbell Creek. Values are in parts per million. (WB01, WB02 & WB03 are in Whale Branch; WB04, WB05 & WB06 are in Campbell Creek).

Date	Station	Crabs	Oysters	Sediment
3/29/85	Huspah Creek	*	0.97	**
6/3/85	Huspah Creek	*	*	0.24
6/3/85	WB04	*	*	25.21
7/2/85	WB04	7.73	*	*
7/11/85	WB04	*	0.83	*
8/27/85	WB04	2.17	0.91	7.71
8/27/85	WB04	1.01		
7/11/85	WB05	1.23	*	2.98
8/27/85	WB05	0.91	0.25	4.66
8/27/85	WB05	0.50		
7/11/85	WB06	1.14	0.28	12.37
8/27/85	WB06	0.99	0.23	2.20
8/27/85	WB06	2.79		
7/2/85	WB03	0.57	*	**
8/27/85	WB03	0.36	**	0.21
8/27/85	WB03	0.33		
7/2/85	WB02	0.22	*	1.21
7/11/85	WB02	*	*	0.59
8/27/85	WB02	0.10	*	**
8/27/85	WB02	0.34		
7/2/85	WB01	0.45	*	**
8/27/85	WB01	*	0.03	**
10/4/85	WB02	0.11[a]		
10/4/85	WB02	0.81[a]		
10/4/85	WB02	4.29[a,b]		
10/4/85	WB04	1.26[a]		
10/4/85	WB04	2.79[a,c]		
10/4/85	WB04	3.93[a]		
10/4/85	WB04	0.63[a,b]		
10/4/85	WB04	6.31[b,c]		
10/4/85	WB04	1.59[a,c]		
10/4/85	WB05	0.26[a]		
10/4/85	WB05	1.93[b]		
10/4/85	WB05	2.10[a]		

*No sample taken; **Too few peaks to ascertain presence of A1232; a = Backfin tissue; b = other body tissue; c = trap left at WB04 for two weeks.

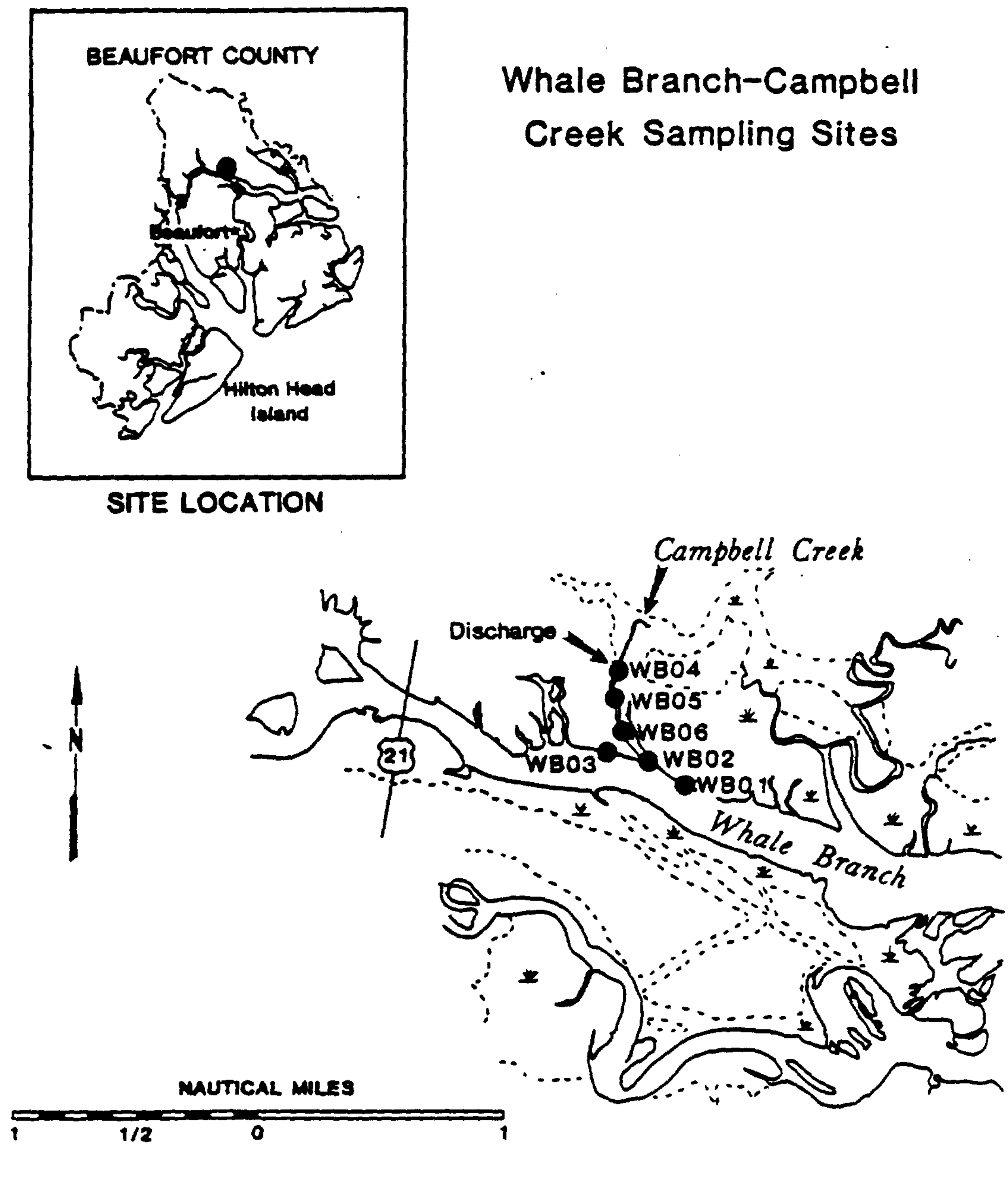
BEAUFORT COUNTY
Beaufort
Hilton Head
Island
SITE LOCATION
Whale Branch-Campbell
Creek Sampling Sites
Campbell Creek
Discharge
WB04
WB05
WB06
WB03
WB02
WB01
21
Whale Branch
N
NAUTICAL MILES
1
1/2
0
1

FIGURE 1.

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Venture File

5. CONCLUSIONS

1. Sixty-six (66) different organic chemical compounds were detected in oyster tissue, sediment and effluent during this assessment. A toal of 71 compounds were actually detected but five of these were found in both oyster tissue and sediment. Thirty-four compounds (27 aliphatics and seven aromatics) were detected in oyster tissue; 29 compounds (13 aliphatics and 16 aromatics) were detected in sediment; and, eight compounds (one aliphatic and seven aromatics) were detected in the effluent. Due to the nature of these compounds, their often intimate use in organic synthesis/dye production reaction and their occurrence/distribution pattern over the assessment area, the source of the vast majority of these constituents was determined to be the Venture Chemicals C ompany wastewater treatment facility effluent. These compounds reflected only those that were recovered in the analytical procedure employed and did not preclude the existence of ~~the~~ other chemical constituents in sediment, tissue or effluent.
2. Several of the compounds detected as noted in Conclusion No. 1 would be expected to exert some toxic or narcotic effects on a portion or all of the biological community in Campbell Creek. The occurrence of benzene, toluene, chlorinated benzenes, chlorinted phenols and other hydrocarbon compounds presented the potential for potent toxicological responses in the aquatic biological community. Likewise, some of the compounds detected are considered definite (benzene) or likely (chloroform) carcinogens. Compounds closely related but not structurally equivalent to other such potential/likely carcinogens were also detected in the assessment area. The ultimate significance of the presence of these known/likely carcinogens is not known at this time given the disparity between the animal systems used for

carcinogenicity testing and those of the estuarine environment and, also, duet to the lack of analytical quantitative data for most of these compounds. Nevertheless, the detection of these constituent, as well as the otherwise myriad of compounds is certainly basis fro concern.

3. The expected toxicological effects due to the mixture of synthetic organic chemicals was, in fact, manifested in the macroinvertebrate community in Campbell Creek. The community structure of both the hard substrate and soft substrate fauna in Campbell Creek had been deleteriously altered relative to other stations in the assessment area. A significant reduction in the numbers of decapod crustaceans and concomitant increase in numbers of other organisms filling this vacated niche reflected the perturbation of the aquatic community in Campbell Creek.

4. Fewer total numbers of oysters were observed in Campbell Creek relative to other stations in the assessment area. Perhaps more important, however, was the identification of significantly ($p<.05$) fewer juvenile ($\leq$11mm) oysters in Campbell Creek than at any of the other assessment stations. Whether those adult oysters currently present in Campbell Creek have been inhibited from or otherwise impacted to preclude spawning by the constituents in the wastewater or whether spawning has occurred and the resultant larvae have experienced lethal toxicity due to those constituents was not determined during this assessment. Nevertheless, it was apparent that moderate to severe impact had occurred in the aquatic macroinvertebrate community in Campbell Creek due to the discharge of wastewater from the Venture Chemicals Company wastewater treatment facility.

5. The biological degradation and apparent toxic effects of the wastewater was essentially limited to Campbell Creek and did not extend into Whale Branch. The satisfactory number of both juvenile and adult oysters at those stations

outside of Campbell Creek indicated ongoing spawning activities and general healthy functioning of the system. With an apparent satisfactory level of spawning ongoing in Whale Branch, some amount of larval recruitment into Campbell Creek would be reasonably expected. The aforementioned diminution of juvenile oysters in Campbell Creek even with reasonable expectation of larval recruitment from outside areas would suggest that constituents discharged to Campbell Creek from the wastewater treatment facility did, in fact, exert toxic effects on the oyster community there.

6. There was no significant accumulations of polynuclear aromatic hydrocarbons in either oyster tissue or sediment at any of the stations in the assessment area. The few compounds detected and the low levels at which they were measured actually indicated by comparison the significance of the occurrence/concentration of these compounds recently found around three marinas in Beaufort County and one marina in Georgetown County.

7. There was no significant accumulation of selected heavy metals in either oyster tissue or sediment at any of the stations in the assessment area. All discrete concentrations in oyster tissue were within the respective ranges observed in other South Carolina oysters. There was no significant differencies ($p>.05$) between the mean concentrations for any of the metals at all stations.

8. There were no contraventions of the Class SA quality standards for dissolved oxygen, pH and temperature in the assessment area. A limited amount of fecal coliform bacteria data from oyster tissue indicated potential violations of the State shellfish standards at some points in the assessment area although these could not be related directly to the presence of the Venture Chemical Company wastewater treatment facility discharge. There was some evidence of alteration in the bacteriological composition of Campbell Creek due to the discharge of wastewater and was apparently related to the

intermittent chlorination procedure employed at the facility, the nature of the influent waste stream/treatment process and the use of fecal coliform bacteria as the indicator organism group for this effluent instead of total coliform bacteria.

9. As noted in Conclusion No. 8, the bacteriological indicator group of choice to be used as an NPDES permit limit for the treatment facility would be the total coliform bacteria group (significantly, 70/100 ml) since the effluent does go to Class SA shellfishing waters. These waters employ total coliform bacteria are retained as the indicator group for permit compliance, the absolute maximum allowable limit should be reduced to 14/100 ml to coincide with the Federal criterion for quality shellfishing waters. In addition, the chosen bacteriological limit should be incorporated into the second phase of the NPDES permit. Currently, when the second phase of the permit becomes effective (i.e., when effluent flow increases beyond 180,000 gallons per day), there is no effluent limitation on bacteria.

10. There is an inconsistency in terminology in the NPDES permit as related to the definition of tidal cycle such that the ultimate oxygen demand cannot be calculated accurately. The ultimate oxygen demand permit specification requires that this parameter be reported in pounds per tidal cycle and is computed from the measured biochemical oxygen demand and ammonia nitrogen loadings. The sample type requirement for these two measured parameters is set at one to 12 hour composite sample. Since this facility discharges only on ebbing tide and since the complete exchange from ebb slack to ebb slack tide constitutes a tidal cycle; 12 hour composite sample could result in two different situations. In one instance, sampling could be conducted for 12 consecutive hours even though the discharge of wastewater occurred for only six of those hours with no sample being collected over the other six hours. Conversely, if two consecutive discharges are sampled, this would constitute two different

tidal cycles and, therefore, the ultimate oxygen demand level would not be reported correctly as per the permit requirements. A six hour composite sample under the sample type requirement would correct this monitoring/data reporting problem.

11. There were no apparent violations of the NPDES permit conditions as a result of the compliance sampling inspection during this assessment period. Even though the facility was sampled according to permit requirements, the ultimate oxygen demand could not be accurately computed or reported as per Conclusion No. 10.

12. Given the specialty chemical nature of the Venture Chemicals Company manufacturing process and the concomitant variations in the influent waste stream characteristics, it is questionable as to whether the biological treatment process can be expected to efficiently and consistently treat the raw waste. While biological systems are not automatically discounted for treating specific and consistent synthetic organic chemical wastes. The wide variations in the influent waste characteristics does not allow for the biological flora to become acclimated to the waste stream such that consistently efficient treatment is obtained.

13. Given the highly synthetic organic chemical nature of the wastewater which appears usually to contain a significant portion of aromatic compounds, disinfection of the effluent by chlorination must be examined carefully. The chlorination, or halogenation, of the effluent may, in some cases, actually increase the toxicity of some of the chemical constituents. Moreover, the discharge of chlorine containing effluent to estuarine waters itself presents the potential for toxicity to aquatic macroinvertebrates. This is but another aspect to the problem of the suitability of estuarine waters such as Campbell Creek to receive and assimulate such complex, synthetic organic chemical wastes as discharged from the Venture Chemicals Company.

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REFERENCE # 28

FILE - VENTURE WW

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

MEMORANDUM

TO: Russell W. Sherer, Director
Division of Water Quality Assessment and Enforcement

THRU: Harry L. Gaymon, Manager *Harry L. Gaymon*
Biological Services Section

FROM: Glenda R. Swearingen *Glenda R Swearingen*
Biological Services Section

SUBJECT: Crab Tissue Analyses for PCBs at Venture Chemicals, Incorporated, Beaufort County, NPDES #SC0000914

DATE: October 28, 1985

On September 27, 1985, the Biological Services Section with assistance from the South Carolina Wildlife and Marine Resources collected legally harvestable ($\geq$12.7 cm/5 inches) blue crabs, Callinectes sapidus, from seven locations (Table 1, Figure 1) in the vicinity of Venture Chemicals, Incorporated, Beaufort County for the purpose of polychlorinated biphenyl (PCBs) analyses of edible meat. The crab pots in Campbell Creek and Huspah Creek were not recovered, therefore, on October 10, 1985, the Biological Services Section collected crabs from MD-664, the station lost earlier in Campbell Creek and two additional stations in Campbell Creek.

Immediately after collection, crabs were placed on ice and transported live to the Biological Services Section for meat extraction. Individual samples consisted of composited backfin tissue from three crabs with three replicates per station. All sampling procedures and chain-of-custody of samples conformed to all applicable sections in The Standard Operating Procedures Manual and Quality Assurance Procedures Plan (SCDHEC) and Procedures and Quality Control Manual for Chemistry Laboratories.

Results of the analyses showed detectable levels of PCBs in nearly all samples (Table 2) which is not unexpected due to the ubiquitous nature of PCBs in the environment (National Academy of Sciences, 1979). However, PCBs in crab tissue from MD-664, at Venture Chemicals, Incorporated, outfall were elevated above values reported elsewhere for crab tissue (Table 3). The mean level of .949 ppm PCBs in crab muscle from MD-664 was significantly higher ($p<.05$, Kruskal-Wallis H test) than Stations MD-665 ($\bar{x}$ = .061) and MD-634 ($\bar{x}$ = .036). Although the other stations sampled were not significantly less than MD-664, all the values except for the 1.479 ppm level at MD-631 were comparable to levels seen elsewhere in crab muscle (Table 3). The one high PCB level at MD-631, a control station, indicates that contamination of the sample may have occurred during meat extraction. The heptaopancreas of the crab concentrates PCBs, frequently to levels of 20 ppm, and contamination of muscle tissue during dissection for meat extraction is quite possible and probably

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occurred in this case (personal communication, Dr. Ron Sloan, New York Toxics Monitoring Program, New York Department of Environmental Conservation).

However, all levels of PCBs in the crab tissue analyzed are below the 2.0 ppm tolerance level recommended by the Food and Drug Administration (Federal Register 21 CFR Part 109, Volume 49, No 100).

HLG/GRS/al

cc: Bob Gross
Jim Joy
George Nelson
Luke Hause
Lewis Shaw
Bob King
Tom Berry

attachments

Table 1: Sampling locations and Station descriptions for crab tissue sampling, September 27, 1985, and October 10, 1985.

Station	Location
MD-535	Whale Branch approximately 15 meters west of US 21 bridge
MD-538	Campbell Creek at confluence with Whale Branch
MD-664	Campbell Creek immediately at the Venture Chemicals, Incorporated, wastewater treatment facility discharge
MD-629	Campbell Creek approximately 50 meters upstream from Venture Chemicals, Incorporated, wastewater outfall
MD-630	Campbell Creek approximately 300 meters downstream of Venture Chemicals, Incorporated, wastewater outfall.
MD-631	Unnamed tributary to Haulover Creek, approximately 25 meters upstream from confluence with Haulover Creek
MD-634	Cossaw River at western point of Morgan Island where Bull River and Parrot Creek enter the Coosaw
MD-653	Huspah Creek at mouth of Field Creek
MD-665	North bank of Whale Branch at Stuarts Point

Figure 1: Sampling locations for crab tissue analysis for PCBs, September 27, 1985 and October 10, 1985, Beaufort County, S.C.

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Table 2: Total PCBs detected in muscle tissue of *Callinectes sapidus* in the vicinity of Venture Chemicals, Incorporated, September 27, 1985 and October 10, 1985. All values in ppm.

Replicate	MD-629	MD-664	MD-630	MD-538	MD-535	MD-653	MD-631	MD-665	MD-634
1	.1627	.606	.189	.121	.207		1.479	<.05[a]	.036
2	.216	.952	.027	.286	.027		.253	<.05	<.05
3	.302	1.025	.258	.212	.057		.098	.085	.022
4[b]		1.215				.157			
Mean	.227	.949	.158	.206	.097		.61	.061	.036
Standard Deviation	.070	.254	.119	.083	.096		.757	.02	.014

a = Non-detectable values treated as .049

b = Values in Replicate row 4 collected September 27, 1985

Table 3: PCBs (ppm) in Crab Muscle Tissue from various locations.

Location	Species	Levels	Reference
Chesapeake Bay, MD	*C. sapidus*	N.D. -.08	Eisenberg and Topping, 1984
Hudson River, NY	*C. sapidus*	0.16-0.29 ppm	NY Dept. of Environ. Cons., 1981
Palos Verdes, CA	crab	.019	Young, 1982
Whale Branch, SC	*C. sapidus*	.014 - 1.479	Present study

·U¹

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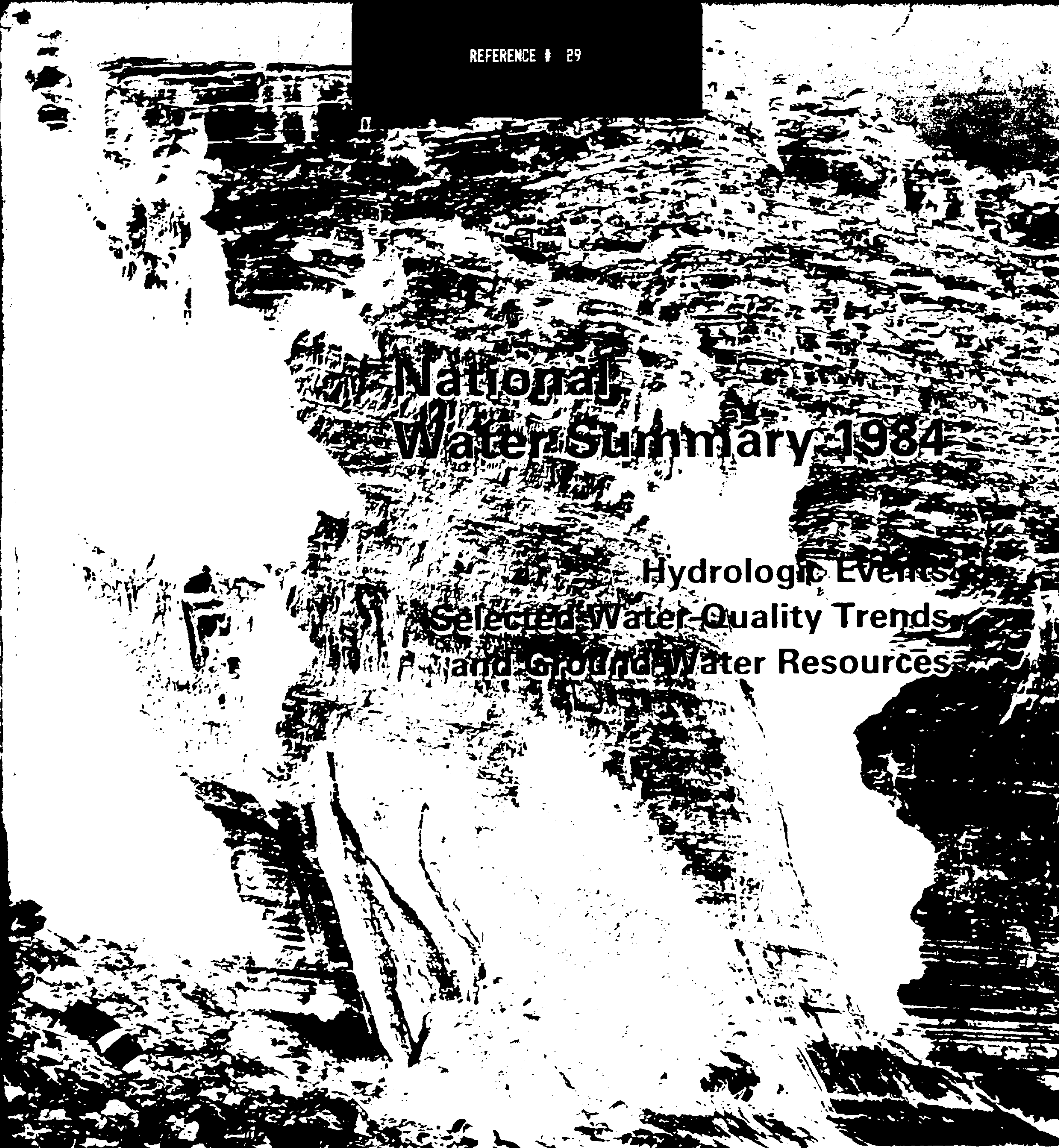

National Water Summary 1984

Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources

United States Geological Survey
Water-Supply Paper 2275

National Water Summary 1984

Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources

By United States Geological Survey

United States Geological Survey
Water-Supply Paper 2275

DEPARTMENT OF THE INTERIOR
DONALD PAUL HODEL, Secretary

U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

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Page 1, Hydrologist monitoring discharge from an irrigation pump north of Sterling, Colo. Well pumps 2,700 gallons per minute. (Photograph by D. E. Reed.)

Page 7, San Luis Drain to Kesterson National Wildlife Refuge, San Joaquin Valley, Calif. (Photograph by S. J. Deverel.)

Page 47, Analyst operating automated wet chemical analyzer for nitrogen at U.S. Geological Survey's Denver Central Laboratory. (Photograph by D. E. Reed.)

Page 117, Old pump, east of Brighton, Colo. (Photograph by D. E. Reed.)

INTRODUCTION TO NATIONAL WATER SUMMARY 1984

By David W. Moody and Edith B. Chase

The initial volume in the annual National Water Summary series (U.S. Geological Survey, 1984) introduced a chronology of hydrologic and water-related events to document their importance to human activities and also outlined a number of water issues of concern to the Nation. This second volume, *National Water Summary 1984—Hydrologic Events, Selected Water-Quality Trends*, and *Ground-Water Resources*, continues the chronology of events and presents additional information on several issues discussed in the 1983 volume. The 1984 *National Water Summary* is organized in three parts.

The first part, "Hydrologic Conditions and Water-Related Events, Water Year 1984," provides a synopsis of the hydrologic conditions and water-related events that occurred during the 1984 water year (October 1, 1983-September 30, 1984). Streamflow variations are compared to precipitation, temperature, and upper-air atmospheric pressure for the four seasonal quarters of the year to relate surface-water flows to climatic conditions.

The second part, "Hydrologic Perspectives on Water Issues," contains two sections. In the section titled "Water-Quality Issues," the occurrence of sediment, dissolved solids, nutrients, and pesticides in the Nation's streams are discussed. Recently compiled information is used to show the distribution and trends of these constituents and to relate them to various natural sources and human activities. The occurrence and sources of nitrate in ground water also are discussed. The section entitled "Water-Availability Issues" provides hydrologic explanations for changes in ground-water levels in several areas of the country.

The articles in this part of the report complement a number of other reports, published during the past year, which provide information on the water quality of the Nation's rivers. The 1982 *National Fisheries Survey* (Judy and others, 1984), cosponsored by the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency, provides an assessment of biological conditions in a statistical sample of river segments throughout the United States. The U.S. Environmental Protection Agency also sponsored an evaluation of the progress of water-pollution control efforts (Association of State and Interstate Water Pollution Control Administrators, 1984), an overview of nonpoint-source pollution (U.S. Environmental Protection Agency, 1984a), and the 1982 *National Water Quality Inventory* (U.S. Environmental Protection Agency, 1984b). Other recent studies that examine water resources from a national perspective include the 14th annual report of the U.S. Council on Environmental Quality (1983), the Conservation Foundation's (1984) *State of the Environment* report, and the Office of Technology Assessment's (1984) *Protecting the Nation's Groundwater from Contamination*.

The third and final part of the report, "State Summaries of Ground-Water Resources," summarizes for each State, the District of Columbia (combined with Maryland), Puerto Rico, the U.S. Virgin Islands, the Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa, the distribution, characteristics, and uses of principal aquifers. (The term "State" as used throughout the report is all inclusive of these geographic areas.) Each summary contains maps that show the location of aquifers and major areas of ground-water withdrawals and tables that describe the characteristics of the aquifers and present data on ground-water withdrawals. These descriptions of ground-water resources were prepared by the U.S. Geological Survey offices in each State.

Technical terms used in the report are defined in the Glossary. Selected references are given at the end of each article and State summaries to supplement the information provided. Numerous references are made to the National Drinking-Water Regulations; as an aid to the reader, these regulations follow the Glossary. A conversion table of water measurements and a geologic age chart also are provided for the reader's convenience.

ACKNOWLEDGMENTS

National Water Summary reports, because of their scope, are necessarily the work of many individuals. The coordinators of the 1984 *National Water Summary* wish to acknowledge the assistance of water-resources organizations in each State for their review of the descriptions of State ground-water resources and the assistance of the following Federal agencies, who provided unpublished data and advice in preparing parts of this report:

National Oceanic and Atmospheric Administration,
  National Weather Service
Tennessee Valley Authority
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation
U.S. Bureau of Land Management
U.S. Coast Guard, National Response Center
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Soil Conservation Service

The authors of individual articles and State ground-water summaries are identified within the report. Richard H. Johnson, John S. McLean, Andrew

M. Spieker, and Lindsay A. Swain coordinated the preparation of the State summaries. David A. Aronson, Bruce L. Foxworthy, Kenneth J. Lanfear, Perry G. Olcott, Robert S. Roberts, and Michael Turtora reviewed the text and illustrations. Janet N. Arneson coordinated the assembly of the manuscript. Although individual credit is not feasible for all reviewers, graphic specialists, and typists who participated in the preparation and publication of this report, their cooperation and many contributions are gratefully acknowledged. Overall preparation of the 1984 *National Water Summary* was directed by David W. Moody, John N. Fischer, and Edith B. Chase.

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State Summaries of Ground-Water Resources

INTRODUCTION TO STATE SUMMARIES OF GROUND-WATER RESOURCES

By Ralph C. Heath

The "State Summaries of Ground-Water Resources" part of the 1984 *National Water Summary* contains descriptions of the occurrence, use, and general quality of the ground-water resources of each State, the District of Columbia (combined with Maryland), Puerto Rico, the U.S. Virgin Islands, and the Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa. (Hereafter, the term "State" is used for all geographic areas.) Each summary contains the following components:

- General setting—Highlights of the physiographic, hydrologic, and geologic framework of the ground-water system.
- Principal aquifers—A description of location, geology, and use of the aquifers.
- Ground-water withdrawals and water-level trends—A description of the location and purpose of major ground-water withdrawals and the trends in water levels.
- Ground-water management—A description of ground-water related laws and regulations and an identification of management agencies.
- Selected references—A listing of relevant reports on ground-water resources.
- Table 1, Ground-water facts—A tabulation of ground-water withdrawals for various uses in relation to total water withdrawals. (Not included with the Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa.)
- Table 2, Aquifer and well characteristics—A listing of important characteristics of the principal aquifers and of the water-supply wells drilled in the aquifers. (Table 1 in Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa.)
- Figure 1, Principal aquifers—A map showing geographic distribution of the principal aquifers.
- Figure 2, Areal distribution of major ground-water withdrawals and trends in ground-water levels—A map showing areas of withdrawals, hydrographs showing the long-term water level trends of aquifers, and a tabulation of areas of withdrawals and use of the water.

In the State summaries, common ground-water terms are used, and reference is made, without explanation, to basic ground-water principles. Some of those terms and principles are described briefly in the glossary at the end of the report. Additional discussions of basic ground-water terms and principles and of the general features of ground-water occurrence in the United States are found in Heath (1983, 1984).

IMPORTANCE OF GROUND WATER TO THE NATION

Ground water is available in at least small amounts at nearly every point on the Earth's surface, making it one of the most widely available of all natural resources. It serves as the only, or the dominant, source of drinking water for most rural areas, as the largest source of water for irrigation and other purposes in arid and most semiarid regions, and as an important source of water for urban, industrial, and supplemental irrigation purposes in humid areas. The importance of ground water in the United States is shown graphically in figure 67. Nationwide, ground-water withdrawals in 1980 (excluding those for thermoelectric power) range from less than 1 percent of the total water withdrawal in the District of Columbia to 85 percent of that in Kansas. In 10 States, ground water represents more than one-half of the total withdrawal.

By far the largest use of ground water is for irrigation. States with the largest ground-water use are those in the western part of the conterminous United States—Arizona, California, Idaho, Kansas, Nebraska, and Texas—where irrigated agriculture is a major activity. In the eastern part of the country, States that use large amounts of ground water for irrigation include Arkansas, Florida, Louisiana, and Mississippi.

The importance of fresh ground water to the different States readily can be seen by comparing ground-water withdrawals to total fresh surface-and ground-water withdrawals (table 9). Total withdrawals, as given in water use reports, usually include thermoelectric power withdrawals mainly for condenser and reactor cooling and related purposes. Because water used for thermoelectric power must be available in very large quantities, 99 percent of it is obtained from surface-water sources, of which 30 percent is from saline surface-water bodies. Thus, the inclusion of thermoelectric power in total withdrawals tends to obscure the relative importance of ground and surface water for other uses, such as for public supplies, irrigation, and industrial usage (exclusive of thermoelectric power). For this reason, the ground-water facts table in each State summary shows total withdrawals including and excluding thermoelectric power.

DELINEATION OF PRINCIPAL AQUIFERS IN THE STATE SUMMARIES

In each State summary, the aquifers that are developed most intensively for water supplies are identified, and their areal extents are shown on a map (fig. 1 in each summary). Areas in many of the States, and especially those that occupy parts of the Atlantic and Gulf Coastal Plains, are underlain by two or more aquifers separated by confining beds. In most instances, the maps show the uppermost of these multiple aquifers, although the maps for some States delineate the most-used aquifers. The relative vertical positions of the aquifers and of the intervening confining beds are indicated on cross sections or in block diagrams which show schematically the arrangement of the aquifers and confining beds along vertical slices through the Earth's

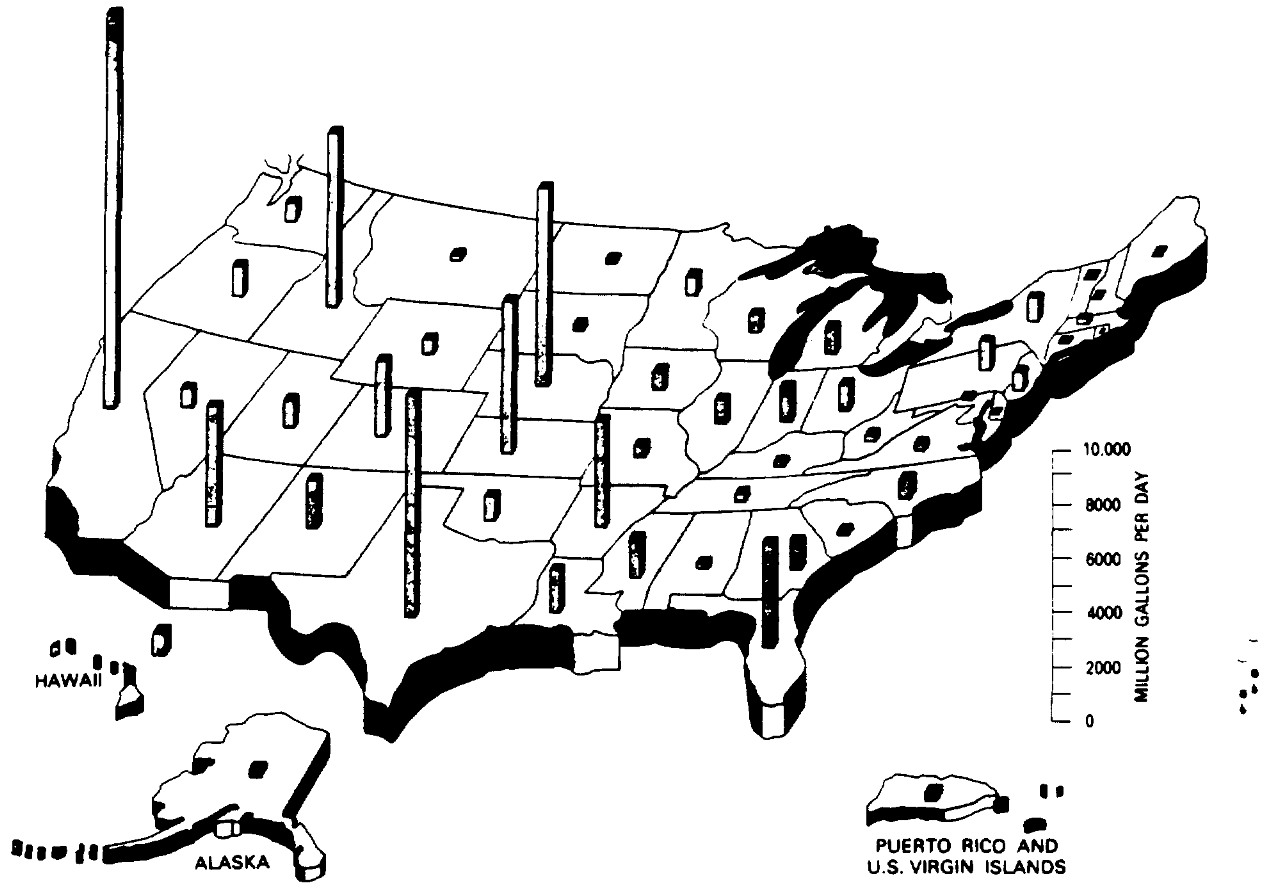

Figure 67. Ground-water withdrawals in 1980 for the United States, Puerto Rico, and U.S. Virgin Islands. (Source: Modified from Solley and others, 1983.)

crust. To help the reader visualize the aquifer distribution in relation to land forms, figure 1 also has a small map showing the physiographic divisions of the State.

The relative vertical positions of the aquifers in each State also are indicated in a table of aquifer and well characteristics (table 2 in each summary). Thus, it will be useful to refer to this table while scanning the aquifer map and the cross section or block diagram.

In some areas, an aquifer occurring in the same geologic formation is identified by one name in one State and by another in an adjacent State. In preparing this report, attempts were made to resolve these differences in names; however, several remain. Where appropriate, the corresponding name(s) of the aquifer in the adjacent State is given in the table 2 "Remarks" column to aid in understanding aquifer nomenclature.

The importance of an aquifer as a source of water may change from one State to another because of changes in demands for freshwater, variations in ground-water quality, and differences in the hydrogeologic characteristics of the aquifer. The differences may be of such magnitude that an aquifer that serves as a principal source of supply in one State may not be intensively developed in a neighboring State. For these reasons, the aquifer boundaries depicted in figure 1 of each State summary may not match at State boundaries.

RESPONSE OF AQUIFERS TO WITHDRAWALS

A map showing the location of major withdrawals and, through the use of symbols, the magnitude of the withdrawals, is given for each State (fig. 2 in each summary). Also included in this figure are hydrographs that show, in some cases, the effects of climatic changes and, in others, the long-term effect of withdrawals on ground-water levels; the hydrograph data are the annual greatest depth to water. A list of the withdrawal points, the name of the aquifer, and the principal uses of withdrawals also is provided.

Changes in the position of the water level in wells reflect changes in the amount of ground water in storage in aquifers, and, where these changes are due to withdrawals, they also may reflect changes in flow direction. Thus, the measurement of the position of the water levels in wells is an important part of most ground-water investigative programs. These water-level measurements are most readily understandable in the form of hydrographs as given in the State summaries and in the form of water-level maps, which can be used to determine directions of flow. The hydrographs included in the State summaries were selected, in most instances, to show the effect of withdrawing ground water from the most intensively developed aquifers.

Table 9. Summary of fresh ground-water withdrawals as a percentage of total fresh surface- and ground-water withdrawals for all categories of use and for specific categories of use, by State

[Data rounded to two significant figures. Data not included for Trust Territory of the Pacific Islands, Saipan, Guam, and American Samoa. Mgal = million gallons. Sources: State data from table 1 in respective State summary, *National Water Summary 1984*; total data from Solley, Chase, and Mann, 1983]

State	Total surface- and ground-water withdrawals per day (Mgal)	Percentage of population served by ground water	Ground-water withdrawals per day (Mgal)	Ground-water withdrawals as a percentage of total fresh surface- and ground-water withdrawals for—					
				All categories of use[1]	Specific categories of use				
					Public supply	Rural supply		Industrial self-supplied[1]	Irrigation
						Domestic	Livestock		
Alabama	8,700	52	290	3 (14)	28	100	34	0.6 (4)	30
Alaska	220	69	49	22 (26)	43	99	0	9 (11)	0
Arizona	7,300	65	4,200	58 (57)	54	100	82	72 (88)	58
Arkansas	33,000	50	4,300	13 (81)	42	100	36	1 (55)	86
California	38,000	46	14,600	39 (38)	46	93	41	54 (89)	39
Colorado	16,000	15	2,800	18 (18)	8	36	18	2 (1)	19
Connecticut	1,300	32	150	11 (20)	17	100	18	3 (10)	8
Delaware	140	60	82	59 (57)	38	100	100	68 (73)	63
District of Columbia	340	0	.8	.2 (.4)	0	0	0	.6 (57)	0
Florida	7,300	90	3,800	52 (69)	86	100	66	27 (82)	53
Georgia	6,700	48	1,200	18 (52)	29	100	61	8 (57)	66
Hawaii	1,700	95	710	41 (37)	90	90	96	73 (20)	93
Idaho	18,000	88	6,300	35 (35)	94	96	42	95 (95)	25
Illinois	18,000	49	980	5 (24)	27	97	100	1 (10)	100
Indiana	14,000	32	1,200	11 (30)	41	90	18	8 (18)	98
Iowa	3,200	82	900	28 (81)	81	100	100	13 (71)	84
Kansas	6,600	49	5,600	85 (89)	48	86	43	35 (77)	92
Kentucky	4,600	31	180	4 (22)	13	91	5	2 (25)	6
Louisiana	12,000	69	1,800	14 (27)	44	100	70	5 (12)	47
Maine	850	57	80	9 (10)	19	98	59	5 (5)	3
Maryland	1,400	30	175	13 (17)	9	100	54	6 (18)	54
Massachusetts	2,500	33	320	13 (28)	24	100	58	6 (30)	28
Michigan	15,000	43	530	4 (18)	17	100	77	1 (3)	37
Minnesota	3,100	75	670	22 (48)	52	100	85	5 (20)	88
Mississippi	2,900	93	1,500	54 (82)	18	100	77	21 (61)	35
Missouri	6,900	34	470	7 (34)	22	74	26	2 (39)	75
Montana	11,000	54	200	2 (2)	39	94	38	20 (52)	1
Nebraska	12,000	82	7,100	59 (73)	77	100	80	3 (85)	67
Nevada	3,600	50	710	20 (20)	40	94	31	30 (45)	17
New Hampshire	380	60	65	17 (21)	48	98	25	5 (6)	0
New Jersey	2,900	45	730	25 (37)	40	100	67	10 (20)	73
New Mexico	3,900	89	1,800	47 (47)	90	97	50	25 (98)	44
New York	7,900	35	970	12 (28)	23	89	65	4 (11)	46
North Carolina	8,100	55	770	10 (20)	12	100	85	6 (17)	30
North Dakota	1,000	62	110	11 (11)	54	100	40	.3 (25)	37
Ohio	13,000	42	740	6 (32)	27	90	60	2 (16)	36
Oklahoma	1,700	41	960	56 (61)	28	83	12	23 (35)	84
Oregon	6,800	61	1,100	17 (17)	29	87	27	15 (16)	14
Pennsylvania	16,000	44	1,000	6 (16)	16	100	88	4 (15)	14
Puerto Rico	1,100	26	246	22 (35)	22	42	50	3 (21)	34
Rhode Island	170	24	37	22 (21)	15	100	50	36 (36)	9
South Carolina	5,800	42	210	4 (21)	22	100	55	1 (5)	27
South Dakota	690	77	330	48 (48)	68	94	88	54 (55)	33
Tennessee	10,000	51	460	5 (21)	40	100	17	2 (11)	51
Texas	16,000	47	9,700	61 (62)	46	84	49	23 (24)	70
Utah	4,300	63	770	18 (18)	66	90	80	14 (16)	10
U.S. Virgin Islands	6	42	1.1	18 (18)	12	100	0	0 (0)	0
Vermont	340	54	45	13 (50)	35	85	62	2 (35)	19
Virginia	5,600	41	370	7 (30)	17	100	10	2 (24)	29
Washington	8,200	71	750	9 (9)	37	78	67	15 (15)	4
West Virginia	5,600	53	220	4 (22)	27	95	13	3 (18)	8
Wisconsin	5,900	70	580	10 (46)	48	100	96	1 (15)	97
Wyoming	5,300	54	540	10 (11)	33	92	21	34 (76)	8
Total or percentage	380,000	51	88,000	23 (38)	35	97	55	6 (26)	40

[1]Number in parentheses was calculated excluding thermoelectric power.

These hydrographs represent only a small sample of those available from the U.S. Geological Survey and State ground-water agencies. The response of water levels in aquifers to ground-water withdrawals is described in detail in the 1983 *National Water Summary* (U.S. Geological Survey, 1984, p. 36–45).

Estimates of well yields for each aquifer are given in table 2 of each State summary. These yields are the amounts of water per minute that can be obtained when an effort is made to design and construct wells to obtain large supplies of water, such as are needed for agricultural, public supply, or industrial uses. For most aquifers, they do not represent the average yield of all wells, which may include many small-yield rural domestic wells. A range of yields reflects the effect of areal differences in aquifer thickness or composition. The yields listed in the "May exceed" column are obtainable where conditions are especially favorable; for example, where an aquifer has its greatest thickness or is most permeable. All yields represent the rates at which individual wells can be pumped continuously for long periods. They do not, however, include the possible influence of interference from nearby wells and do not indicate the "safe" or sustained yields of the aquifer.

GROUND-WATER MANAGEMENT

The Nation's freshwater needs are met by withdrawals from streams, lakes, reservoirs, and ground-water systems. Trends in water developments over the last 30 years show that the use of ground water for all purposes, exclusive of thermoelectric power, has been increasing at a faster rate than has the use of surface water for the same purposes. Several factors may cause this trend to continue or accelerate in the future. First, the most cost-effective surface reservoir sites already have been developed (U.S. Geological Survey, 1984, p. 33) and the sustained yields of existing reservoirs are decreasing due to sedimentation. Second, the cost of storage at the remaining reservoir sites is becoming increasingly expensive. And third, public opposition is increasing to reservoir construction because of potential environmental damages. Thus, the development of alternative ground-water supplies and the protection of ground-water quality are management issues of critical importance.

Discussion of the quality of ground water is limited in this report to identifying the natural condition of the water in those instances where it influences the use of the water. For the most part, data are available to assess the common constituents that influence the quality of the Nation's ground water. However, much less is known about ground-water constituents that occur naturally in trace concentrations and about the degree and extent of contamination by human activities. Investigations by Federal and State agencies, universities, and other groups are underway to address these technical aspects of ground-water management.

To ensure that the Nation's future water demands are met, it is important that an infrastructure exists within each State to utilize the technical information and manage the ground-water resources. To achieve these ends, many States have enacted ground-water laws and regulations and have established organizations to implement them. A description of these management initiatives constitutes the final section of each State summary.

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SOUTH CAROLINA
Ground-Water Resources

Fresh ground water is available in most of South Carolina. Although it provides only about 4 percent of total water used in the State, it serves 42 percent of the population, or about 1.33 million people. Most large withdrawals of ground water are obtained from Coastal Plain aquifers in the southeastern two-thirds of the State. Ground-water withdrawals in 1980 for various uses and related statistics are given in table 1.

GENERAL SETTING

South Carolina is located in three physiographic provinces (fig. 1)—the Coastal Plain province, which occupies approximately the southeastern 63 percent of the State; the Piedmont province, which occupies roughly 35 percent of the State; and the Blue Ridge province, which occupies about 2 percent of the State (Fenneman, 1938). Coastal Plain deposits consist of consolidated and unconsolidated sediments of continental and marine origin that thicken from a few feet at the Fall Line to more than 4,000 feet (ft) at the southern tip of the State. The Piedmont and Blue Ridge provinces are underlain by metamorphosed sedimentary, volcanic, and igneous rocks. Most of the area is mantled by a layer of chemically weathered bedrock called saprolite, which ranges in thickness from a few feet to about 100 ft, but generally is less than 50 ft thick.

Recharge to the ground-water system in South Carolina is from precipitation. Statewide average annual precipitation is slightly more than 48 inches (in.) (Snyder and others, 1983) and ranges from an average of 46 in. in part of the central area of the State to 80 in. in the Blue Ridge province. Ground-water recharge ranges from less than 1 in. in parts of the Piedmont–Blue Ridge to about 15 in. in parts of the Coastal Plain.

PRINCIPAL AQUIFERS

Principal aquifers in South Carolina consist of unconsolidated to partly consolidated sediments of the Coastal Plain province and igneous and metamorphic rocks of the Blue Ridge and Piedmont provinces. The aquifer names commonly used in South Carolina are, for the most part, synonymous with the names of geologic formations that contain the principal water-bearing materials. The aquifers are described below and in table 2; their areal distribution is shown in figure 1.

COASTAL PLAIN AQUIFERS

The formations of the Coastal Plain consist of unconsolidated or partly consolidated sediments, including sand, gravel, clay, limestone, marl, coquina, and shale. Many of the formations of the Coastal Plain are excellent aquifers that are able to store and transmit large quantities of water.

Table 1. Ground-water facts for South Carolina

[Withdrawal data rounded to two significant figures and may not add to totals because of independent rounding. Mgal/d = million gallons per day; gal/d = gallons per day. Source: Lonon and others, 1983]

Population served by ground water, 1980	
Number (thousands)	1,330
Percentage of total population	42
From public water-supply systems:	
Number (thousands)	530
Percentage of total population	17
From rural self-supplied systems:	
Number (thousands)	800
Percentage of total population	25
Freshwater withdrawals, 1980	
Surface water and ground water, total (Mgal/d)	5,800
Ground water only (Mgal/d)	210
Percentage of total	4
Percentage of total excluding withdrawals for thermoelectric power	21
Category of use	
Public-supply withdrawals:	
Ground water (Mgal/d)	82
Percentage of total ground water	40
Percentage of total public supply	22
Per capita (gal/d)	155
Rural-supply withdrawals:	
Domestic:	
Ground water (Mgal/d)	57
Percentage of total ground water	28
Percentage of total rural domestic	100
Per capita (gal/d)	71
Livestock:	
Ground water (Mgal/d)	6
Percentage of total ground water	3
Percentage of total livestock	55
Industrial self-supplied withdrawals:	
Ground water (Mgal/d)	46
Percentage of total ground water	22
Percentage of total industrial self-supplied:	
Including withdrawals for thermoelectric power	1
Excluding withdrawals for thermoelectric power	5
Irrigation withdrawals:	
Ground water (Mgal/d)	15
Percentage of total ground water	7
Percentage of total irrigation	27

Shallow Aquifer

A shallow aquifer occurs throughout the Coastal Plain but is not mapped in figure 1. In general, the aquifer consists of deposits that range in age from Cretaceous to Holocene, is less than 100 ft thick, and contains water under unconfined conditions, although semiconfined conditions may be present locally. The aquifer is used mostly for domestic and other small supplies, but, in some areas, such as North Myrtle Beach where very permeable beds of coquina are present, yields can exceed 500 gallons per minute (gal/min). Water quality is extremely variable, as are yields, but the aquifer is a valuable resource in many areas, particularly for rural domestic use. Recharge is from local rainfall; therefore, water levels tend to fluctuate seasonally.

Table 2. Aquifer and well characteristics in South Carolina

[Ft = feet; gal/min = gallons per minute; mg/L = milligrams per liter. Sources: Reports of the U.S. Geological Survey and several State agencies]

Aquifer name and description	Well characteristics			Remarks
	Depth (ft)	Yield (gal/min)		
	Common range	Common range	May exceed	
Coastal Plain aquifers:				
Shallow aquifer: Sand, gravel, and coquina. Unconfined. (Not shown in fig. 1).	20 - 100	5 - 10	500	Tapped mostly for domestic use. Variable water quality with local problems. Concentrations of iron greater than 1 mg/L, and pH less than 5.5 in many areas.
Floridan aquifer system: Fossiliferous limestone. Confined.	80 - 250	100 - 300	2,000	Principal aquifer in southern South Carolina. Saltwater encroachment a potential problem. Water predominantly calcium bicarbonate type except in coastal areas where it is salty.
Tertiary sand aquifer: Fine to course quartzose sand. Confined to unconfined.	100 - 300	50 - 200	700	Interfingers with limestone in southern Barnwell County. Concentrations of dissolved solids less than 50 mg/L near recharge areas; water predominantly a sodium bicarbonate type downdip except near the coast where it is salty.
Black Creek aquifer: Thinly laminated sand and clay lenses. Confined.	200 - 700	50 - 400	900	Principal source of ground water in Horry and Georgetown Counties (Myrtle Beach area). Water predominantly calcium carbonate type with concentrations of iron greater than 3 mg/L near recharge areas, a sodium bicarbonate type downdip, and salty in northeast Horry County and along southern coast. Equivalent to Cretaceous aquifer in North Carolina.
Middendorf aquifer: White and gray sand and gravel. Confined.	200 - 2,000	200 - 700	2,000	Most intensively used in the upper Coastal Plain. Concentrations of dissolved solids are less than 50 mg/L; concentrations of iron greater than 1 mg/L in the upper Coastal Plain. Water predominantly sodium bicarbonate type downdip, and salty in northeast Horry County. Equivalent to Cretaceous aquifer in North Carolina.
Piedmont and Blue Ridge aquifers: Fractured igneous and metamorphic rocks and saprolite. Confined to unconfined.	50 - 300	10 - 30	300	Small yields and areal variability limit large-scale use. Water quality variable in dissolved solids and major constituents.

Floridan Aquifer System

The Floridan aquifer system in South Carolina includes parts of some Miocene formations, but the principal water-bearing units are the Santee and Ocala Limestones of Eocene age. These formations consist of creamy-white to yellow fossiliferous limestone. Typically, the upper part of each unit, particularly the Ocala Limestone, contains extensive loosely cemented shell deposits. These limestones are the facies equivalents of the Eocene sands of the Tertiary sand aquifer. The Floridan aquifer system extends over a wide triangle in the southern part of South Carolina (fig. 1). It is capable of yielding as much as 2,000 gal/min of water suitable for public supply, but common yields range from 100 to 300 gal/min.

Tertiary Sand Aquifer

The Tertiary sand aquifer includes permeable parts of the Congaree, the Warley Hill, the McBean, and the Barnwell Formations, listed in ascending order. The water-bearing sands have limited extent and are present mostly in the upper part of the Coastal Plain between the Savannah and Congaree Rivers. Well yields range from 50 to 200 gal/min but may exceed 700 gal/min.

Black Creek Aquifer

The Black Creek aquifer, of Cretaceous age, ranges in thickness from a few feet in updip areas to about 400 ft in coastal areas. The Black Creek aquifer is the most important source of ground water in Horry and Georgetown Counties. Wells in the two-county area yield 50 to 400 gal/min but may exceed 900 gal/min. The quality of the water in the Black Creek aquifer in Horry and Georgetown Counties generally is acceptable for drinking water except for fluoride concentrations of as much as 7 milligrams per liter (mg/L), chloride concentrations that exceed the 250 mg/L national drinking-water regulation (U.S. Environmental Protection Agency, 1982a, b) in some areas, and dissolved-solids concentrations of as much as 1,800 mg/L in some areas. The large fluoride concentrations in the water are believed to be caused by shark teeth in the Black Creek Formation (Zack, 1980). Saltwater is present in parts of the Black Creek aquifer but is not precisely

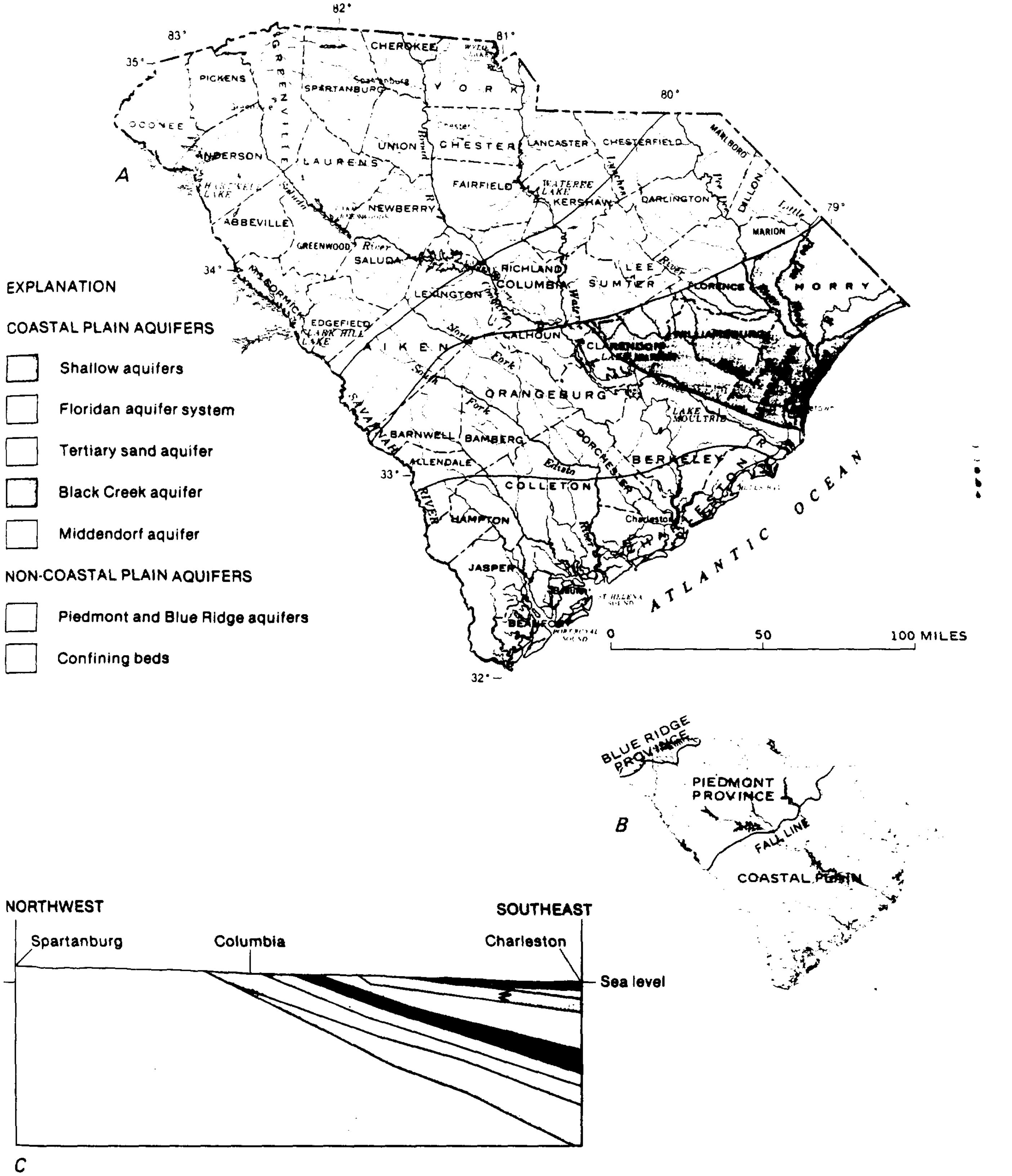

Figure 1. Principal aquifers in South Carolina. *A*, Delineations indicating the most widely used aquifers. *B*, Physiographic diagram and divisions. *C*, Generalized cross section. (See table 2 for a more detailed description of the aquifers. Sources: *A*, *C*, Compiled by W. R. Aucott from U.S. Geological Survey files. *B*, Fenneman, 1938; Raisz, 1954.)

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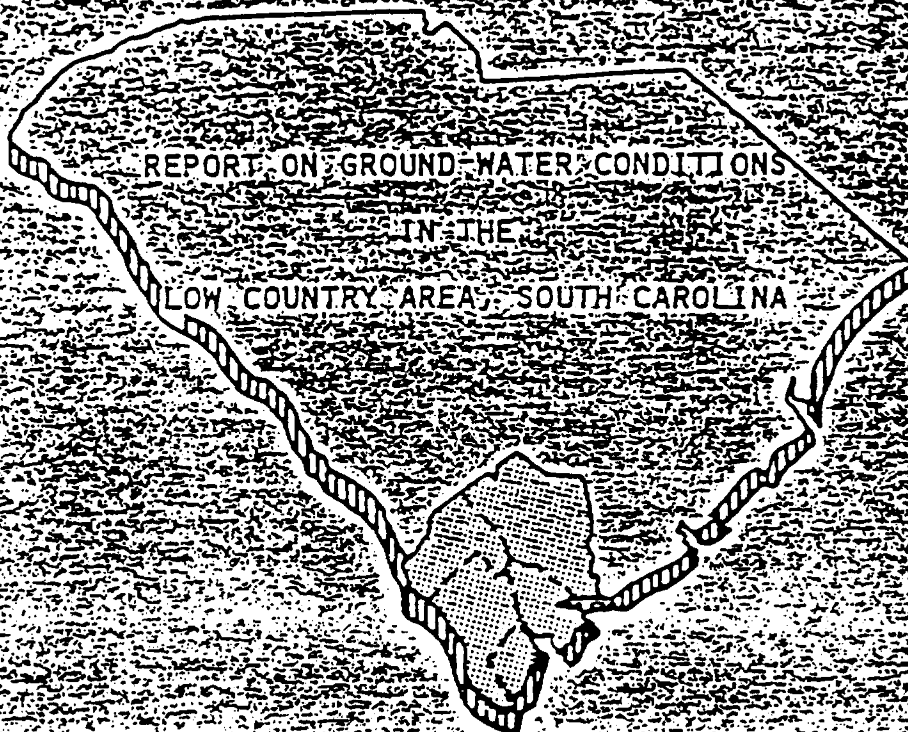
REPORT ON GROUND-WATER CONDITIONS IN THE LOW COUNTRY AREA, SOUTH CAROLINA



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SOUTH CAROLINA WATER RESOURCES COMMISSION

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REPORT ON GROUND-WATER CONDITIONS IN THE LOW COUNTRY AREA, SOUTH CAROLINA

A Capacity Use Investigation

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REPORT ON
GROUND-WATER CONDITIONS IN THE
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ABSTRACT

The Low Country Capacity Use Investigation was initiated by the S. C. Water Resources Commission (SCWRC) in 1973 at the request of legislative and local officials in the four-county area. As required by the S. C. Ground Water Use Act of 1969, the SCWRC must report on ground-water problems in a capacity use study area. The results of a technical ground-water investigation, made by the U. S. Geological Survey (WRD) in cooperation with the SCWRC, are contained in SCWRC Report Number 9 entitled, "The Ground-Water Resources of Beaufort, Colleton, Hampton, and Jasper Counties, South Carolina". Therefore, this report and SCWRC Report Number 9 are submitted to fulfill the requirement of the Act, and to make the findings of the investigation available to the public.

Ground water is the most important source of water supplies in the Low Country area. Six major aquifer systems have been identified. From the surface downward, these are: (1) the Hawthorn-Recent, (2) the Tertiary Limestone, (3) the Black Mingo, (4) the Peedee, (5) the Black Creek, and (6) the Tuscaloosa Aquifer Systems. Approximately 50 million gallons per day (Mgd) of ground water are withdrawn daily from these aquifer systems. The largest withdrawals, approximately 35 Mgd, are from the Tertiary Limestone Aquifer. In the adjacent Savannah area, approximately 75 Mgd to 90 Mgd of ground water are being pumped from this aquifer system for industrial and municipal water supplies.

There are several major ground-water problems that are occurring now in the Low Country area, and other problems that are likely to become major problems unless a comprehensive management program is initiated. Documented problems include:

(1) Regional water-level declines (loss of artesian pressure) throughout large areas of the Low Country and adjacent counties in Georgia.

(2) Salt-water contamination of the Tertiary Limestone Aquifer in the coastal area, primarily in Beaufort County.

(3) Local well interference, where water levels have been lowered below some pump intakes.

(4) Interaquifer transfer, resulting in artesian pressure losses and(or) water quality impairment.

(5) Inadequate requirements relating to well location, spacing, construction, and abandonment.

(6) No requirements for proper water-use, well-construction, and hydraulic data reporting.

Potential problems include:

(1) Subsidence of the land surface (compaction subsidence) caused by excessive, concentrated ground-water withdrawals,

(2) Local dewatering of the Tertiary Limestone Aquifer,

(3) Land-surface subsidence and collapse, if certain conditions are created by improperly-planned well location and spacing, or by dewatering operations, and

(4) Ground-water pollution of aquifers within the Hawthorn-Recent and in the Tertiary Limestone Aquifer Systems.

There are several administrative problems that have a bearing on an effective ground-water management program. These are:

(1) Technical data acquisition and technology transfer.

(2) Uncoordinated water resources development, and

(3) Economics and financing of ground-water management.

An assessment of these technical and administrative problems indicates that:

- The major technical problems are related to ground-water withdrawals from the Tertiary Limestone Aquifer.
- Many of the problems are interrelated, and the solution of one problem would permit the solution of another problem.
- There is no local, state, or federal regulation which is capable of providing appropriate remedies for all of these ground-water problems.
- A ground-water management program is urgently needed that will provide for the proper development of the ground-water resources, and aid in eliminating some of the current problems.
- *The uses of ground water in the Low Country area have developed to a degree which requires coordination and regulation. Therefore, it is recommended that the Low Country area, which includes all of Beaufort, Jasper, Colleton, and Hampton Counties and Edisto Island in Charleston County, be declared a capacity use area.*

If the Low Country area is declared a capacity use area, the SCWRC would have the authority to promulgate regulations concerning the drilling of wells and the withdrawal of ground water in the capacity use area. The following ground-water management methods are needed to protect the aquifers and ground-water users in the Low Country area.

1. *Coordinated water-supply planning.*

The major problem in the Low Country is uncoordinated pumpage, a water-supply management problem. In the past, ground-water development activities have been undertaken without proper consideration of existing ground-water withdrawals, both on a local and on a regional scale. Ground-water withdrawals from the Tertiary Limestone Aquifer in the Low Country area and the adjacent Savannah area now exceed a daily average of 110 Mgd. Throughout the Low Country area as a whole, greater ground-water withdrawals from this aquifer can be made. However, a comprehensive ground-water management program is needed to insure that the proper planning precedes additional pumpage from this important aquifer. This program must consider existing and future water-supply needs of both the Low Country and the adjacent Savannah area. Therefore, it is recommended that officials in South Carolina and Georgia establish a formal Interstate Ground Water Committee. With the proper coordination of ground-water management programs, existing water-supply problems could be realistically addressed. More importantly, emerging or possible future water-supply problems could be addressed before the problems become serious.

2. *Regulations to limit ground-water withdrawals in areas where the supply is limited or where the movement of poor-quality water is degrading a fresh-water aquifer.*

In some areas, it will become necessary to limit the quantity of ground water withdrawn from the Tertiary Limestone Aquifer in order to protect the aquifer from salt-water contamination. Currently, the most critical area is in southwestern Beaufort County where salt water is slowly moving into this aquifer. With the proper management of this aquifer, greater quantities of ground water can be withdrawn without immediate danger to fresh water. However, it is especially important that additional ground-water withdrawals be carefully planned, and that wells be properly designed and constructed.

3. *Regulations related to well spacing, well construction and abandonment.*

The proper location and construction of wells, and proper well-abandonment procedures are ground-water management methods, or "tools", that can be successfully employed in preventing excessive water-level declines, inter-aquifer transfer, salt-water contamination, and other problems outlined in this report.

4. *Regulations related to proper testing of aquifers during well-construction operations, and the proper reporting of this information.*

Certain types of information must be collected prior to, during, and after well-construction operations in order to insure the proper development (utilization) of ground-water resources. Prior to issuing a water use permit, the SCWRC would evaluate the effects of a proposed ground-water withdrawal in order to avoid or minimize adverse effects on the acuifer or existing users.

5. *Best Practical Management of Ground-Water Systems.*

In order to protect existing ground-water users, measures should be instituted that would provide for the best practical management of a ground-water system. Such measures would include careful consideration and evaluation of well placement, proper well spacing, and the establishment of "optimum practical" pumping rates and pumping water levels.

6. *Water Conservation and Alternative Water-Source Selection.*

Water users and prospective water users would be required to use the water of lowest quality available that is suitable, or can feasibly be made suitable, for a particular purpose. If necessary, water users would be required to utilize water-conservation measures where necessary to protect an aquifer or other water users. The selection of these water-management measures would be made on the basis of the best available technical information.

7. *Proper Ground-Water Monitoring.*

One of the most important ground-water management "tools" is the continual collection of ground-water data, including water levels, water quality, geophysical and well-construction data, and water-use information. Without these technical data, a ground-water management program can not be effective. Accordingly, it is recommended that the Regional Office of the SCWRC be maintained to collect and evaluate these data on a continuing basis. These data will insure that the proper technical assistance can be rendered to existing and prospective ground-water users.

Although ground-water problems are emphasized in this report, this report should not be used to suggest that ground water is an undependable resource. To the contrary, the ground-water resources of the area can sustain much greater development. Artesian aquifers in the Black Mingo, Black Creek, and Tuscaloosa Aquifer Systems are capable of supplying large quantities of good-quality water in much of Hampton and Colleton Counties, and possibly in northern Jasper and Beaufort Counties. The Tertiary Limestone Aquifer is also capable of supplying much greater quantities of water, providing wells are properly located and constructed.

The S. C. Ground Water Use Act of 1969 must be regarded as a ground-water management "tool" which can be utilized to insure the proper development and management of ground-water resources. If many of the ground-water management measures outlined in this report are not initiated, and ground-water problems become critical, certain management options may not be available over the long term.

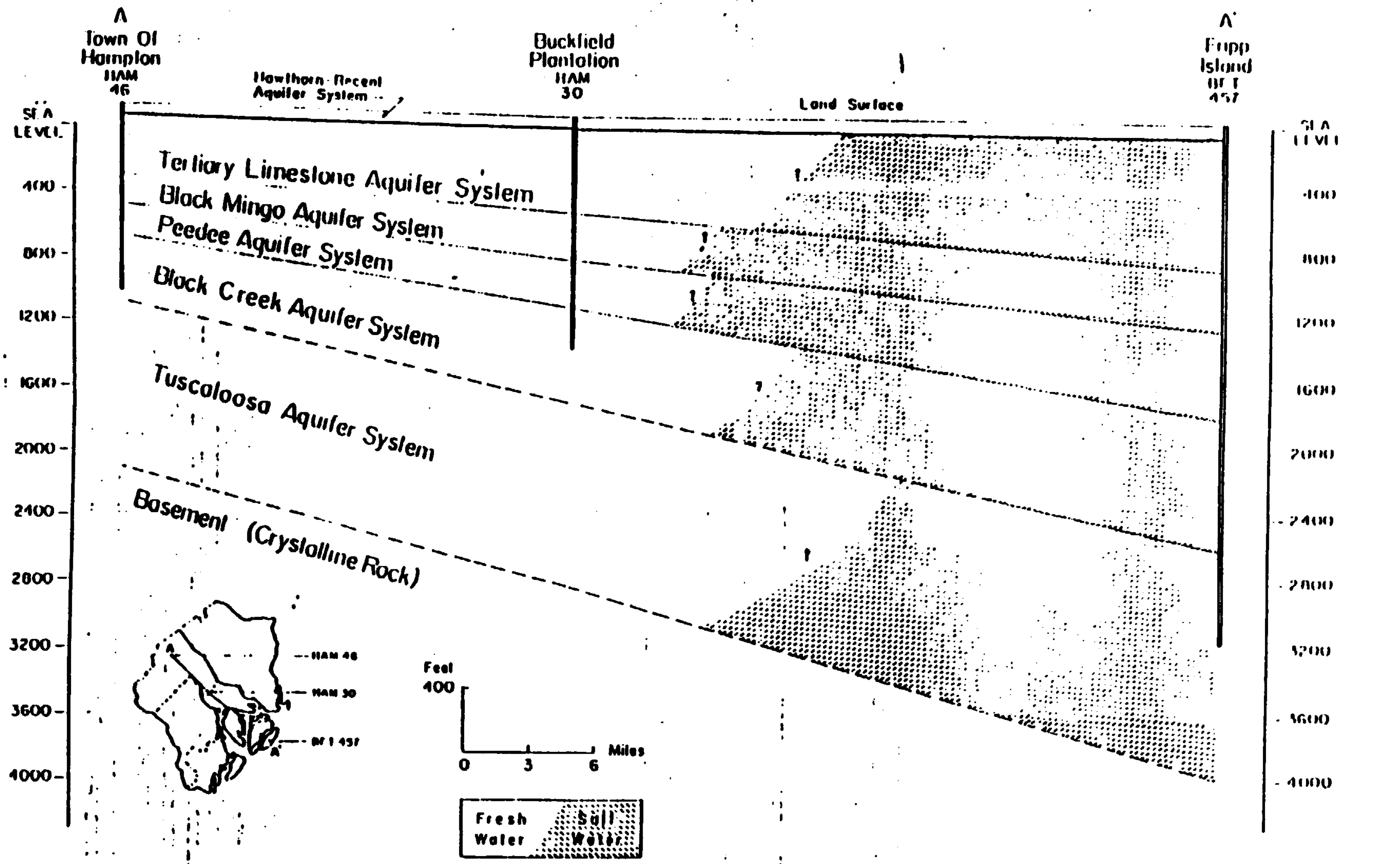

FIGURE 3. GENERALIZED HYDROGEOLOGIC CROSS-SECTION OF THE LOW COUNTRY AREA

geologic unit (or 'formation') boundaries. This parallelism of water-bearing zones and geologic units is important in understanding and 'mapping' hydrogeologic units throughout the Low Country area.

Using information from project test holes, other test holes, and water wells, the Tertiary Limestone Aquifer has been subdivided, for the purposes of this report, into two major hydrogeologic units in the Low Country area (see figs. 7 and 8). The delineation of these hydrogeologic units was based on lithologic, geophysical, and water-bearing (hydrologic) characteristics and current-meter tests run in selected test holes. These data were then correlated with lithologic and geophysical data in wells where current meter data were unavailable. These two hydrogeologic units consist of (1) an *Upper Hydrogeologic Unit* that contains an upper permeable zone delineated by Hayes (1979); and (2) a thick *Lower Hydrogeologic Unit* that is partly water-bearing but has relatively low permeability compared to the Upper Unit. Based on current-meter tests, Hayes (1979) identified a lower permeable zone near the base of the Lower Hydrogeologic Unit that is water-bearing but has a low permeability compared to the upper permeable zone. data?

The division of the Tertiary Limestone Aquifer into two major hydrogeologic units is done informally for the purpose of this report as an aid in explaining the water-bearing properties, use, and water-quality characteristics of this aquifer system. The division of a limestone aquifer system on the basis of permeable and impermeable 'zones' is a well-accepted practice in limestone hydrology where sufficient hydraulic (permeability) data are available. However, in the case where insufficient data exist (such as in Jasper County where few wells penetrate below the upper part of the Tertiary Limestone Aquifer System), it is rather difficult to discuss 'permeable' zones. Thus, we prefer to call this lower part of the Tertiary Limestone Aquifer the Lower Hydrogeologic Unit.

The Upper Hydrogeologic Unit is composed primarily of the upper part or unit of the Santee Limestone, but it also contains limestones of Oligocene and Miocene age, mainly in southwestern Beaufort County. As pointed out by Hayes, few wells in Jasper County penetrate below the Upper Unit; thus, *the hydrogeologic properties of the Lower Hydrogeologic Unit of the Tertiary Limestone Aquifer are unknown in Jasper County.*

As shown in figures 7 and 8, most of the Tertiary Limestone Aquifer is composed of the Lower Hydrogeologic Unit. Thus, permeable zones (aquifers) constitute a small part of the total thickness of the Tertiary Limestone Aquifer. *Although the Lower Unit is water-bearing in many places, the Upper Unit generally has a greater overall permeability and will yield much greater quantities of ground water to wells.*

According to Hayes (1979), the upper permeable zone is not present in southern Colleton County, and wells withdraw ground water from the Lower Hydrogeologic Unit. Therefore, in figure 7 (which is modified from Hayes' figure 8) we have extended the Upper Hydrogeologic Unit into southern Colleton County, but not the upper permeable zone.

and no water wells are known that are open only to the lower permeable zone in the Lower Hydrogeologic Unit.

The Lower Hydrogeologic Unit is not a single hydrogeologic unit. It is a thick complex unit that is composed of both aquifers and confining beds. However, the water-bearing zones (aquifers) within the Lower Unit are relatively thin and not as permeable as those in the Upper Unit. Prolific aquifers do not occur in the Lower Unit because these rocks are primarily 'impure' limestone or marl. Therefore, water-bearing solution cavities in this unit are not as thick and laterally extensive as those in the Upper Unit. Consequently, the large well yields that can be obtained from the Upper Unit (especially from the Upper permeable zone) in many areas generally cannot be obtained from the Lower Unit.

Lower Permeable Zone.--Currently the hydrogeologic characteristics of this zone are poorly known. Since no wells are known to be open only to this zone, additional knowledge must be obtained from current-meter and downhole sample tests before reasonable interpretations of the hydrogeology of this zone can be made.

As shown in several multi-zone test wells, aquifers in the Lower Unit contain saline formation water in the coastal parts of the Low Country (see, for example, fig. 6). Chloride and dissolved solids generally increase with depth in these zones; therefore, drilling a well deeper into the Lower Unit of the Tertiary Limestone Aquifer in these areas will not obtain better quality water.

Inland from the coastal area in northern Beaufort County and in Hampton and Colleton Counties, Lower Unit aquifers contain fresh water. However, as previously mentioned, water-quality data on these aquifers are poor, especially in Jasper County. Presumably, fresh water could be obtained from Lower Unit aquifers, at least in northern Jasper County.

In some areas of Hampton and Colleton Counties and possibly in northern Beaufort County, potentiometric head (or 'artesian pressure') of aquifers in the Lower Hydrogeologic Unit is believed to be greater than the potentiometric head of the Upper Unit. This belief is based on the fact that increases in artesian pressure were noted as some test holes penetrated deeper; and the potentiometric head of the Upper Unit has been reduced as a result of ground-water withdrawals. Thus, in some areas, it may be possible to obtain flowing artesian wells by tapping aquifers in the Lower Unit, whereas shallower wells completed in the Upper Unit no longer flow. In some cases, if a well penetrates and is uncased through both the Upper and Lower Units, ground water could flow upward from a Lower Unit aquifer and into the lower-head Upper Unit. This probably would also occur in open-hole wells drilled in much of Jasper County where the potentiometric head of the Upper Unit has been substantially reduced as a result of large ground-water withdrawals from this unit at Savannah (see fig. 11). It must be emphasized that hydraulic data on Lower Unit aquifers is so limited that upward movement of ground water from the Lower Unit is more speculation than documented fact.

A comparison of the potentiometric map (fig. 12) with an 1880 potentiometric map constructed by Warren (1944) indicates an overall water-level decline of approximately 185 feet at the center of the cone of depression at Savannah (fig. 13). Figure 13, a net water-level decline map, shows the approximate total net decline of water level in the Tertiary Limestone Aquifer since 1880. This map indicates that ground-water withdrawals, primarily from the Upper Unit, in the Savannah-Low Country area have lowered water levels from 70 to 100 feet in the southern portion of Jasper County and from 30 to 50 feet in southwestern Beaufort County. Water levels in Hampton, northern Jasper, northern Beaufort, and Colleton Counties have declined nearly 10 feet.

In an area surrounding the City of Walterboro, water-level declines have been about 10 to 30 feet. In this area, Hayes (1979) suggested that the upper permeable zone of the Upper Hydrogeologic Unit is absent or very thin and most wells withdraw water from the Lower Hydrogeologic Unit. According to Hayes, the lower permeability of the Lower Hydrogeologic Unit combined with the volume of water being withdrawn in the vicinity of Walterboro probably accounts for the greater water-level declines near Walterboro.

The decline of water levels in the Tertiary Limestone Aquifer has changed the original direction of ground-water movement which was generally toward Port Royal Sound, as indicated from a map constructed by Warren (1944). The 1976 potentiometric map (fig. 12), like earlier maps, shows how the heavy pumpage at Savannah has displaced the original configuration of the potentiometric contours and has shifted the direction of ground-water movement from Port Royal Sound toward the center of pumpage at Savannah. The effects of these water-level declines are discussed in the following section.

RECHARGE-DISCHARGE RELATIONSHIPS

The Upper Hydrogeologic Unit of the Tertiary Limestone Aquifer in the Low Country is recharged primarily from precipitation in the outcrop area, mainly in southern Allendale, Bamberg, and Orangeburg Counties; by vertical leakage from overlying aquifers; and by some upward leakage from underlying Lower Unit aquifers. *Both Nuzman (1972) and Hayes (1979) estimated that recharge from the outcrop areas amounted to about 45 Mgd.*

There are many areas where recharge takes place by vertical downward leakage from the overlying shallow aquifers in the Hawthorn-Recent Aquifer System. Hayes estimated that this leakage amounts to 5 to 10 Mgd within the boundaries of the study area. The most prominent area of downward leakage is centered near the Marine Corps Auxiliary Air Station (MCAAS) on Port Royal Island (fig. 12). In this area, downward leakage is significant and water levels in the Upper Hydrogeologic Unit (-25 feet msl) are higher than those normally occurring in the surrounding area. Siple (1960b) suggested that these comparatively high water levels in the aquifer resulted from downward leakage through the overlying confining beds which, in this of other fresh-water aquifers or saline-water aquifers for a particular purpose, requiring conjunctive use of surface-and ground-water resources, plugging and abandonment of wells, and other factors. As outlined previously in this report, the control of salt-water contamination of an aquifer may be fairly simple or extremely complicated. The primary factor in the control of salt-water contamination is the control of hydraulic gradient which is related directly to ground-water withdrawals.

CONCLUSIONS AND RECOMMENDATIONS

After careful consideration of the data collected during the Low Country Capacity Use Investigation, and data collected by the SCWRC, USGS, and others prior to this investigation, the following conclusions and recommendations are submitted to the Commission for consideration.

Surface water is currently not utilized to a large extent for water supplies in the Low Country area. Since most streams in the coastal area either contain salty water or have insufficient fresh-water discharge, there are few withdrawal uses of fresh water from these streams. Thus, several water users have had to resort to interbasin transfers from the Savannah or Edisto Rivers. Approximately 5 Mgd are withdrawn from the Savannah River and transported via canal to the Beaufort area by the Beaufort-Jasper Water Authority; and approximately 75 Mgd are withdrawn from the Edisto River and transported via underground tunnels to the Charleston area by the Charleston Water Works.

Ground water is by far the most important source of water supplies for public, rural-domestic (private), industrial, and agricultural supplies in the Low Country area. This ground water is obtained from six major aquifer systems that are now supplying or are capable of supplying from small to large ground-water supplies. These are, from the surface downward, (1) shallow aquifers within the Hawthorn Formation and unnamed Pleistocene deposits, included in the Hawthorn-Recent Aquifer System in this report; (2) the Tertiary Limestone Aquifer; (3) the Black Mingo Aquifer System; (4) the Peedee Aquifer System; (5) the Black Creek Aquifer System; and (6) the Tuscaloosa Aquifer System.

In order of their current utilization for ground-water supplies, the most important are the Tertiary Limestone, the Black Creek, the Black Mingo, and the Tuscaloosa Aquifer Systems. The Tertiary Limestone Aquifer is currently the most heavily developed aquifer system throughout the area as a whole. Aquifers within the deeper artesian aquifer systems are primarily utilized in Hampton and Colleton Counties, and to a much lesser extent in coastal Beaufort County. The Peedee Aquifer System is not known to yield large quantities of ground water to wells in the area; and if used at all, it is probably developed with overlying or underlying aquifer systems. Shallow aquifers occur in some areas in the Hawthorn Formation and (or) Pleistocene deposits and are tapped by small-diameter, shallow wells used primarily for rural-domestic supplies in Jasper County and in some areas of Beaufort County; however, these shallow aquifers are relatively thin, laterally discontinuous, and relatively untapped. The major functions of these shallow sediments are as a confining bed over the underlying Tertiary Limestone Aquifer, and as a source of recharge by the process of downward leakage.

The estimated total ground-water withdrawals in the four-county area is an average of about 50 Mgd. However, much of this total includes ground water withdrawn for commercial and agricultural irrigation, and only a fraction of the flowing artesian wells in the area have been properly inventoried. Thus, the total ground-water withdrawals during certain periods could easily range from about 30 Mgd to as much as 70 Mgd. It is believed that most of the flowing artesian wells that have been inventoried in Hampton and Colleton Counties tap the Black Mingo Aquifer System. However, in some areas, these wells tap water-bearing (permeable) zones in the middle and lower parts of the Tertiary Limestone Aquifer.

The largest ground-water withdrawals (approximately 35 Mgd) in the Low Country area are from the Tertiary Limestone Aquifer. This aquifer is the most economical source of large quantities of good-quality water throughout much of the area. Present information indicates that there is no alternative source of good quality ground water in much of Beaufort County and the southern portions of Jasper and Colleton Counties. Deeper artesian aquifers are utilized to some extent in Hampton and Colleton Counties, primarily by industries and municipalities. However, in Beaufort and southern Colleton Counties, these deeper aquifers either contain mineralized water; are not as productive; or they occur at greater depths and their utilization is not as economical as that of the Tertiary Limestone Aquifer. *Therefore, the Tertiary Limestone Aquifer is almost exclusively utilized as a source of fresh-water supplies in much of the Low Country.* The largest withdrawals from this aquifer (25 Mgd) are in Beaufort County, where approximately 10 to 15 Mgd are used for commercial and agricultural irrigation. The Tertiary Limestone Aquifer is also extensively (many wells) but not heavily utilized throughout the remainder of the Low Country area. In the Savannah area, approximately 75 to 90 Mgd of ground water are withdrawn from the Tertiary Limestone Aquifer by 21 water users, mainly for industrial and public water supplies. Contacts with Georgia and USGS ground-water officials indicate a lack of accurate water-use reporting, and to date they have not conducted a thorough water-use inventory. Thus, pumpage from the Tertiary Limestone Aquifer in Chatham County alone may periodically exceed 90 Mgd.

There are several major problems occurring now in the Low Country area, and others that are likely to become serious if the ground-water resources are not properly managed. These problems have been categorized as 'technical' and 'administrative' in this report, but their separation has been primarily to facilitate orderly discussion. They are, in fact, closely interrelated.

As summarized in this report, the major technical problems are related to ground-water withdrawals from the Tertiary Limestone Aquifer. Documented problems that are directly related to these withdrawals include (1) regional water-level declines (loss of artesian pressure) throughout large areas of the Low Country and adjacent counties in Georgia, (2) progressive salt-water contamination of this aquifer in parts of the coastal area, (3) local well interference where water levels are lowered below some pump intakes, (4) interaquifer transfer resulting in local artesian pressure losses in wells and water quality impairment. Potential problems that could result from improper well design, location, and spacing include (1) subsidence of the land surface, which has occurred in the Savannah area, (2) local dewatering of the Tertiary Limestone Aquifer, and (3) land-surface subsidence and collapse if certain conditions are created.

The problems are related to varying degrees, and the solution of one problem would permit the solution of another problem. *The one factor common to all of the problems is hydraulic gradient, which is related to ground-water withdrawals.* Of course, some of these problems have been more serious in some areas than in others. As summarized in this report, the 'seriousness' of a ground-water problem ranges from loss of a ground-water supply to little more than aggravation. Recognizing that the degree of 'seriousness' of a water problem is highly subjective, we have tried to evaluate the degree of seriousness on the basis of technically-documented facts rather than speculation.

Ground-water pollution of shallow aquifers has occurred in some areas and locally poses a potential threat to the Tertiary Limestone Aquifer. Several cases of ground-water pollution have been intensively investigated by the SCDHEC, and other cases are being investigated at the present time. The final results of these investigations have not been released by the SCDHEC. Therefore, we have not speculated in this report on the results of these investigations.

The major problem in the Low Country area is unregulated, uncoordinated pumpage. Closely linked to the 'technical' problems associated with this pumpage are several 'administrative' problems. In effect, there is no ground-water management in the Low Country area.

At the present time, almost anyone can drill a well pretty much where they wish and pump how much they wish. There is essentially no control on well depths and type of well construction. There are no controls on amount of ground-water pumpage, water levels, and well location and spacing. The only existing controls on well location or construction are for wells utilized for public drinking-water supplies. These requirements pertain primarily to the quality (potability) of ground water which must meet certain minimum drinking-water standards established by the U. S. Environmental Protection Agency.

There are no requirements, or minimal requirements for collecting and reporting certain technical data to a state agency. Many types of data should be submitted prior to any well-construction activity so that a prospective withdrawal can be evaluated as to its possible effects on existing water users or on the aquifer.

Other types of hydrogeologic data should be collected and submitted to the proper authority, either during or immediately after well-construction operations. These requirements are important for several reasons: (1) In many cases, the collection of proper data by a prospective water user, his consultant, or well-drilling contractor prior to beginning a proposed withdrawal will save a prospective water user hundreds or perhaps even thousands of dollars for an unnecessary expense. (2) The collection of proper hydrogeologic data during well-construction operations would save the well owner money; it would insure protection for the well owner and well-drilling contractor should questions arise concerning the adequacy of well-construction in obtaining the desired quantity and quality of ground water. (3) Accumulated hydrogeologic and well-construction data will be properly stored and evaluated so it can be utilized by the water users, consultants, future water users, well-drilling contractors, or any other individual requesting the information. (4) The continual evaluation of these data by state hydrologists would insure that ground-water knowledge of the area is accumulated for utilization by the general public, prospective water users, and others.

Exhibit

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As required by the S. C. Ground Water Use Act, an assessment has been made of existing methods to solve or minimize water-use problems short of declaring a capacity use area. These ground-water management methods consist of both regulatory and voluntary methods.

There is no local, state, or federal law or regulation which is capable of providing appropriate remedies for the ground-water use and management problems outlined in this report. Contacts with local government agencies indicate a lack of authority, funding, personnel, and technical expertise to carry out a ground-water managment program. There have been no substantiative changes in state or federal law since completion of our first capacity-use report that merit detailed review in this report, because none that we know of would be unnecessarily duplicative of authorities granted to the SCWRC by the S. C. Ground Water Use Act.

In connection with voluntary ground-water management methods, it would indeed be a fortunate circumstance if all ground-water users and potential ground-water users in both South Carolina and Georgia, and others involved in designing and constructing wells, could agree on proper ground-water development and management methods. While 'voluntary' sounds good (and indeed proper coordination among various ground-water users would be ideal), it has not been done in the past. However, we believe it must be done in the future.

One aspect of 'voluntary' ground-water managment is a sound technical assistance program, and the SCWRC, SCDHEC, and USGS are committed, in our opinion, to providing the best technical assistance possible in assisting existing and prospective ground-water users. Indeed, these technical assistance efforts have in the past prevented many problems. However, the State can only do so much in terms of technical assistance; and the State can not and should not be reasonably expected to provide all services that logically must be provided by the water user or potential water user. Thus, *our conclusion regarding voluntary ground-water management methods is that they could not possibly provide solutions to all of the problems and potential problems identified in this report.*

A ground-water management program is urgently needed in the Low Country that will provide for the orderly development of the ground-water resources, and aid in eliminating some of the current problems, or preventing them from becoming worse; and in preventing future water-use conflicts, waste, and overdevelopment. We believe the following specific recommendations are needed to help solve or, at least, alleviate the problems arising from the development of the ground-water resources and are herein submitted for consideration by the Commission.

Declaration of a Capacity Use Area: which would include all of Beaufort, Jasper, Hampton, and Colleton Counties, and Edisto Island (Charleston County). Recommended boundaries of the proposed Low Country Capacity Use Area are shown on figure 20.

Much consideration has been given to recommending the declaration of a larger capacity use area to include recharge areas of the Tertiary Limestone Aquifer in adjacent Allendale, Bamberg, and southern Orangeburg Counties. There would be several advantages to doing this in regard to ground-water management. However, there are several reasons, both technical and administrative, why we do not recommend the declaration of a larger capacity use area at this time: (1) With the technical data presently available on these recharge areas, we do not feel that ground-water development from the Tertiary Limestone Aquifer in Allendale, Bamberg, and southern Orangeburg Counties 'significantly' affects artesian pressures of this aquifer in the Low Country area at this time. We are now in the process of refining hydrogeologic data in these areas, and we believe that through a good technical assistance program, potential problems can be avoided. In addition, the high-capacity wells in these areas are primarily completed in deeper artesian aquifers. Ground-water development from these deeper aquifers should have little effect on the overlying Tertiary Limestone Aquifer, unless interaquifer transfer becomes a problem. (2) Administratively, with the current level of funding for our Capacity Use Program, funding and personnel constraints would limit the effort needed to manage a larger capacity use area. (3) The current needs of ground-water management efforts in the Low Country area, especially in the coastal area, are so great that a large area could not be managed without additional funding and manpower. Therefore, the recommended boundaries are somewhat of a compromise between good ground-water management practices and current administrative constraints. However, we believe our recommendations are adequate to provide for proper ground-water management.

Although not specifically required by the S. C. Ground Water Use Act for this report, we would recommend that the following ground-water management methods be instituted if a capacity use area is declared. If the Low Country area is declared a capacity use area, we would recommend adoption of the same type of ground-water management regulations that have been promulgated for the Waccamaw Capacity Use Area. Copies of these regulations, which were approved on June 22, 1979, are available from the SCWRC upon request.

1. *Regulations to limit ground-water withdrawals in areas where the supply is limited or where it has been documented that the movement of poor quality water is degrading a fresh-water aquifer:*

As discussed and illustrated in this report, there is no question that in some areas it will become necessary to limit the quantity of ground water withdrawn from the Tertiary Limestone Aquifer in order to protect the aquifer from further salt-water contamination, and (or) to protect water users. The State of Georgia has already established pumpage limitations in the Savannah area of Chatham County, and Georgia officials are not permitting additional ground-water withdrawals in that area.

2. *Regulations related to well spacing, construction, and abandonment; proper testing of aquifers during well-construction operations; and the proper reporting of all such data:*

Reasonable application of these ground-water management "tools" would be of enormous benefit in preventing further salt-water contamination, and interaquifer transfer; and in preventing needless expenditures for unnecessary ground-water or surface-water development activities. By controlling well spacing and design, excessive water-level declines can often be prevented, thus decreasing the threat of salt-water contamination by lateral encroachment and intrusion, upconing, and interaquifer transfer. Improper well abandonment may not be completely stopped by requiring well-abandonment permits, but it can at least be reduced in the most critical areas. The proper reporting of hydrogeologic data will enable the ground-water data base to be refined and expanded so as to insure the most reliable information.

3. *Ground-water monitoring program:* A ground-water monitoring program is needed to measure continuing changes in water levels and water quality. Long-term records of these measurements, correlated with accurate water-use and other data, provide the most reliable information on the capacity of aquifers to sustain long-term withdrawals. The SCWRC test wells completed during phase I of the Low Country Capacity Use Investigation are available for future monitoring. However, it is estimated that a minimum of an additional 20 properly constructed multi-aquifer test wells will be necessary to establish an adequate ground-water monitoring network in the coastal area of the Low Country. These test wells would be in addition to test wells needed for special studies in local areas.

4. *Water conservation measures:* Each ground-water user should be encouraged to limit ground-water development activities to actual needs, and to make concerted efforts to reduce water requirements as much as technically and economically feasible. The State of Georgia has already done so in the Savannah area, encouraging water-requirement reduction and the recycling of water.

5. *Water users should be required to use the water of lowest quality available that is, or can feasibly be made, suitable for a particular purpose.* For example, for certain water uses that do not require drinking-water quality, a ground water of lower quality could be utilized and thus conserve higher-quality ground water.

6. *Measures should be instituted that would provide for the best practical management of the ground-water system and cause the least interference with existing water users.* Such measures would include careful consideration of well or well-field placement, proper well spacing, and the establishment of "optimum practical" pumping rates and pumping water levels. In short, prior to permitting a certain withdrawal, the water user should be required to consider the best location for a well, which may not necessarily be his most economic location. One area in particular which this is already critical is in southwestern Beaufort County (specifically on Hilton Head Island). The concentration of extremely large-capacity wells without proper spacing and depth control that are to be completed in the Tertiary Limestone Aquifer should be prohibited. Again, prohibition of future ground-water withdrawals from this aquifer, even in coastal Beaufort County, is unrealistic and not supported by the technical data. We are recommending careful consideration of these withdrawals. For example, if it is shown that two properly-spaced lower capacity wells can replace one large-capacity well, then this would be the proper alternative.

7. *If a capacity use area is declared, we would recommend that no well in coastal Beaufort County (especially southeast of the Coosaw River), regardless of capacity or purpose, should be drilled without first obtaining a permit from the SCWRC under the provisions of Section 49-5-40(a)(2) of the Ground Water Use Act.* The primary concern is not necessarily the quantity that may be withdrawn through a small-diameter well, but the possible contribution to salt-water contamination if the well were improperly constructed. If a reasonable need could not be shown, and the proper well-construction criteria could not be adherred to then the well should not be permitted.

8. *Measures for proper monitoring:* There are some areas, southwest of the Broad River for example, where prospective water users wishing to install a large-capacity well or well field should bear the cost of one or more observation wells if it is deemed necessary. For example, if a water user wished to locate a large-capacity well in close proximity (within 2,000 feet) of a known fresh-salt-water interface (or a suspected interface), he should be required to install a minimum of one salt-water monitor well. The State of S.C. should not be expected to do this; we have neither the funding, equipment, nor the personnel budget to do so. Obviously, the greater the quantity of ground-water use requested, the greater the need for monitoring. It is entirely possible, or even probable, that one relatively inexpensive small-diameter (four inch) test well may save a prospective water user from an unnecessary large expense.

Two other recommendations should be considered, and are strongly recommended whether or not a capacity use area is declared.

1. *Maintain the SCWRC Regional Office in Beaufort, South Carolina:* This office will serve the proposed Low Country Capacity Use Area (if declared) as well as Allendale, Bamberg, and Barnwell Counties. The duties of personnel assigned to this office will include carrying out the administrative responsibilities necessary to manage the proposed capacity use area (if declared) as well as carrying out a comprehensive ground-water research and technology transfer program to assist existing and prospective ground-water users. The ground-water program conducted from this office will be directed towards providing an adequate ground-water research program consisting of the collection and evaluation of basic hydrogeologic data pertaining to the occurrence, movement, availability, and chemical quality of ground water. As such data become available, they will be interpreted and evaluated and reported immediately by direct oral communication, and letter-type reports; and these data will be published by the SCWRC on a regular basis.

2. *Establish a formal Interstate Ground-Water Committee composed of representatives from South Carolina and Georgia:* Insomuch as the impact of ground-water withdrawals does not stop at state boundaries, a technical ground-water committee, composed of hydrologists from South Carolina and Georgia, should be created immediately. Because both Georgia and South Carolina rely heavily on the Tertiary Limestone Aquifer in the Low Country-Savannah area, several problems involving water rights are becoming more apparent as the demand for ground water increases. A Technical Ground-Water Committee could serve as a source of communication whereby joint efforts could be made by qualified ground-water personnel to seek practical solutions to present technical problems and future water-supply needs of the area.

It should be re-emphasized that the ground-water resources of the Low Country area, as a whole, can sustain much greater development. Deep artesian aquifers below the Tertiary Limestone Aquifer in Hampton County, much of Colleton County, and possibly in northern Beaufort and Jasper Counties are capable of supplying much greater quantities of fresh, good-quality ground water to properly constructed wells. If the ground-water resources of the Tertiary Limestone Aquifer are properly managed, this aquifer system is also capable of additional development. As mentioned in the "Introduction", this report, as required by a State law, has concentrated on problems that require the application of proper ground-water management. *Therefore, it would be erroneous and totally misleading for this report to be utilized to suggest that ground water is an undependable resource.* On the other hand, we hope that we have not left the reader with the impression that the problems are not serious. *To the contrary, without proper management, ground-water management options now available may not be available in the short term and certainly not over the long term.*

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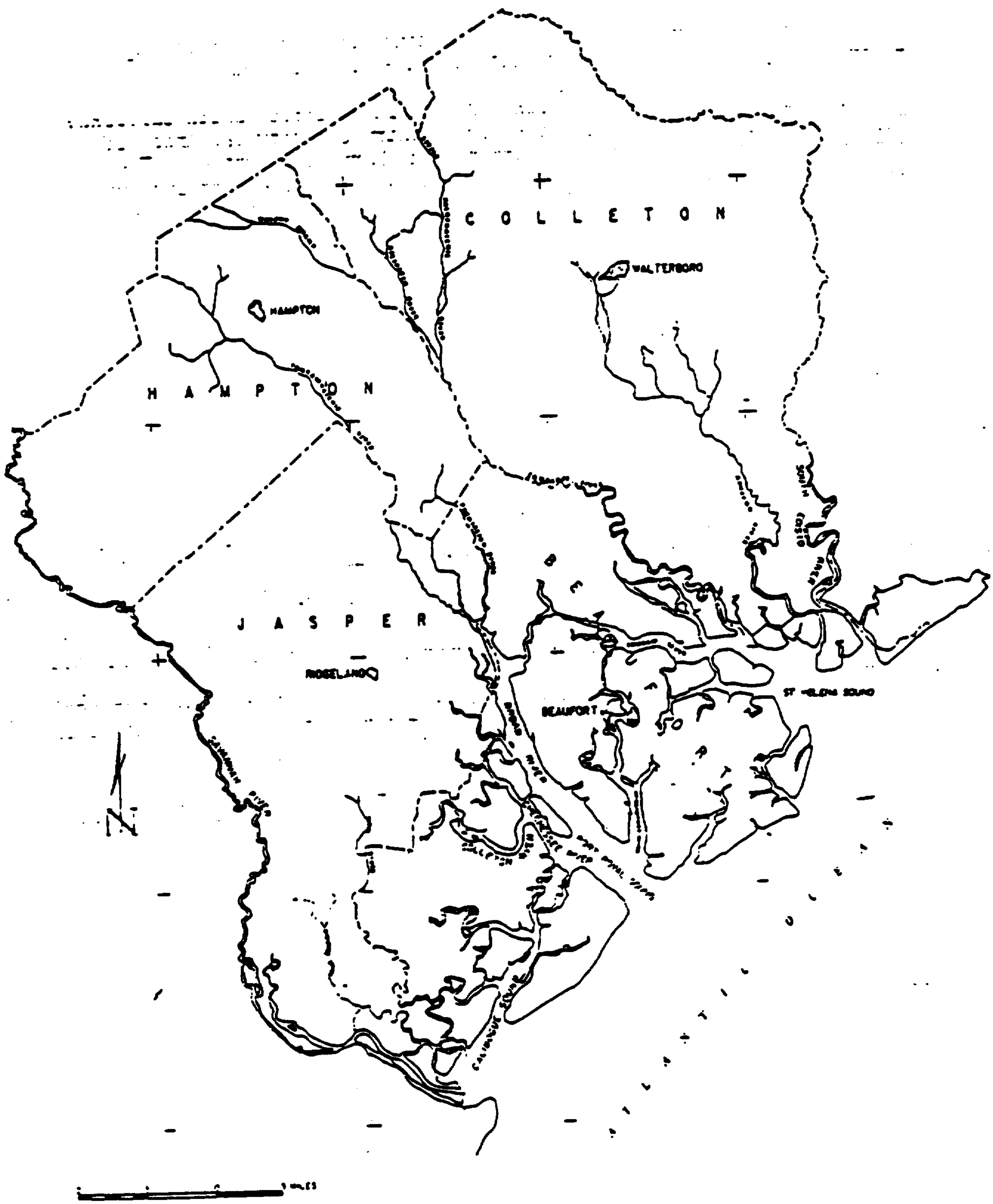

FIGURE 20. BOUNDARY OF PROPOSED LOW COUNTRY CAPACITY USE AREA.

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NUS CORPORATION AND SUB	REFERENCE # 31	TELECON NOTE
CONTROL NO. F4-8904-54	**DATE:** December 13, 1989	**TIME:** 1140
DISTRIBUTION: American Color andChemical/Venture Chemical File		
BETWEEN: Mr. Henry Walker	**OF:** Dickenson Well Drilling & Pump Service	**PHONE:** (803) 524-2274
AND: James Miller, NUS Corporation J.M.		

DISCUSSION:

Called Henry Walker, a local water well driller, and asked about aquifer use within 4 miles of Lobeco Products, Inc. Mr. Walker stated that about 95% of the groundwater supply for this area is obtained from the Tertiary Limestone aquifer. The wells completed within this unit are normally about 80 feet deep. All other groundwater supplies are obtained from shallow (18-25 feet below land surface) wells screened in the surficial aquifer.

South C — REFERENCE # 32 — : Health
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2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

MEMORANDUM

TO: George Nelson, P.E., Director
Low Country District

Clyde M. Livingston

FROM: Clyde M. Livingston, P.G., Manager
Geohydrologic Section
Water Pollution Control Bureau

RE: Lobeco Products, Inc.
Vicinity Private Well Water Quality Reconnaissance
Beaufort County

DATE: July 25, 1989

SCDHEC laboratory analyses of samples taken from six (6) private water supply wells near Lobeco Products, Inc. on 5/25/89 by staff hydrologists have been received and reviewed. Analysis for organics and inorganics indicates both the sampled wells and adjacent water supplies to be of satisfactory ground-water quality respective of the parameters evaluated and normal to the hydrogeologic conditions of the Low Country area.

The attached location map provides sample locations, resident names and sampling conditions. Copies of the individual laboratory reports are included both for the District file and for distribution to the individual well owners.

Please advise if you have any questions or anticipate difficulty in distribution of the data to the corresponding well owners.

CL/sr

Enclosures:
1. Location map of sampled wells.
2. List of well owner names and well conditions at time of sampling.
3. Laboratory analyses from 5/25/89 sampling.

cc: Lobeco Products, Inc.
P.O. Box 815, SC Highway 38
Lobeco, SC 29931 w/enc.

RMT
100 Verdae Blvd.
P.O. Box 16778
Greenville, SC 29606 w/enc.

Sandra Hursey, EQM, Enforcement Section wo/enc.
Bart Ruiter, Director, Industrial and Agricultural Wastewater Div. wo/enc.

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South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

MEMORANDUM

TO: Sandra Hursey, EQM
Division of Water Quality Assessment and Enforcement

FROM: B. Thomas Knight, Hydrogeologist
Geohydrologic Section
Division of Water Quality Assessment and Enforcement

Tom Knight

RE: Lobeco
May 24 and 25, 1989 Private Water Supply Well Survey and Sampling
Beaufort County

Date: May 26, 1989

On May 24, 1989, Christine Sanford, Clyde Livingston and the writer located private water supply wells within approximately one-quarter mile radius around the old burn site and the old lagoon at the Lobeco Plant. Information from the survey was used to determine which wells downgradient from the Lobeco sites were to be sampled on May 25, 1989. The following information was gathered during the well survey:

1) Gilbert Well. According to Mr. Roy Gilbert, Mr. Pulaski from Beaufort (out of business) drilled the 60 foot deep well. The well serves three people in the Gilbert house and two mobile homes also located on the property. The well is constructed of 1.5 inch diameter galvanized steel with a suction type pump.

2) Lane Well. According to Ms. Dianne Lane (Post Office Box 790, Lobeco, S. C. 29931), the well water has a bad taste and is used mostly for watering, cooking, cleaning and bathing. The well serves three people and no information is known about the well. The well is constructed of a 2 inch diameter galvanized steel with a suction type pump.

3) Unknown Home #1. No one could be located at this residence. A swimming pool is located behind the house and the well is constructed of a 2 inch galvanized steel pipe with a suction type pump.

4) Brantley Well. According to Ms. Judy Brantley (P.O. Box 681, Lobeco, S. C. 29931), a man from Walterboro installed the deep well about 10 years ago. The well serves four people and is constructed of 4 inch diameter PVC pipe with a suction type pump.

5) Powell Well. According to Mr. Evan Powell, who lives on the east side of the road and whose son lives on the west side of the road, the water supply well in the horse pasture is 160 feet deep, is 10 years old and was drilled by Mr. Pulaski. The well at Mr. Evan Powell's residence (house well) is 160 feet deep and was installed by Mr. Peterson out of Estill. According to Mr. Powell, the wells across the street (Lane, Brantley, Gilbert, etc.) are 160 feet to 180 feet deep. The only well driller out of Beaufort (Bellam?) has installed some of the wells in the area.

6) Rei Well. According to Ms. Annie May Rei (Route 1, Box 224, Dale, S. C. 29914), the well is deep. The well serves at least five people and is constructed of a two inch steel pipe with a jet type pump. The well serves at least three people.

7) Graham Well. No information could be obtained on this well and the well could not be positively located. According to Ms. Rei, a Mr. Fred Graham and another person reside at the trailer. Mr. Graham is presently sick and is with his mother, Henrietta Graham in Beaufort.

8) Austin Well and Residence. According to Ms. Ertha Austin, the Rei and Graham residences are located on Austin property. The home, not in use, belongs to her mother. This well is constructed of a 4 inch PVC pipe and has a submersible type pump. The well at the Austin residence is located behind the old house, is over 100 feet, is the deepest well in the area and was installed over thirty years ago by Mr. Pinkney in Beaufort. The well serves at least five people. A suction type pump is used on the well. The well could not be observed directly due to extensive covering.

9. Glenn Well. According to Ms. Ronald Glenn, the well is 125 feet deep. Five people are being served by the well. The Department sampled the well about one year before the plant explosion. PBC's were detected in the first analysis of the well, but were not detected in the confirmation analysis. A driller off of Rebock Road in Beaufort (Mr. Pulaski?) drilled the well.

10) Anderson Well. The depth of the well is unknown, but is thought to be shallow. The well serves four people, has a suction type pump, and is two inches in diameter. The day of the well survey, the well had quit working. That afternoon, a neighbor lowered the well piping about two to three feet and primed the well. Black silt was produced from the well for a short time after it started working.

11) Unknown Home #2. The well is two inches in diameter, has a suction type pump and serves seven people.

12) Williams Well. The well is constructed of two inch pipe and is fitted with a suction type pump. Water from the well tastes bad and the well serves two people.

13) Kenlaw Well. The well is constructed of two inch pipe with a suction type pump. The water has a bad taste and serves two people.

14) Lamb Well. The well is constructed of two inch pipe with a suction type pump. The well serves four people.

15) Burgess Well. (Route 1, Box 230, Seabrook, S. C. 29940). The well is constructed of two inch pipe with a jet type pump. The well serves two people.

16) Carroll Well. The well is 5 or 6 years old and serves three people. Dickenson Well Services (524-2274) drilled the well. Water from the well has a strong smell and is tinted yellow. The well is connected to a large holding tank.

On May 26, 1989, Ray Livingston and the writer sampled the Lane, Graham, Glenn, Anderson, Burgess and Carroll water supply wells for volatile organics, priority pollutant metals, selected secondary metals, acid base and neutral extractable components, PBC's, alkalinity and total dissolved solids. Metal samples were acidified in the field. Samples were placed in a cooler with ice after collection and transported to the DHEC lab. The Ph was not measured due to faulty equipment. See Table One (attached) for additional information on individual samples.

If you have any questions, please feel free to contact me at 734-5243.

Enclosure: Location map of wells
Table One, Sampling Notes

cc: George Nelson, Director
Low Country District EQC

Christine Sanford, Hydrogeologist
Trident District EQC

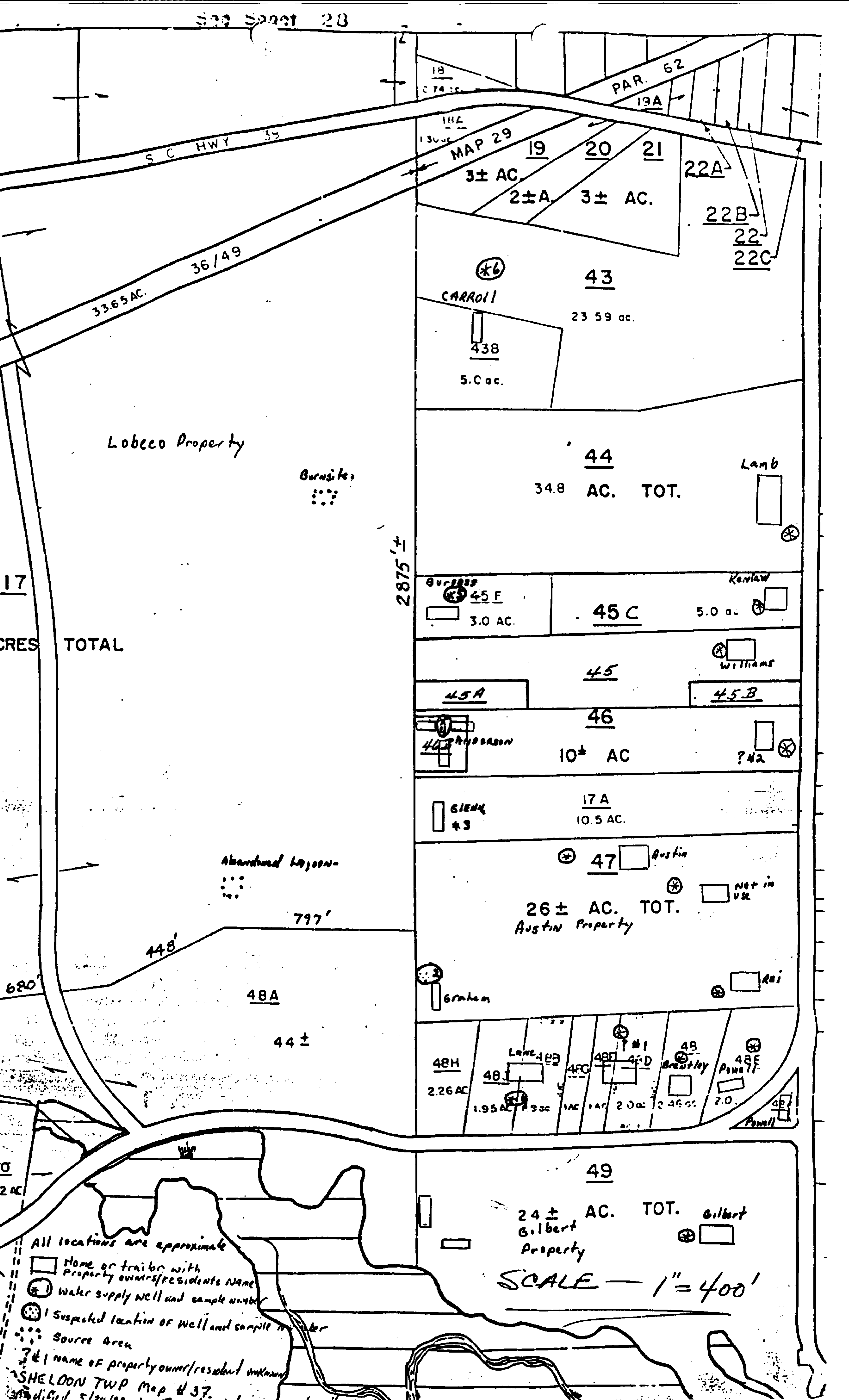
Andy Yasinsac, Manager
Division of Industrial and Agricultural Wastewater

Tom Kurimcak, Director
Analytical Services Division

Ground Water Protection Division Files

TABLE ONE

Sample Identification	LAME 1	GRAHAM 2	GLENN 3	ANDERSON 4	BUGRESS 5	CARROLL 6
Time Collected	10:25 & 13:00*	11:00 &12:50*	11:25	11:45	12:10	12:35
Temperature	22°C	21°C	21.5°C	24°C	21°C	23°C
Specific Conductance T°=25°C	301 umhos/cm	298 umhos/cm	338 umhos/cm	362 umhos/cm	314 umhos/cm	395 umhos/cm
Length of time well purged	10 minutes	10 minutes	10 minutes	1 minute	15 minutes	15 minutes
Sample Collection Point	Copper/bronze Spigot in front of home	Copper/bronze Spigot behind trailer	Copper/bronze Spigot at well	Brass? Spigot on side of western most trailer	Copper/bronze Spigot behind trailer	Copper/bronze Spigot in front of trailer
COMMENTS:	Sample was clear with a slight H_2S odor. Dark spongy - precipitate noticed in PCB sample upon delivery to lab. *The well was sampled for PBC's after purging well for 5 minutes.	Sample was clear with a moderate H_2S odor. Thermo-plastic water line. *The well was sampled for PCB's after purging for 3 minutes.	Sample was clear with a moderate H_2S odor.	Sample was clear with a very slight pesticide like odor. Due to well going dry, well was purged only long enought to clear the line. Family recently used well.	Sample was clear with a slight H_2S odor and sweet odor. Well was purged longer due to large holding tank. Thermoplastic water line.	Sample was clear with a slight H_2S odor. Well was purged longer due to large holding tank. The well is also located a long distance from the sampling point. Thermoplastic water line.



See Sheet 28
18
184
PAR. 62
19A
S C HWY 35
MAP 29
19
20
21
22A
3± AC.
2±A.
3± AC.
22B
22
22C
36/49
33.65AC.
43
CARROLL
23 59 ac.
43B
5.C ac.
Lobeco Property
Bursites
44
34.8 AC. TOT.
Lamb
2875'±
17
CRES TOTAL
Burgess
45 F
3.0 AC.
45 C
Kenlaw
5.0 ac
Williams
45
45A
45B
46
Anderson
10± AC
?#2
17 A
10.5 AC.
GLENN
#3
Abandoned Lagoon
47
Austin
Not in use
26± AC. TOT.
Austin Property
797'
448'
680'
48A
44±
Graham
Rai
48H
2.26AC
48J
Lane
48G
48F
48D
48E
48
Brantley
Powell
2.0
Powell
49
24± AC. TOT.
Gilbert
Gilbert Property
SCALE — 1" = 400'
All locations are approximate
Home or trailer with property owners/residents name
Water supply well and sample number
Suspected location of well and sample number
Source Area
?#1 name of property owner/resident unknown
SHELDON TWP Map #37

WPC

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Solid Waste and Hydrology

Sample Location NEAR LOBECO CHEM. County BEAUFORT

Sample Type GROUND-WATER Comments PRIVATE WELL SAMPLES (DOWN GRADIENT)

Date 5/25/89 Collected by LIVINGSTON KNIGHT An "X" in the small column indicates test requested

	#1	#2	#3		#1	#2	#3
Time Collected (Milit.)	1025	1100	1125		1025	1100	1125
Sample Point	LANE	GRAHM	GLENN		LANE	GRAHM	GLENN
Lab No. 052689	0151	0152	0153		0151	0152	0153
NH_3-N, mg/l				Calcium			
NO_3/NO_2-N, mg/l				Magnesium			
TKN				Sodium			
Nitrite, N, mg/l				Potassium			
T-P,				Arsenic	X	X	X
Hardness, mg/l				Barium	X	X	X
Cl, mg/l				Cadmium	X	X	X
SO_4 mg/l				Chromium	X	X	X
Flashpoint, °F				Copper	X	X	X
Solids, Total, mg/l				Iron	X	X	X
Solids, Tot. Diss, mg/l	X	X	X	Lead	X	X	X
Solids, %				Manganese			
pH				Mercury	X	X	X
Alkalinity mg/l	X	X	X	Nickel	X	X	X
Fluoride, mg/l				Selenium	X	X	X
TOC				Silver	X	X	X
Phenols, µg/l				Zinc	X	X	X
COD							
Cyanide, mg/l							
MBAS, mg/l				Remarks:			

Remarks: ACIDIFIED IN FIELD
SEND RESULTS TO EITHER
LIVINGSTON OR KNIGHT IN
GEOHYDROLOGIC SECTION BWAC
Phone (734-5309/5243)

Date Received in Regional Laboratory ______ by ______

Date Released from Regional Laboratory ______ by ______

Date Received in Central Laboratory 5-26-89 by E Cox

Date Released from Spec & A. A. Section 7-10-89 by [illegible]

Date Released from Metals Section 7-10-89 by [illegible]

DHEC 40-89 (01/81) White - Program; Yellow - Program; Pink -Program; Gold - Lab

EJS

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Organic Compounds in Solid Waste and Hydrology Samples

WPC

Sample Location: NEAR LOBECO CHEM. County: BEAUFORT

Comments: RESIDENTIAL WELLS (PRIVATE) DOWN GRADIENT

Date: 5/25/89 Collected By: LIVINGSTON / KNIGHT

An "X" in the small column indicates test requested.

Sample Type: 1. Water (circled) 2. Soil/Sediment 3. Hazardous Waste 4. Other ______

Time Collected (Milit.)		#1 LANE Res.		#2 GRAHM Res.		#3 GLENN Res.
Station No.	X	1300/1025	X	1250/1100	X	1125 (time)
Lab. No. 052689		0151		0152		0153
Chlorinated hydrocarbon - Pesticides						
Endrin (µg/L or µg/Kg)						
Lindane (µg/L or µg/Kg)						
Methoxychlor (µg/L or µg/Kg)						
Toxaphene (µg/L or µg/Kg)						
Organophosphate - Pesticides (µg/L or µg/Kg)						
PCBs (µg/L or µg/Kg)						
	X		X		X	
Base Neutral/Acid Extractables	X		X		X	
Volatile Organics	X		X		X	
Petroleum Hydrocarbons						

Comments: SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC phone (734-5309/5243)

Date Received in Regional Laboratory ______ By ______

Date Released from Regional Laboratroy ______ By ______

Date Received in Central Laboratory 05-26-89 By E Cox

Date Released from Organic Section 7-10-89 By TCH

DHEC 40-90 (7/87)

WPC

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Solid Waste and Hydrology

Sample Location NEAR LOBECO CHEM. County BEAUFORT

Sample Type GROUND WATER Comments PRIVATE WELLS (DOWN GRADIENT)

Date 5/25/89 Collected by LIVINGSTON KNIGHT An "X" in the small column indicates test requested

		#4		#5		#6			#4		#5		#6
Time Collected (Milit.)		1145		1210		1235			1145		1210		1235
Sample Point		ANDERSON		BARGESS		CARROL			ANDERSON		BARGESS		CARROL
Lab No. 052689	✓	0154	✓	0155	✓	0156			0154		0155		015
NH_3-N, mg/l							Calcium						
NO_3/NO_2-N, mg/l							Magnesium						
TKN							Sodium						
Nitrite, N, mg/l							Potassium						
T-P,							Arsenic	X		X		X	
Hardness, mg/l							Barium	X		X		X	
Cl, mg/l							Cadmium	X		X		X	
SO_4 mg/l							Chromium	X		X		X	
Flashpoint, °F							Copper	X		X		X	
Solids, Total, mg/l							Iron	X		X		X	
Solids, Tot. Diss, mg/l	X		X		X		Lead	X		X		X	
Solids, %							Manganese						
pH							Mercury	X		X		X	
Alkalinity mg/l	X		X		X		Nickel	X		X		X	
Fluoride, mg/l							Selenium	X		X		X	
TOC							Silver	X		X		X	
Phenols, µg/l							Zinc	X		X		X	
COD													
Cyanide, mg/l													
MBAS, ~~mg/l~~													

Remarks:
ACIDIFIED IN FIELD
SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC
phone 734-5309/5243

Date Received in Regional Laboratory ____ by ____
Date Released from Regional Laboratory ____ by ____
Date Received in Central Laboratory 5-26-89 by Clay
Date Released from Spec & A. A. Section ____ by ____
Date Released from Metals Section 07-05-89 by [illegible]

DHEC 40-89 (01/81) White - Program; Yellow - Program; Pink -Program; Gold - Lab

...OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Organic Compounds in Solid Waste and Hydrology Samples

WPC

Sample Location: NEAR LOBECO CHEM. County: BEAUFORT

Comments: RESIDENTIAL WELLS (PRIVATE) DOWN GRADIENT

Date: 5/25/89 Collected By: LIVINGSTON / KNIGHT

An "X" in the small column indicates test requested.

Sample Type: 1. Water 2. Soil/Sediment 3. Hazardous Waste 4. Other

Time Collected (Milit.)		#4 ANDERSON		#5 BURGESS		#6 CARROLL
Station No.	X	1145 (time)	X	1210 (time)	X	1235 (time)
Lab. No. 052689		0154		0155		0156
Chlorinated hydrocarbon - Pesticides						
Endrin (µg/L or µg/Kg)						
Lindane (µg/L or µg/Kg)						
Methoxychlor (µg/L or µg/Kg)						
Toxaphene (µg/L or µg/Kg)						
Organophosphate - Pesticides (µg/L or µg/Kg)						
PCBs (µg/L or µg/Kg)	X		X		X	
Base Neutral/Acid Extractables	X		X		X	
Volatile Organics	X		X		X	
Petroleum Hydrocarbons						

Comments: SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC (Phone 734-5309 / 5243)

Date Received in Regional Laboratory ______ By ______

Date Released from Regional Laboratroy ______ By ______

Date Received in Central Laboratory 5-26-89 By [illegible]

Date Released from Organic Section 07-05-89 By [illegible]

DHEC 40-90 (7/87)

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Organic Compounds in Solid Waste and Hydrology Samples

WPC

Sample Location: NEAR LOBECO   County: BEAUFORT

Comments: FIELD BLANK

Date: 5/23/89   Collected By: LIVINGSTON / Knight

An "X" in the small column indicates test requested.

Sample Type: 1. Water 2. Soil/Sediment 3. Hazardous Waste 4. Other: FIELD BLANK

Time Collected (Milit.)						
Station No.		LANE RES				
Lab. No. 052689		0150				
Chlorinated hydrocarbon - Pesticides						
Endrin (µg/L or µg/Kg)						
Lindane (µg/L or µg/Kg)						
Methoxychlor (µg/L or µg/Kg)						
Toxaphene (µg/L or µg/Kg)						
Organophosphate - Pesticides (µg/L or µg/Kg)						
PCBs (µg/L or µg/Kg)						
Base Neutral/Acid Extractables						
Volatile Organics	X					
Petroleum Hydrocarbons						

Comments: SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC phone (734-5309 / 5243)

Date Received in Regional Laboratory ______ By ______

Date Released from Regional Laboratroy ______ By ______

Date Received in Central Laboratory 5-26-89 By E Cox

Date Released from Organic Section 6-12-89 By TLK

DHEC 40-90 (7/87)

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890150
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JUNE 12TH, 1989
RELEASE DATE : 06/12/89 12:34:33
DT COLLECTED : 05/25/89 00:00:00
SAMPLE MEDIUM : WATER
STATION CODE : BLANK

ANALYSIS	STORET	RESULT
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890150
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JUNE 12TH, 1989
RELEASE DATE : 06/12/89 12:34:38
DT COLLECTED : 05/25/89 00:00:00
SAMPLE MEDIUM : WATER
STATION CODE : BLANK

ANALYSIS	STORET	RESULT
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

clean

COMMENTS:

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890151	MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC	RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON	DT COLLECTED : 05/26/89 10:25:00
COUNTY : BEAUFORT	SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL	STATION CODE : #1

ANALYSIS	STORET	RESULT
LKALINITY MG/L	00410	195
RSENIC UG/L	01002	<5
CENAPHTHENE UG/L	34205	<4.0
CENAPHTHYLENE UG/L	34200	<4.0
NTHRACENE UG/L	34220	<4.0
ENZO(A)ANTHRACENE UG/L	34526	<4.0
ENZO(B)FLUORANTHENE UG/L	34230	<4.0
ENZO(K)FLUORANTHENE UG/L	34242	<4.0
ENZO(A)PYRENE UG/L	34247	<4.0
ENZO(GHI)PERYLENE UG/L	34521	<4.0
UTYLBENZYL PHTHALATE UG/L	34292	<4.0
IS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
IS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
IS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
IS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
-CHLORONAPHTHALENE UG/L	34581	<4.0
-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
HRYSENE UG/L	34320	<4.0
IBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
I-N-BUTYLPHTHALATE UG/L	39110	5.85
,3-DICHLOROBENZENE UG/L	34566	<4.0
,2-DICHLOROBENZENE UG/L	34536	<4.0
,4-DICHLOROBENZENE UG/L	34571	<4.0
,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

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SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

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SAMPLE NUMBER : 0526890151 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/26/89 10:25:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #1

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890151
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/26/89 10:25:00
SAMPLE MEDIUM : WATER
STATION CODE : #1

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30.
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890151
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/26/89 10:25:00
SAMPLE MEDIUM : WATER
STATION CODE : #1

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	10
IRON UG/L	01045	40
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	70
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	230
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526390131 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/26/89 10:25:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #1

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
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SAMPLE NUMBER : 0526890151 MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/26/89 10:25:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #1

ANALYSIS STORET RESULT

COMMENTS:

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526690152
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/25/89 11:00:00
SAMPLE MEDIUM : WATER
STATION CODE : #2

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	185
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
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SAMPLE NUMBER : 0526890132 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:00:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #2

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 052689[illegible]1[illegible]2
MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC
RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON
DT COLLECTED : 05/25/89 11:00:00
COUNTY : BEAUFORT
SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL
STATION CODE : #2

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890152
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/25/89 11:00:00
SAMPLE MEDIUM : WATER
STATION CODE : #2

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	180
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	230
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	210
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *

SAMPLE NUMBER : 0520890102 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : RPC — RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:00:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : 02

PAGE 5

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0522890152
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/25/89 11:00:00
SAMPLE MEDIUM : WATER
STATION CODE : #2

ANALYSIS STORET RESULT

COMMENTS:

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 052[illegible]901[illegible] MONDAY JULY 10TH, 1989
CHARGE NUMBER : AFC RELEASE DATE : 07/10/89 1[illegible]:[illegible]:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 11:35:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : 43

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	185
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOPOBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL     *
*             ANALYTICAL SERVICES DIVISION LABORATORY  REPORT              *
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SAMPLE NUMBER : 0526890153 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/10/89 1[illegible]:[illegible]9:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:[illegible]:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #3

PAGE 3

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

MONDAY JULY 10TH,

SAMPLE NUMBER : 0526890173
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

RELEASE DATE : 07/1 /9
DT COLLECTED : 05/25/ 9 11:25
SAMPLE MEDIUM : WATER
STATION CODE :

PAGE 3

ANALYSIS — STORET — RESULT

PHENOL UG/L
2,4,6-TRICHLOROPHENOL UG/L
BENZIDINE UG/L
HEXACHLOROCYCLOPENTADIENE UG/L
N-NITROSODIMETHYLAMINE UG/L
N-NITROSODIPHENYLAMINE UG/L
ANILINE UG/L
BENZYL ALCOHOL UG/L
2-METHYLPHENOL UG/L
4-METHYLPHENOL UG/KG
BENZOIC ACID UG/L
4-CHLOROANILINE UG/L
2-METHYL NAPHTHALENE UG/L
2,4,5-TRICHLOROPHENOL UG/L
2-NITROANILINE UG/L
3-NITROANILINE UG/L
DIBENZOFURAN UG/L
4-NITROANILINE UG/L
AZOBENZENE UG/L

STORET: 34694, 34621, 39120, 34336, 34438, 34433, 77089, 77147, 77247, 77416, 77087, 78303, 81302, 77625

RESULT: <4.0 (each entry)

ANALYSIS	STORET	RESULT
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890153
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:59:02
DT COLLECTED : 05/25/89 11:25:00
SAMPLE MEDIUM : WATER
STATION CODE : #3

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	40
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	50
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	250
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890153
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/25/89 11:35:00
SAMPLE MEDIUM : WATER
STATION CODE : 03

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
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SAMPLE NUMBER : 052689O153 MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/10/89 13:39:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 11:25:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : 43

ANALYSIS STORET RESULT

COMMENTS:

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*              ANALYTICAL SERVICES DIVISION LABORATORY  REPORT           *
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SAMPLE NUMBER : 0525890154 | MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC | RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON | DT COLLECTED : 05/25/89 11:45:00
COUNTY : BEAUFORT | SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL   STATION CODE : #4

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	200
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

cb

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *

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SAMPLE NUMBER : 0526890154
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY   : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 11:45:00
SAMPLE MEDIUM : WATER
STATION CODE : #4

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

Clean

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT
****

SAMPLE NUMBER : 0526890154
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 11:45:00
SAMPLE MEDIUM : WATER
STATION CODE : #4

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

clean

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*       SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL    *
*               ANALYTICAL SERVICES DIVISION LABORATORY  REPORT          *
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SAMPLE NUMBER : 0526890154 — MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:45:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #4

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	20
IRON UG/L	01045	280
MANGANESE UG/L	01055	10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	90
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	270
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

clean

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890154
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 11:45:00
SAMPLE MEDIUM : WATER
STATION CODE : #4

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

clean

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *

****

SAMPLE NUMBER : 0526890154 MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 11:45:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #4

ANALYSIS	STORET	RESULT

COMMENTS:

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526390155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	176
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

clean

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

NALYSIS	STORET	RESULT
IETHYL PHTHALATE UG/L	34336	<4.0
IMETHYL PHTHALATE UG/L	34341	<4.0
,4-DINITROTOLUENE UG/L	34611	<4.0
,6-DINITROTOLUENE UG/L	34626	<4.0
I-N-OCTYLPHTHALATE UG/L	34596	<4.0
LUORANTHENE UG/L	34376	<4.0
LUORENE UG/L	34381	<4.0
EXACHLOROBENZENE UG/L	39700	<4.0
EXACHLOROBUTADIENE UG/L	34391	<4.0
EXACHLOROETHANE UG/L	34396	<4.0
NDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
SOPHORONE UG/L	34408	<4.0
APHTHALENE UG/L	34696	<4.0
ITROBENZENE UG/L	34447	<4.0
-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
HENANTHRENE UG/L	34461	<4.0
YRENE UG/L	34469	<4.0
,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
-CHLOROPHENOL UG/L	34586	<4.0
,4-DICHLOROPHENOL UG/L	34601	<4.0
,4-DIMETHYL PHENOL UG/L	34606	<4.0
,4-DINITROPHENOL UG/L	34616	<4.0
-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
-NITROPHENOL UG/L	34591	<4.0
-NITROPHENOL UG/L	34646	<4.0
NTACHLOROPHENOL UG/L	39032	<4.0

clean

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

dea

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER

SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #5

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	40
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	30
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	230
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

clean

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
',1-DICHLOROETHENE UG/L	34501	<2.0
'RANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
,2-DICHLOROPROPANE UG/L	34541	<2.0
IS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
RANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
THYL BENZENE UG/L	34371	<2.0
ETHYLENE CHLORIDE UG/L	34423	<2.0
,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
ETRACHLOROETHENE UG/L	34475	<2.0
OLUENE UG/L	34010	<2.0
,1,1-TRICHLOROETHANE UG/L	34506	<2.0
,1,2-TRICHLOROETHANE UG/L	34511	<2.0
RICHLOROETHENE UG/L	39180	<2.0
RICHLOROFLUOROMETHANE UG/L	34488	<2.0
INYL CHLORIDE UG/L	39175	<2.0

clean

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526890155 | WEDNESDAY JULY 5TH, 1989
CHARGE NUMBER : WPC | RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON | DT COLLECTED : 05/25/89 12:10:00
COUNTY : BEAUFORT | SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL   STATION CODE : #5

ANALYSIS   STORET RESULT

OMMENTS:

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT
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SAMPLE NUMBER : 0526890156
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:35:00
SAMPLE MEDIUM : WATER
STATION CODE : #6

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	212
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

clean

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526890156 MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 12:35:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #6

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL     *
*              ANALYTICAL SERVICES DIVISION LABORATORY  REPORT             *
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SAMPLE NUMBER : 0526890156
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL   STATION CODE : #6

MONDAY JULY,3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:35:00
SAMPLE MEDIUM : WATER

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

clean

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890156
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:35:00
SAMPLE MEDIUM : WATER
STATION CODE : #6

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	340
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	10
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	290
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

clean

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL        *
*              ANALYTICAL SERVICES DIVISION LABORATORY  REPORT                 *
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SAMPLE NUMBER : 0526890156 — MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 12:35:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #6

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

clean

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL    *
*               ANALYTICAL SERVICES DIVISION LABORATORY  REPORT           *
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SAMPLE NUMBER : 0526890156
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEN - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:35:00
SAMPLE MEDIUM : WATER
STATION CODE : #6

ANALYSIS STORET RESULT

COMMENTS:

REFERENCE # 33

06 OCT 1987

MEMORANDUM

SUBJECT: Updated Drinking Water Standards and Health Advisory Table

FROM: Steve Pardieck, Chief
Drinking Water Branch (W-6)

TO: Regional Drinking Water Branch Chiefs
Regions I-VIII, X

Region II's Drinking Water Branch recently distributed to all Regions a Federal Drinking Water Standards and Health Advisory Chart. I found it interesting that other Regions have also seen the need to have a handy reference table of drinking water standards and health advisories. Region IX has also produced a variation of Region II's chart which was updated on September 21, 1987. The updated Drinking Water Standards and Health Advisory Table is enclosed.

The Drinking Water Standards and Health Advisory Table was developed, in part, to give guidance regarding Superfund remedial clean-up actions involving potential drinking water sources. Therefore, the Table includes information from IRIS and CAG as well as State Action Levels.

I hope you will find the information helpful. Please send any comments or suggestions you may have regarding the Table to Melvin Okawa, Policy Standards and Technology Section, of my staff.

Attachment

A nominal .1 FTE tap per Region will be assessed and reallotted in FY ?? !!

REGION 9

ENVIRONMENTAL PROTECTION AGENCY

DRINKING WATER STANDARDS

AND

HEALTH ADVISORY TABLE

DRINKING WATER BRANCH
SEPTEMBER 21, 1987

INTRODUCTION AND WARNING

This Drinking Water Standards and Health Advisories Table is a compendium of standards, criteria and advisories for chemical and other contaminants which may be found in ground and surface waters. In order to make this Table a manageable size, very few explanations, caveats, etc. for the values are included in the body of the Table. Because of this limitation, and the fact that the background documentation and knowledge of the derivation of any particular number is critical to the proper use of such number, this Table cannot be used as a sole source of information. The Appendix contains brief explanations about the standards, criteria and advisories, but the appropriate reference materials must be consulted to determine the applicability of the number being considered. Some of the references are listed in the Appendix.

Since the numbers are subject to change, this Table will be updated on an as-needed basis. However, the user of this Table is advised to check with the appropriate source for a number to make sure that the value hasn't been recently changed. Not following this procedure could result in the selection of an inappropriate number for the intended purpose.

SUMMARY

Under the National Primary Drinking Water Regulations (NPDWRS), there are existing maximum contaminant levels (MCLs) for eight volatile organic chemicals, seven synthetic organic chemicals, nine inorganic compounds, the microbiological parameter of total coliform, turbidity, and three radionuclide contamination indicators. There are also existing maximum contaminant level goals (MCLGs) for the eight volatile organic chemicals with MCLs. Regulatory revisions to the NPDWRs subsequent to passage of the Safe Drinking Water Act (SDWA) Amendments of 1986 (in additional to the final regulations for the eight volatile organic chemicals) thus far have consisted of proposing MCLGs for 11 inorganic, 25 synthetic organic chemicals, microbiological parameters for total coliform, Giardia and viruses, and turbidity. In a separate regulatory action for fluoride, a final MCL and a Secondary MCL were promulgated in 1986. These regulatory revisions are mandated in the 1986 re-authorized and amended SDWA which requires EPA to develop drinking water standards for 83 contaminants over a three-year period. A list of these chemicals is contained in table 1 and a summary of statutory deadlines under the SDWA is contained in table 2. These tables follow the Drinking Water Standards and Health Advisory Table.

The Drinking Water Standards and Health Advisory Table provides a comprehensive listing of all the existing and proposed National Primary Drinking Water Regulations (NPDWRs), the State Action Levels for Arizona and California, and, where available, the following criteria: EPA Integrated Risk Information System (IRIS) drinking water lifetime calculations, EPA Office of Drinking Water (ODW) Health Advisories (HA), the National Academy of Sciences (NAS) Health Advisories, and EPA Carcinogen Assessment Group (CAG) risk levels for drinking water.

HOW TO USE THIS TABLE

Consult the Appendix to familiarize yourself more fully with the terms used in the Table and how the numbers are derived. Following are the different categories of standards and advisories used in the Table:

MCL = EPA Maximum Contaminant Level
PMCL = EPA Proposed Maximum Contaminant Level
MCLG = EPA Maximum Contaminant Level Goal
PMCLG = EPA Proposed Maximum Contaminant Level Goal
SMCL = EPA Secondary Maximum Contaminant Level
IRIS = EPA's Integrated Risk Information System
HA = Health Advisories developed by either the EPA's ODW Health Advisory Program or the National Academy of Sciences (NAS) recommendations based on NAS Suggested Non-Adverse Response Levels (SNARLS)
CAG = EPA Carcinogen Assessment Group
AZ DOHS = Arizona Department of Health Services Action Levels
CA DOHS = California Department of Health Services Action Levels

The only federally enforceable drinking water standard in the Table is EPA's MCL. When considering a value to use for determining an acceptable level in drinking water, the MCL (with its corresponding MCLG) should be selected first. The other noncarcinogenic criteria in the Table are nonenforceable goals and advisories which are derived from health-related data or information. These criteria have been set at levels at which no known or anticipated adverse effects on the health of persons occur and which allows for an adequate margin of safety. They do not take into account, however, treatment technology as do the MCLs. For chemicals that are classified as carcinogens by EPA, a 1×10^{-6} lifetime risk level has been listed in the Table. For chemicals that are listed by CAG, unit risks per parts per billion in water have also been included.

The derivation of MCLGs, lifetime (chronic) HAs, and IRIS lifetime levels for noncarcinogenic endpoints of toxicity are based on the same assumptions. These assumptions are discussed in the Appendix. In theory, the MCLG, lifetime HA, and the IRIS number should be the same for a specific contaminant as long as the same oral reference dose (RfD) is used in the calculation. Slight differences in the values are caused by rounding off numbers. If there are real discrepancies, individual program offices at EPA may have derived different RfDs or used RfDs before the number was updated. EPA is now attempting to use only consensus reference doses in the derivation of standards and criteria. The IRIS data base contains EPA intra-agency consensus oral RfDs for over 200 chemicals. Carcinogenic potency slope factors are also now being added to IRIS. Many of the chemicals in the Drinking Water Standards and Health Advisories Table are in the IRIS data base.

Many compounds in the Table will have more than one standard or criteria. When consulting the Table, users will have to decide which criteria is most appropriate in the absence of existing MCLs. For example, public water suppliers in a State with Action Levels will have to consider these criteria in any water protection action. When multiple criteria are available for a compound, the numbers should be ranked for use. The recommended priority ranking is PMCLG (if other than zero), IRIS lifetime number, ODW HA, CAG carcinogen risk number, and the NAS HA. In many cases, the criteria numbers will be the same. Reviewing the derivations of the criteria in the Appendix should help in understanding the priority of rankings.

Under the Superfund Program in order to achieve remedies that are protective of health and environment, remedial actions involving contamination of drinking water supplies must comply with applicable or relevant and appropriate requirements (ARARs). For the SDWA, the ARARs are the MCLs. Where there are no MCLs or where the MCLs are determined not sufficient to be protective because of a multitude of contaminants, one should refer to the J. Winston Porter, Assistant Administrator for Solid Waste and Emergency Response's July 9, 1987 memo "Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements" to determine clean-up policy effecting drinking water. For remedial actions involving waters regulated under the Clean Water Act, consult the National Ambient Water Quality Criteria (NAWQC).

Following are explanations of symbols used in the Table:

LOQ = Limit of quantification (detection limit)
mg/l = milligrams per liter which is equivalent to parts per million (ppm)
ug/l = micrograms per liter which is equivalent to parts per billion (ppb). NOTE: values in Table are in ug/l unless otherwise noted
ng/l = nanograms per liter which is equivalent to parts per trillion (ppt)
10^{-6} = cancer values are listed at the 10^{-6} level or a risk of one in a million over a lifetime.
T&O = taste and odor refers to a value based upon organoleptic data for controlling undesirable taste and odor quality of water
+ = EPA final draft Health Advisory
* = National Academy of Sciences Health Advisory
# = One of 83 required to be regulated contaminants with no current proposed MCLG which EPA will address at a later date

INORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in( )	chronic(lifetime) non-cancer	cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK/ per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Aluminum		#		35,000*							
Antimony		#	1.4								
Arsenic	50	PMCLG 50					$5.0x10^{-5}$	0.02	A		
Asbestos		7.1 x 10^6 long fib/l(PMCLG)				$7.1x10^6$ long fibers(>10 microns)/liter					
Barium	1000	PMCLG 1,500	1500	1500+	1500+						
Beryllium		#	17.5								
Bromide				1,400,000*	2300*						
Cadmium	10	PMCLG 5		43+	5+						
Chloramine				1200*							
Chlorate				125*							
Chloride	SMCL 250ppm										
Chlorine Dioxide				1200*	380*						
Chlorite				125*							
Chromium (Total)	50	PMCLG 120	17.5	1400(10)+	120+						
Copper	SMCL 1000	PMCLG 1,300									
Cyanide		#	70	220+	154+						160
Fluoride	4000 SMCL2000	4000	4000** 1000(child)***								
Iodide				115500*	1190*						

Values are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

**IRIS lifetime number is based on the prevention of skeletal fluorosis over a lifetime.

***IRIS child number is based on the critical effect of objectional dental fluorosis which the EPA has determined is a cosmetic effect and not a toxic and/or adverse health effect (50 FR 20164)

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

INORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in( )	chronic(lifetime) non-cancer	cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Iron	SMCL 300										
Lead	50	PMCLG 20									
Manganese	SMCL 50										
Mercury	2	PMCLG 3		1.58+	1.1+						
Molybdenum		#									
Nickel		#		1000(10)+	150+						
Nitrate (as N)	10ppm	PMCLG 10ppm	10000(child)** 35000 adult	10000(10)+ 4 kg child*** 111000 (10)+ adult							
Nitrite (as N)		PMCLG 1ppm	1000(child)** 3500 adult	1000(10)+ 4 kg child*** 11000(10)+ adult							
Selenium	10	PMCLG 45									
Silver	50	+	- 10.5								
Sodium		+									
Strontium				8400(7)*							
Sulfate	SMCL 250ppm										
Uranium		#			35*					20pCi/l	35
Vanadium		#									
Zinc	SMCL 5000	#									

Values are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

**IRIS child numbers for Nitrate/Nitrite designed to be protective of children up to 2 years (10 kg)

***10-day HA for Nitrate/Nitrite protective of 4 kilogram child (level for adult deemed also protective of 10 kg child); 10-day HA is also used for chronic (lifetime) HA

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

INORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in( )	chronic(lifetime) non-cancer	cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
RADIONUCLIDES											
Gross Alpha excl uranium & radon	15 pCi/ liter	#									
Man-made radio-activity	4 mrem total dose	#									
Radium 226 & 228	5 pCi/l	#									
Radon		#									
Uranium	See previous page										

ORGANIC CHEMICALS

Acrolein											320
Acrylamide		PMCLG 0		1500+		0.01+					
Acrylonitrile											10.0
Adipates		#									
Alachlor		PMCLG 0	70	100(10)+		0.15+				LOQ (0.2)	0.15
Aldicarb		PMCLG 9	9	12+	9+					10	9
Aldrin			0.2				$4.9x10^{-4}$	0.002	B2	LOQ (0.05)	
Atrazine		#			150*					15	
Baygon										90	
Bentazon (Basagran)			18							8	
Benzene	5	0		235+		0.7+	$8.2x10^{-7}$	1.20	A	0.70	5.0
Benzene hexachloride (BHC, alpha(a) beta (b) isomers)				35,000* tech grade		0.02*				0.70 a-BHC 0.30 b-BHC	
Benzidine			0.0002 = 10^{-6} Risk								

Values are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

**** CAG (Carcinogen Assessment Group) of EPA - See Appendix

ORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in ()	HEALTH ADVISORIES chronic(lifetime) non-cancer	HEALTH ADVISORIES chronic(lifetime) cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK per ppb	EPA/CAG CANCER NUMBERS**** 10^{-6} RISK	EPA/CAG CANCER NUMBERS**** WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Benzo(a)pyrene (one of many PAHs)				25(7)*		0.003*	3.3×10^{-4}	0.003	B2		
Bolero(thiobencarb)										10(tentative) (1 T&O)	
Bromodichloromethane	100**										
Bromomethane (Methyl bromide)			2.8								2.5
Bromide				1400000*	2300*						
Captan			90							350	
Carbaryl			700							60	
Carbofuran		PMCLG 36		50+	36+						36
Carbon Disulfide											830
Carbon tetrachloride	5	0	0.3 = 10^{-6} Risk	4000+		0.3+	3.7×10^{-6}	0.26	B2	5.0	5.0
Catechol				2200*							
Chlordane		PMCLG 0	0.35	60+		0.022+	3.7×10^{-5}	0.03	B2	0.055	0.50
Chlorobenzene (Monochlorobenzene)		PMCLG 60		4300+ (long-term#)	300+					30 (3 T&O)	60
bis-(2-chloroethyl) ether			0.03 = 10^{-6} Risk								10.0
Chloroform (trichloromethane)	100**		70	220*			2.3×10^{-6}	0.43	B2		3.0
Chloromethane (Methyl chloride)											0.50
Chloropicrin										50 (37 T&O)	
CIPC										350	

Values are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

** See Total Trihalomethanes

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

ORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in()	chronic(lifetime) non-cancer	cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Dalapon		#	560								
DDT			3.5				9.7×10^{-6}	0.10	B2		
Diazinon										14	
Dibromochloromethane	100**			18000*							
1,2-Dibromo-3-chloropropane (DBCP)		PMCLG 0		200+		.025+				1.0	0.025
1,2-Dibromoethane (Ethylene Dibromide)		PMCLG 0		8(10)+		.0005+				LOQ(0.02)	0.010
Dibromomethane		#									
Di-n-butyl phthalate			700								
1,2-Dichlorobenzene (o-Dichlorobenzene)		PMCLG 620		8930+	620+					130*** (T&O)	620
1,3-Dichlorobenzene (m-Dichlorobenzene)				8930+	620+					130*** (20 T&O)	
1,4-Dichlorobenzene (p-Dichlorobenzene)	75	75		10,700+ (long-term#)	75+					LOQ(0.5) (0.3 T&O)	75
Dichlorobenzidine							4.8×10^{-5}	0.02	B2		
Dichlorodifluoromethane (freon 12)			1400	350,000*	5600*						1.0
1,1-Dichloroethane										20	
1,2-Dichloroethane	5	0	0.4 = 10^{-6} Risk	740+		0.38+	2.6×10^{-6}	0.38	B2	1.0	5.0
1,1-Dichloroethylene	7	7	0.06 = 10^{-6} Risk	2000+	7+		1.7×10^{-5}	0.06	C	6.0	7.0
cis-1,2-Dichloroethylene		PMCLG 70		4000+	70+					16.00***	70***
trans-1,2-Dichloroethylene		PMCLG 70		20,000+	70+					16.00***	70***

Levels are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

** See Total Trihalomethanes

*** Action level is for a single isomer or sum of the two isomers

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

ORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in ()	HEALTH ADVISORIES chronic(lifetime) non-cancer	HEALTH ADVISORIES chronic(lifetime) cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK/ per ppb	EPA/CAG CANCER NUMBERS**** 10^{-6} RISK	EPA/CAG CANCER NUMBERS**** WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Dichloromethane (Methylene chloride)			420	13300+		5+	2.1×10^{-7}	5.0	B2	40	4.7
2,4-Dichlorophenol			21		700*						
2,4-Dichlorophenoxy-acetic acid (2,4-D)	100	PMCLG 70	70	1100+	70+						
1,2-Dichloropropane		PMCLG 6		90(10)+		0.56+				10	1.0
Dichloropropene											87
Dieldrin							8.8×10^{-4}	0.001	B2	LOQ(0.05)	
Dimethoate			140							140	
2,4-dimethylphenol										400 (T&O)	
2,4-Dinitrophenol			14		110*						
2,4-Dinitrotoluene							8.9×10^{-6}	0.11	B2		
Dinoseb (2-sec-Butyl-4,6-dinitrophenol)		#	7		39*						
1,4-Dioxane (p-Dioxane)				4120+		7+					
Diphenamide										40	
1,2-Diphenylhydrazine			$0.45 = 10^{-6}$ Risk				2.2×10^{-5}	0.05	B2		
Diquat		#	15								
Endothall		#	140								

Levels are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

ORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in ()	chronic(lifetime) non-cancer	cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK/ per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Endrin	0.2	#		20+	0.32+						
Epichlorohydrin		PMCLG 0	3.6 = 10^{-6} Risk	140+		3.5+	$2.8x10^{-7}$	3.6	B2		3.5
Ethion			35							35	
Ethylbenzene		PMCLG 680	700	32,000+	680+					680 (29 T&O)	680
Ethylene dibromide (EDB,1,2-dibromomethane)		PMCLG 0		8(10)+		.0005+	$2.4x10^{-3}$	0.0004	B2	LOQ(.02)	0.010
Ethylene Glycol				19000+	7000+						5500
Formaldehyde										30	
Glyphosate		#	700							500	
Heptachlor		PMCLG 0		10(10)+		.076+	$1.3x10^{-4}$	0.008	B2	0.02	0.05
Heptachlor epoxide		PMCLG 0	0.09			.038+	$2.6x10^{-4}$	0.004	B2	0.10	
Hexachlorobenzene (HCB, Perchlorobenzene)				50+ (long-term#)		.02+	$4.9x10^{-5}$	0.02	B2		0.02
Hexachlorobutadiene			0.5 = 10-6 Risk				$2.2x10^{-6}$	0.45	C		
Hexachlorocyclo-pentadiene		#	49								
n-Hexane				12,900+							4000
Isophorone			1050								
Lindane(gamma-BHC, gamma-HCCH)	4	PMCLG .2	2	1,200(10)+	2+		$3.2x10^{-5}$	0.03	B2/C		
Malathion										160	
Methomyl (Lannate)			175		175*						
Methoxychlor	100	PMCLG 340		6400+	340+						

Levels are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

ORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in ()	chronic(lifetime) non-cancer	cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK/ per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Methylene chloride (Dichloromethane)		#	420	13300+		5+	$2.1x10^{-7}$	5.0	B2	40	4.7
Methyl ethyl ketone (MEK, 2-Butanone)			350	75000+	170+						170
Methyl Parathion			1.8							30	
Mononitrophenol				290(7)*							
Nitrobenzene			3.5	35*							
n-Nitrosopyrrolidine			0.015 = 10^{-6} Risk				$6.1x10^{-5}$	0.02	B2		
Ordram (Molinate)										20	
Oxamyl (Vydate)		#	175	175+ (lifetime#)	175+						
Parathion (Ethyl Parathion)										30	
Pentachlorobenzene			6								74
Pentachlorophenol		PMCLG 220	210	1000+	220+					30	200
Picloram		#			1050*						
Phenol			280							1.0 T&O for Cl. systems	
Phthalates		#									
Polychlorinated Biphenyls (PCB's)		PMCLG 0					$2.2x10^{-4}$	0.005	B2		1.0
Polynuclear Aromatic Hydrocarbons(PAH)		#					No CAG# See Benzo(a)pyrene				
Resorcinol				11,700*							

Levels are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

ORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in ()	HEALTH ADVISORIES chronic(lifetime) non-cancer	HEALTH ADVISORIES chronic(lifetime) cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK/ per ppb	EPA/CAG CANCER NUMBERS**** 10^{-6} RISK	EPA/CAG CANCER NUMBERS**** WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
Rotenone					14*						
Simazine		#								150	
Styrene		PMCLG 140	1400	22,500+	140+						140
Terrachlor (pentachloronitrobenzene)										0.90	
1,2,4,5-Tetrachloro-benzene			2								38
2,3,7,8-Tetrachloro-dibenzo-p-dioxin		#		.001+		2.2×10^{-7}	4.5x10-3/ ppt	2.2x 10^{-7}	B2		
1,1,2,2-Tetrachloro-ethane			$0.2 = 10^{-6}$ Risk				5.8×10^{-6}	0.17	C		0.50
Tetrachloroethylene (Perchloroethylene)		PMCLG 0	140	2000(10)+		3.5+	1.5×10^{-6}	0.67	B2	4.0	1.0
Toluene		PMCLG 2000	2100	21,500+	2420+					100	2000
Toxaphene	5	PMCLG 0		500+		0.03+	3.2×10^{-5}	0.03	B2		
Tribromomethane (Bromoform)	100**										
Trichlorobenzene		#									
1,2,4-Trichlorobenzene			140								
1,1,1-Trichloroethane	200	200	630	140,000+	200+					200	200
1,1,2-Trichloroethane		#	$0.6 = 10^{-6}$ Risk				1.7×10^{-6}	0.59	C	100	1.0
Trichloroethylene	5	0	$3 = 10^{-6}$ Risk			2.8+	3.2×10^{-7}	3.0	B2	5.0	5.0
Trichlorofluoromethane (Freon 11)			2100	88,000*						3,400	1.0
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon 113)			210000							18,000	

Levels are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

**See Total Trihalomethanes

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

ORGANIC CHEMICALS	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in()	chronic(lifetime) non-cancer	cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK/ per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
2,4,5-Trichlorophenol			700								
2,4,6-Trichlorophenol			1.8 = 10^{-6} Risk	17,500*			5.7×10^{-7}	1.8	B2		
2,4,5-Trichloro-phenoxypropionic acid (2,4,5-TP, Silvex)	10	PMCLG 52		200(10)+	52+						
1,2,3-Trichloropropane			42								
Trihalomethanes (Total)	100**										
2,4,6-Trinitrophenol (Picric acid)				4900*							
Trithion										7.0	
Vinyl chloride	2	0		2600(10)+		0.015+	6.6×10^{-5}	0.02	A	2	1.0
Xylenes - Total of the three below		PMCLG 440		11900+	400+					620***	440***
Meta-Xylene										620	440
Ortho-Xylene										620	440
Para-Xylene										620	440

Levels are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

** Total Trihalomethanes MCL includes four compounds: Bromodichloromethane, Chloroform, Dibromochloromethane, Tribromomethane

*** Action Level for Xylene is for a single isomer or sum of the three isomers

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

OTHER SUBSTANCES	EPA MCL	EPA MCLG	IRIS Lifetime Calculation (See Appendix)	HEALTH ADVISORIES acute 1 day unless in ()	chronic non-cancer	chronic cancer	EPA/CAG CANCER NUMBERS**** UNIT RISK/ per ppb	10^{-6} RISK	WT. OF EVIDENCE	CA DOHS Action Levels	AZ DOHS Action Levels
MICROBIOLOGY & TURBIDITY											
Giardia Lamblia		PMCLG 0									
Legionella		#		EPA Health Advisory Available Control Recommendations Only							
Standard Plate Count		#									
Total Coliforms	<1/100 ml	PMCLG 0									
Turbidity	1 - 5 NTU	PMCLG .1 NTU									
Viruses		PMCLG 0									
SECONDARY STANDARDS											
Color	SMCL 15 Color Units										
Corrosivity	SMCL Non-Corrosive										
Foaming Agents	SMCL 500										
Odor	SMCL 3.0 Odor Threshold #										
pH	SMCL 6.5-8.5										
Total Dissolved Solids (TDS)	SMCL 500 ppm										

Values are indicated in micrograms per liter (ug/l) [equivalent to parts per billion (ppb)] unless otherwise stated

****CAG (Carcinogen Assessment Group) of EPA - See Appendix

TABLE 1

83 CONTAMINANTS REQUIRED TO BE REGULATED BY THE SDWA AMENDMENTS OF 1986

Volatile Organic Chemicals (14)

Benzene*
Carbon Tetrachloride*
Chlorobenzene
Dichlorobenzene*
1,2-Dichloroethane*
1,1-Dichloroethylene*
cis-1,2-Dichloroethylene
trans-1,2-Dichloroethylene
Methylene Chloride
Tetrachloroethylene
Trichlorobenzene
1,1,1-Trichloroethane*
Trichloroethylene*
Vinyl Chloride*

Organics (35)

Acrylamide
Adipates
Alachlor
Aldicarb
Atrazine
Carbofuran
Chlordane
2,4-D
Dalapon
Dibromochloropropane (DBCP)
Dibromomethane**
1,2-Dichloropropane
Dinoseb
Diquat
Endothall
Endrin
Epichlorohydrin
Ethylene Dibromide (EDB)
Glyphosate
Hexachlorocyclopentadiene
Lindane
Methoxychlor
PAH's
PCB's
Pentachlorophenol
Pichloram
Phthalates
Simazine
2,3,7,8-TCDD (Dioxin)
2,4,5-TP
Toluene
Toxaphene
1,1,2-Trichloroethane
Vydate
Xylene

TABLE 1 (CONTINUED)

CONTAMINANTS REQUIRED TO BE REGULATED BY SDWA

Inorganics (23)

Aluminum**	Mercury
Antimony	Molybdenum**
Arsenic	Nickel
Asbestos	Nitrate
Barium	Selenium
Beryllium	Silver**
Cadmium	Sodium**
Chromium	Sulfate
Copper	Thallium
Cyanide	Vanadium**
Fluoride*	Zinc**
Lead	

Microbiology and Turbidity (6)

Giardia Lamblia	Total Coliforms
Legionella	Turbidity
Standard Plate Count	Viruses

Radionuclides (5)

Gross Alpha Particle Activity
Beta Particle and Photon Radioactivity
Radium 226 and 228
Radon
Uranium

* Contaminants with promulgated final MCL's and MCLG's

** Seven contaminants EPA proposes to remove from regulated list and substitute with other compounds. EPA proposes to substitute these with the following seven contaminants: Aldicarb Sulfone, Aldicarb Sulfoxide, Ethylbenzene, Heptachlor, Heptachlor Epoxide, Nitrite, Styrene

TABLE 2

Summary of Statutory Deadlines

for Standards under SDWA of 1986

What	When
9 MCLGs and MCLs/Monitoring	June 19, 1987
Public Notice Revisions	September 19, 1987
Filtration Criteria	December 19, 1987
Monitoring for Unregulated Contaminants	December 19, 1987
List of Contaminants	January 1, 1988
40 MCLGs and MCLs/Monitoring	June 19, 1988
34 MCLGs and MCLs/Monitoring	June 19, 1989
Disinfection Treatment	June 19, 1989
25 MCLGs and MCLs/Monitoring	Every three years starting January 1, 1991

APPENDIX

DESCRIPTION OF STANDARDS AND ADVISORIES

The various types of standards and advisories contained in the Table can be based upon different assumptions, and consequently may have varying applications depending on their derivation.

Under the authority of the Safe Drinking Water Act (SDWA) P. L. 93-523, The EPA is mandated to establish National Primary Drinking Water Regulations (NPDWRs). Included in these regulations are the drinking water standards which set the maximum contaminant levels (MCLs) allowable in drinking water. Of these drinking water standards, there are primary standards which are established for the health effects of contaminants, and secondary standards which are for the aesthetic qualities of drinking water e.g. taste and odor. The primary standards are federally enforceable and the States which have primacy status from EPA must adopt State standards which are at least as stringent as the federal standards. The secondary standards are not federally enforceable but a State can choose to enforce secondary standards at the State level.

The regulatory process for establishing standards has been altered by the recent 1986 SDWA Amendments. The proposal and promulgation of the MCLGs and MCLs will be done simultaneously in the following manner:

Announced Notice of Proposed Rulemaking
(ANPRM)

|

Proposed Maximum Contaminant Level Goal and Proposed
Maximum Contaminant Level (PMCLG and PMCL)

|

Promulgated MCLG and Promulgated MCL

EPA Maximum Contaminant Level Goals (MCLGs)

These are developed by the Office of Drinking Water as the first step toward promulgation of MCLs. Prior to the SDWA Amendments 1986, these levels had been referred to as Recommended Maximum Contaminant Levels (RMCLs). MCLGs are strictly health-based, which are derived from toxicological data that includes appropriate factors of safety. For carcinogens, the non-threshold assumption (i.e., that there is no absolutely "safe" level for group A and B carcinogens) is used, and EPA by policy sets the MCLG at zero in accordance with a recommendation by Congress. For group C or possible carcinogens, the Office of Drinking Water treats them as non-carcinogens and will propose a MCLG based on a no observed adverse effect level (NOAEL). MCLGs are health-related goals and are not enforceable drinking water standards. MCLGs are to be set at levels at which no known or anticipated adverse effects on the health of persons occur, and which allows for an adequate margin of safety. The MCLGs are derived assuming a lifetime of exposure for a 70 kilogram adult who consumes 2 liters of water per day.

Maximum Contaminant Levels (MCLs)

These are the federally enforceable limits for contaminants in drinking water established under the National Primary Drinking Water Regulations. The MCLs are set by the Office of Drinking Water under the authority of the Safe Drinking Water Act. MCLs are to be set as close to the MCLGs as is feasible. The definition of feasible was changed per the SDWA 1986 Amendments to:

> "Feasible means with the use of the best technology, treatment techniques and other means, which the Administrator finds after examination for efficacy under field conditions and not solely under laboratory conditions, are generally available (taking costs into consideration)".

The setting of MCLs futhermore takes into consideration the availability of analytical detection methods.

Health Advisories (previously called Suggested No Adverse Response Levels, or SNARLs) come from two sources: the EPA and the National Academy of Sciences (NAS).

EPA Health Advisories for contaminants are published by the Office of Drinking Water. An HA is published in draft form first and then as a Final Draft. Only numbers from Final Draft HAs are used in the Table. HAs are developed for one-day, ten-day, longer-term (approximately 7 years, or 10% of an individual's lifetime) and lifetime exposures based on data describing noncarcinogenic end points of toxicity. If data are available, one and 10-day advisories use parameters reflecting exposure to a 10 kilogram child consuming 1 liter of water per day. Longer-term advisories can incorporate either a child or adult parameters, while the lifetime advisory uses a 70 kilogram adult who consumes 2 liters of water per day. A relative source contribution from water is factored into the lifetime health advisory.

NAS Health Advisories can be found in the volumes of Drinking Water and Health, published by the National Academy Press. They are calculated to reflect the lifetime exposure to a 70 kilogram adult consuming 2 liters of water per day. Advisories are reported in terms of three exposure levels: 1 day, 7 days, and "chronic". In the NAS publications, cancer risks are reported in terms of excess lifetime risk per ug/l, but in this table they have been recalculated to reflect the concentration at which one would expect an excess risk of 10^{-6} ("one in a million").

HA numbers listed in the cancer column are levels representing an excess lifetime cancer risk of 10^{-6}. Cancer risk estimates are determined by the Carcinogen Assessment Group (CAG), which is part of the Office of Health and Environmental Assessment (OHEA) which is under the Office of Research and Development (ORD). For those substances that are known or probable human carcinogens, according to the EPA classification scheme (Group A or B), lifetime HAs are not recommended by the Office of Drinking Water.

Health Advisories are considered guidance and are not enforceable drinking water standards. Due to the exposure assumptions used, the EPA Health Advisories tend to be more conservative or stringent than the NAS Health Advisories (unless the basic toxicological data used are drastically different). In the HA section of the Table when more than one advisory existed for a particular chemical and a particular exposure duration, the following priority order was utilized in listing one figure:

1. EPA cancer risk estimates from the CAG

2. EPA HAs from the Office of Drinking Water

3. NAS Health Advisories

IRIS, The Integrated Risk Information System is an EPA computer-housed, electronically communicated catalogue of Agency risk assessment and risk management information for chemical substances. The risk assessment information contained in IRIS, unless specifically noted, has been reviewed and agreed upon by intra-agency review groups, and represents an Agency consensus. Therefore, for contaminants in IRIS and also in the Drinking Water Standards and Health Advisory Table, either a lifetime calculation based on an oral reference dose (RfD) has been entered for noncarcinogens or a 10^{-6} risk number has been entered for carcinogens.

The RfD is a daily exposure level which, during a lifetime of a human, appears to be without appreciable risk on the basis of all facts known at the time. The RfD was formally called the acceptable daily intake or ADI, and it is derived from a no observed adverse effect level (NOAEL) which is taken from an appropriate animal study. This NOAEL is divided by an uncertainty or safety factor, and the resulting number is the RfD. An assumption is made that the oral RfD represents 100% exposure from all sources even though the number, in almost all cases, is derived from an oral ingestion study.

The RfD is converted to water units by multiplying it by 70 kilograms (weight of a standard adult) and dividing it by 2 liters (the assumed consumption of water per day). This number is known as the drinking water equivalent level (DWEL) and still represents 100% exposure through water. For the final lifetime advisory for water, it is necessary to allocate the 100% among the other sources which can contribute to the total exposure of a human. Therefore, the DWEL is multiplied by an estimate of the relative source contribution (RSC) of a contaminant in water. Unless otherwise noted, the RSC for organic and inorganic compounds is respectively 20% and 10%. The IRIS lifetime calculation goes through the same sequence of steps that the Office of Drinking Water uses in calculating a MCLG or a lifetime Health Advisory number, and theoretically all these numbers should be equal.

CAG, the Carcinogen Assessment Group, is part of the Office of Health and Environmental Assessment (OHEA). The primary function of CAG is to evaluate the evidence of possible carcinogencity of chemical substances. Evidence of carcinogencity in humans comes primarily from two sources: long-term animal studies and epidemiological investigations. Results from these studies are supplemented by other information from short-term studies, toxicological and pharmacokinetic studies. The evidence of carcinogencity is evaluated in the framework of a weight-of-evidence judgment at EPA. The weighting classification for all data includes: Group A - carcinogenic to humans; Group B - probably carcinogenic to humans (B1 - limited epidemiologic evidence in humans and sufficient evidence in animals and B2 - sufficient evidence in animals but insufficient evidence in humans); Group C - possibly carcinogenic to humans; Group D - not classifiable as to human carcinogenicity; and Group E - evidence of noncarcinogenicty to humans. The Table includes, where available, calculations from CAG for unit risk per parts per billion in drinking water as well as the 1 x 10^{-6} risk level in parts per billion. EPA risk assessment guidelines requires that the weight-of-evidence be listed along with all carcinogen risk numbers.

<u>California Department of Health Services Action Levels</u> are health-based criteria derived much in the same way as EPA and NAS Health Advisories. Assumptions have included a 70 kilogram adult consuming 2 liters of water per day, but more recent Action Levels have been based on the EPA assumptions of a 10 kilogram child consuming 1 liter of water per day. For carcinogens, the levels are set based upon an excess lifetime cancer risk of 10^{-6}. For noncarcinogenic pesticides, it is assumed that 20% of the daily intake is from drinking water, and the other 80% is from other sources.

CA DOHS Action Levels are not enforceable drinking water standards in the same sense that MCLs are, but are levels at which CA DOHS strongly urges water purveyors to take corrective action to reduce the level of contamination in the water they supply.

<u>Arizona Department of Health Services Action Levels</u> were issued by the AZ DOHS on September 17, 1985 and updated in 1987. The AZ DOHS has set Action Levels for two categories of chemicals, the carcinogenic volatile organic chemicals and pesticides, and the non-carcinogenic volatile organic chemicals and pesticides. AZ DOHS Action Levels are not enforceable drinking water standards in the same sense that MCLs are, but are levels at which AZ DOHS strongly urges water purveyors to take corrective action. Compliance with Action Levels is handled by the Arizona Department of Environmental Quality.

REFERENCES

EPA MCLs: Code of Federal Regulations, Title 40, Part 141.

EPA RMCLs (proposed): Federal Register Volume 49, Number 114, Tuesday, June 12, 1984, pages 24330-24355.

EPA Final Rule and Proposed Rule, Fluoride: Federal Register Volume 50, Number 220, Thursday, November 14, 1985, pages 47142-47171

EPA Final Rule and Proposed Rule, Volatile Synthetic Organic Chemicals: Federal Register Volume 50, Number 219, Wednesday, November 13, 1985, pages 46880-46933.

EPA Proposed Rule, Synthetic Organic Chemicals, Inorganic Chemicals and Microorganisms: Federal Register Volume 50, Number 219, Wednesday November 13, 1985, pages 46936-47022.

EPA Final Rule, Fluoride National Primary and Secondary Drinking Water Regulations: Federal Register Volume 51, Number 63, Wednesday, April 2, 1986, pages 11396-11412.

EPA Final Rule, Volatile Organic Chemicals Drinking Water Regulations: Federal Register Volume 52, Number 130, Thursday July 8, 1987, pages 25690-25717

NAS Health Advisories: Drinking Water and Health, National Academy Press, Volumes 1 (1977), 3 (1980), 4 (1982), and 5 (1983).

EPA Health Advisories: are from the EPA Office of Drinking Water. These are published and are available from the National Technical Information Service (NTIS)

IRIS (Integrated Risk Information System), EPA, Office of Health and Environmental Assessment, Office of Research and Development, Washington DC 20460

Arizona Department of Health Services, Office of Risk Assessment and Investigation, 3008 N. 3rd Street, Phoenix, Arizona 85012

California Department of Health Services, Sanitary Engineering Branch, 2151 Berkeley Way, Berkeley, California 94704

Appendices

APPENDIX A

Site Inspection Report

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
SC	D046507018

II. SITE NAME AND LOCATION

Field	Entry
01 SITE NAME (Legal, common, or descriptive name of site)	American Color and Chemical / Venture Chemical
02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER	SC Hwy. 38
03 CITY	Lobeco
04 STATE	SC
05 ZIP CODE	29931
06 COUNTY	Beaufort
07 COUNTY CODE	13
08 CONG DIST	
09 COORDINATES LATITUDE	32° 33' 21.0"
LONGITUDE	80° 43' 43.0"

10 TYPE OF OWNERSHIP (Check one)
☒ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION (MONTH DAY YEAR)	02 SITE STATUS	03 YEARS OF OPERATION
09 14 89	☒ ACTIVE ☐ INACTIVE	1967 (BEGINNING YEAR) / present (ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)
☐ A. EPA ☒ B. EPA CONTRACTOR NUS Corporation (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR ______ (Name of firm)
☐ E. STATE ☐ F. STATE CONTRACTOR ______ (Name of firm) ☐ G. OTHER ______ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
James Miller	Geologist	NUS	(404) 938-7710
09 OTHER INSPECTORS	**10 TITLE**	**11 ORGANIZATION**	**12 TELEPHONE NO.**
Mark Adams	Draftsmen	NUS	(404) 938-7710
			( )
A drive-by reconnaissance only			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO.
John Meeks	Vice President	P.O. Box 815 Lobeco, SC 29931	(803) 525-6611
			( )
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☐ PERMISSION ☐ WARRANT	1015	overcast; mid-70's

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Earl Bozeman	USEPA, Region IV	(404) 347-5065

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE (MONTH DAY YEAR)
James Miller		NUS	(404) 938-7710	08 15 90

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
SC	D046507018

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES

- ✓ A. SOLID
- B. POWDER, FINES
- ✓ C. SLUDGE
- D. OTHER ______ (Specify)
- ✓ E. SLURRY
- ✓ F. LIQUID
- G. GAS

02 WASTE QUANTITY AT SITE
(Measures of waste quantities must be independent)

TONS ______
CUBIC YARDS UNKNOWN
NO. OF DRUMS ______

03 WASTE CHARACTERISTICS

- ✓ A. TOXIC
- B. CORROSIVE
- ✓ C. RADIOACTIVE
- ✓ D. PERSISTENT
- ✓ E. SOLUBLE
- ✓ F. INFECTIOUS
- ✓ G. FLAMMABLE
- H. IGNITABLE
- ✓ I. HIGHLY VOLATILE
- ✓ J. EXPLOSIVE
- K. REACTIVE
- L. INCOMPATIBLE
- M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE	40,000	CY	this is the 3-foot-thick PCB
OLW	OILY WASTE			contaminated sludge layer at the
SOL	SOLVENTS			bottom of the old lagoon
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	UNKNOWN		
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS	UNKNOWN		

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
SLU	Arochlor 1248	12672-29-6	SI	6.02	mg/l
OCC	1,2,4-trichlorobenzene	120-82-1	SI	3.470	mg/l
OCC	napthalene	91-20-3	SI	2.340	mg/l
OCC	chlorotoluene	25168-05-2	SI	0.200	mg/l
OCC	trichloroethene	79-01-6	OD	180	mg/l
OCC	carbon tetrachloride	56-23-5	DR	29	mg/l
OCC	methylene chloride	75-09-2	OD	6.40	mg/l
MES	cadmium	7440-43-9	SI & OD	0.03	mg/l
MES	chromium	7440-47-3	SI	5.4	mg/l
MES	lead	7439-92-1	SI	34	mg/l
MES	mercury	7439-97-6	SI	0.614	mg/l

V. FEEDSTOCKS (See Appendix for CAS Numbers) NA

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See reference list and Appendix B which are attached, Kirk-Othmer Encyclopedia of Chemical Technology, and p. 3 of DHEC's April 17, 1989 memorandum concerning an April 13, 1989 meeting

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
SC	D046507018

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☑ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE:) ☑ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 182 — 04 NARRATIVE DESCRIPTION

There are 48 homes or 182 people (48 houses x 3.8 people/house) relying on groundwater from the aquifer of concern within 4 miles of the site.

01 ☑ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: 11/83) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 0 — 04 NARRATIVE DESCRIPTION

Although PCB contamination exists along the surface water migration pathway, there are no drinking water intakes downstream from the site.

01 ☑ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE:) ☑ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: — 04 NARRATIVE DESCRIPTION

Eight volatile organics were detected in the facility's effluent during a previous sampling investigation.

01 ☑ D. FIRE EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: 12/87) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 376 — 04 NARRATIVE DESCRIPTION

Part of the burn site exploded in December 1987. There are 376 people (99 houses x 3.8 people/house) within 1 mile of the site that may have been affected.

01 ☑ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE:) ☑ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: unknown — 04 NARRATIVE DESCRIPTION

There are uncontained, contaminated soils at the burn site and the stressed vegetation area which could affect employees and/or local residents.

01 ☑ F. CONTAMINATION OF SOIL — 02 ☐ OBSERVED (DATE: 1986) ☐ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: UNKNOWN (Acres) — 04 NARRATIVE DESCRIPTION

The soils at this site are contaminated with PCBs, trichlorobenzene, naphthalene, chromium, lead, and mercury.

01 ☑ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE:) ☑ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: [illegible] — 04 NARRATIVE DESCRIPTION

The contamina[illegible] at this site are migrating in the surficial aquifer and local shallow wells [illegible] become affected. There is at least one shallow drinking water well l[illegible] downgradient of the site.

01 ☑ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE:) ☑ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 75 — 04 NARRATIVE DESCRIPTION

There are currently 75 employees at the Lobeco plant who regularly occupy buildings that are located adjacent to the abandoned burn site and the old drum storage area.

01 ☑ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE:) ☑ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: UNKNOWN — 04 NARRATIVE DESCRIPTION

Exposure to local residents through either direct contact or contamination in nearby drinking water wells is a possibility. Also, recreational users may become exposed to contaminants from the surrounding surface water bodies.

Wastewater from this facility.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☑ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: 4/15-16/88) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
Herbaceous vegetation samples collected by RMT, Inc. showed Arochlor 1248 concentrations of 1.0 mg/Kg and 2.9 mg/Kg in the abandoned lagoon and burn site, respectively.

01 ☑ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: 11/83) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
The South Carolina Department of Health and Environmental Control (DHEC) concluded in a 1984 water quality assessment report that the fauna in Campbell Creek had been moderately to severely impacted due to the discharge of

01 ☑ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE:) ☑ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
Thirty-four (34) organic chemical compounds (including PCBs) have been detected in oyster (Crassostrea virginica) and blue crab (Callinectes sapidus) samples previously collected in Campbell Creek. Although the creek is currently closed

01 ☑ M. UNSTABLE CONTAINMENT OF WASTES — 02 ☐ OBSERVED (DATE: 1986) ☐ POTENTIAL ☑ ALLEGED
(Spills, Runoff, Standing liquids, Leaking drums)
03 POPULATION POTENTIALLY AFFECTED: 182
04 NARRATIVE DESCRIPTION
All of the inactive waste management facilities (lagoon, burn site, and drum storage area) at this site are unlined and have contaminated the surficial aquifer.

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
None reported.

01 ☑ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: 11/83) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
DHEC detected eight volatile organics in the facility's effluent during a November 1983 water quality assessment of Campbell Creek.

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☑ ALLEGED
04 NARRATIVE DESCRIPTION
The burn site was probably never approved by DHEC.

05 DESCRIPTION OF ANY OT[illegible] POTENTIAL, OR ALLEGED HAZARDS
None report[illegible]

III. TOTAL POPULATION POTENTIALLY AFFECTED: unknown

IV. COMMENTS
The contamination in the surficial aquifer is the most hazardous condition at this site. The contaminants are known to be migrating in groundwater and it is recommended that the site be remediated as quickly as possible.

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)
See other appendices and the reference list which are attached, and p. 3 of DHEC's April 17, 1989 memorandum concerning an April 13, 1989 meeting.

EPA FORM 2070-13 (7-81)

to shellfish harvesting, there are approved shellfish harvest areas located further downstream and these could eventually be affected.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☑ A. NPDES	SC0000914	05/23/85	06/30/90	
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA				
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
☐ I. OTHER (Specify)				
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☑ A. SURFACE IMPOUNDMENT	40,000	CY
☐ B. PILES		
☑ C. DRUMS, ABOVE GROUND	UNKNOWN	
☐ D. TANK, ABOVE GROUND		
☐ E. TANK, BELOW GROUND		
☐ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
☐ I. OTHER (Specify)		

04 TREATMENT (Check all that apply)

- ☑ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER (Specify)

05 OTHER

- ☑ A. BUILDINGS ON SITE

06 AREA OF SITE

26 Acres

07 COMMENTS

The gross amount of waste associated with the surface impoundment was derived by calculating the volume of the PCB contaminated sludge layer at the bottom of the impoundment.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE ☐ C. INADEQUATE, POOR ☑ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

All of the [illegible] disposal areas are unlined and there is no artificial cover at [illegible] the burn site or the stressed vegetation area.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☐ YES ☑ NO

02 COMMENTS

Although there is no hazardous waste that is easily accessible, contaminated surface soil media may become a problem at the burn site and/or the stressed vegetation area.

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

See reference list and Appendix B which are attached

EPA FORM 2070-13 (7-81)

private well owners were identified on the USGS topographic maps covering the area.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
SC	D046507018

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)

	SURFACE	WELL
COMMUNITY	A ☐	B ☑
NON-COMMUNITY	C ☐	D ☑

02 STATUS

ENDANGERED	AFFECTED	MONITORED
A. ☑	B. ☐	C. ☐
D. ☑	E. ☐	F. ☐

03 DISTANCE TO SITE

A. 0.0284 (mi)
B. 0.0947 (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☑ A. ONLY SOURCE FOR DRINKING
☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)
☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)
☐ D. NOT USED, UNUSEABLE

3,659 + 436 + 75
02 POPULATION SERVED BY GROUND WATER 4,170

03 DISTANCE TO NEAREST DRINKING WATER WELL 0.0284 (mi)

04 DEPTH TO GROUNDWATER 5-10 (ft)

05 DIRECTION OF GROUNDWATER FLOW S

06 DEPTH TO AQUIFER OF CONCERN 5-10 (ft)

07 POTENTIAL YIELD OF AQUIFER 14,400 (gpd)

08 SOLE SOURCE AQUIFER ☐ YES ☑ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

About 95 percent of the wells in the Lobeco area are completed in the Tertiary Limestone aquifer; all others are completed in the aquifer of concern. This corresponds to 38 homes within 3 miles of the site since approximately 770

10 RECHARGE AREA
☐ YES
☐ NO
COMMENTS The site may be located in a recharge area because the hydraulic head in the Tertiary

11 DISCHARGE AREA
☐ YES
☐ NO
COMMENTS

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☐ A. RESERVOIR, RECREATION DRINKING WATER SOURCE
☑ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES
☐ C. COMMERCIAL, INDUSTRIAL
☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
Campbell Creek	☑	0 (mi)
Whale Branch	☑	0.4818 (mi)
Coosaw River	☐	6 (mi)

V. DEMOGRAPHIC AND PR[redacted]FORMATION

01 TOTAL POPULATION WITHIN

390 + 75
ONE (1) MILE OF SITE
A. 455
NO. OF PERSONS

[redacted]
NO. OF PERSONS

3,215 + 436 + 75
THREE (3) MILES OF SITE
C. 3,726
NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION 0.0947 (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE 1

04 DISTANCE TO NEAREST OFF-SITE BUILDING 1 (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

The site is located in a moderately populated rural area.

Limestone Aquifer has been reduced by pumping at the facility.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☐ A. $10^{-6} - 10^{-8}$ cm/sec ☐ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ☑ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B. RELATIVELY IMPERMEABLE ($10^{-4} - 10^{-6}$ cm/sec) ☑ C. RELATIVELY PERMEABLE ($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
90 (ft)	14 (ft)	

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
≅50 (in)	3.5 (in)	0.6 %	S	1 %

09 FLOOD POTENTIAL

SITE IS IN ________ YEAR FLOODPLAIN

10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE A. 0 (mi) OTHER B. ________ (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)

NA (mi)

ENDANGERED SPECIES: ________

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AG LAND
A. 12 (mi)	B. 0.5 (mi)	C. ________ (mi)	D. ________ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

Site is in an area characterized by low flatland inundated with surface water.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See reference list and appendices B and D which are attached, and p. 93 of the Rainfall Frequency Atlas of the United States

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. SAMPLES TAKEN NA

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN NA

01 TYPE	02 COMMENTS

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☑ GROUND ☑ AERIAL

02 IN CUSTODY OF NUS Corporation
(Name of organization or individual)

03 MAPS ☑ YES ☐ NO

04 LOCATION OF MAPS attached

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

None

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See text

EPA FORM 2070-13 (7-81)

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

EPA

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. CURRENT OWNER(S) / PARENT COMPANY (If applicable)

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
Lobeco Products, Inc.		Enterra Corporation	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	**04 SIC CODE**	**10 STREET ADDRESS** (P.O. Box, RFD #, etc.)	**11 SIC CODE**
P.O. Box 815			
05 CITY / 06 STATE / 07 ZIP CODE		**12 CITY / 13 STATE / 14 ZIP CODE**	
Lobeco / SC / 29931		Philadelphia / PA /	

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE
05 CITY / 06 STATE / 07 ZIP CODE		12 CITY / 13 STATE / 14 ZIP CODE	

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE
05 CITY / 06 STATE / 07 ZIP CODE		12 CITY / 13 STATE / 14 ZIP CODE	

01 NAME	02 D+B NUMBER	08 NAME	09 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE
05 CITY / 06 STATE / 07 ZIP CODE		12 CITY / 13 STATE / 14 ZIP CODE	

III. PREVIOUS OWNER(S) (List most recent first) / IV. REALTY OWNER(S) (If applicable, list most recent first) NA

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
American Color and Chemical Company			
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	**04 SIC CODE**	**03 STREET ADDRESS** (P.O. Box, RFD #, etc.)	**04 SIC CODE**
P.O. Box 88 Mt. Vernon Streets			
05 CITY / 06 STATE / 07 ZIP CODE		**05 CITY / 06 STATE / 07 ZIP CODE**	
Lock Haven / PA / 17745			

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
Tenneco Chemical Company			
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	**04 SIC CODE**	**03 STREET ADDRESS** (P.O. Box, RFD #, etc.)	**04 SIC CODE**
P.O. Box 25			
05 CITY / 06 STATE / 07 ZIP CODE		**05 CITY / 06 STATE / 07 ZIP CODE**	
Houston / TX / 77001			

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY / 06 STATE / 07 ZIP CODE		05 CITY / 06 STATE / 07 ZIP CODE	

V. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

See reference list which is attached; August 16, 1988 DHEC letter to John Mack; Newspaper article from the Post-Courier; January 28, 1981 letter from J.F. Jacoby to DHEC; and June 12, 1989 DHEC letter to R.D. Pruessner

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. CURRENT OPERATOR (Provide if different from owner) NA

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER

OPERATOR'S PARENT COMPANY (If applicable) NA

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner) NA

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 [illegible] DURING THIS PERIOD

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable) NA

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFOR[illegible] specific references, e.g., state files, sample analysis, reports)

See Appendix B which is attached

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. ON-SITE GENERATOR NA

01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE

III. OFF-SITE GENERATOR(S) NA

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY / 06 STATE	07 ZIP CODE	05 CITY / 06 STATE	07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY / 06 STATE	07 ZIP CODE	05 CITY / 06 STATE	07 ZIP CODE

IV. TRANSPORTER(S) NA

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY / 06 STATE	07 ZIP CODE	05 CITY / 06 STATE	07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY / 06 STATE	07 ZIP CODE	05 CITY / 06 STATE	07 ZIP CODE

V. SOURCES OF INFOR[illegible] ([illegible] specific references, e.g., state files, sample analysis, [illegible])

See reference list which is attached

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ D. SPILLED MATERIAL REMOVED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ E. CONTAMINATED SOIL REMOVED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ F. WASTE REPACKAGED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☒ G. WASTE DISPOSED ELSEWHERE 02 DATE 8/77 03 AGENCY American Color & Chemical Co.
04 DESCRIPTION
Sludge solids from the bio-treatment area are landfilled at an offsite location.

01 ☐ H. ON SITE BURIAL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ I. IN SITU CHEMICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ J. IN SITU BIOLOGICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ K. IN SITU PHYSICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ L. ENCAPSULATION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ M. EMERGENCY [illegible] 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ N. CUTOFF WALLS 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ O. EMERGENCY DIKING SURFACE WATER DIVERSION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ P. CUTOFF TRENCHES/SUMP 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ Q. SUBSURFACE CUTOFF WALL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ✓ S. CAPPING COVERING 02 DATE 3/78 03 AGENCY American Color & Chem. C
04 DESCRIPTION
The PCB contaminated sludge layer at the bottom of the old lagoon was covered by a 1- to 2-foot natural earth cap and then backfilled.

01 ☐ T. BULK TANKAGE REPAIRED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ U. GROUT CURTAIN CONSTRUCTED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ V. BOTTOM SEALED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ W. GAS CONTROL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ X. FIRE CONTROL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ Y. LEACHATE TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ Z. AREA EVACUATED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ 1. ACCESS TO SITE RESTRICTED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ 2. POPULATION RELOCATED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

01 ☐ 3. OTHER REMEDIAL ACTIVITIES 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

III. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

See reference list and Appendix B which are attached

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	D046507018

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY ENFORCEMENT ACTION ✓ YES ☐ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY ENFORCEMENT ACTION

All past regulatory enforcement action for this site is at the state level. DHEC has already issued three consent orders because of activities at the facility. Two of the consent orders (86-94-W and 88-37-W) were issued for separate violations of the facility's NPDES permit and required an upgrade in the wastewater treatment system. The third consent order (87-65-W) was issued because of contaminated soil and groundwater at the site. An amendment to this order is requiring that "high level" contamination at the abandoned lagoon and burn site be removed by December 1990.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

See reference list which is attached and Consent Order 87-65-W

EPA FORM 2070-13 (7-81)

APPENDIX

I. FEEDSTOCKS

CAS Number	Chemical Name
1. 7664-41-7	Ammonia
2. 7440-36-0	Antimony
3. 1309-64-4	Antimony Trioxide
4. 7440-38-2	Arsenic
5. 1327-53-3	Arsenic Trioxide
6. 21109-95-5	Barium Sulfide
7. 7726-95-6	Bromine
8. 106-99-0	Butadiene
9. 7440-43-9	Cadmium
10. 7782-50-5	Chlorine
11. 12737-27-8	Chromite
12. 7440-47-3	Chromium
13. 7440-48-4	Cobalt

CAS Number	Chemical Name
14. 1317-38-0	Cupric Oxide
15. 7758-98-7	Cupric Sulfate
16. 1317-39-1	Cuprous Oxide
17. 74-85-1	Ethylene
18. 7647-01-0	Hydrochloric Acid
19. 7664-39-3	Hydrogen Fluoride
20. 1335-25-7	Lead Oxide
21. 7439-97-6	Mercury
22. 74-82-8	Methane
23. 91-20-3	Napthalene
24. 7440-02-0	Nickel
25. 7697-37-2	Nitric Acid
26. 7723-14-0	Phosphorus

CAS Number	Chemical Name
27. 7778-50-9	Potassium Dichromate
28. 1310-58-3	Potassium Hydroxide
29. 115-07-1	Propylene
30. 10588-01-9	Sodium Dichromate
31. 1310-73-2	Sodium Hydroxide
32. 7646-78-8	Stannic Chloride
33. 7772-99-8	Stannous Chloride
34. 7664-93-9	Sulfuric Acid
35. 108-88-3	Toluene
36. 1330-20-7	Xylene
37. 7646-85-7	Zinc Chloride
38. 7733-02-0	Zinc Sulfate

II. HAZARDOUS SUBSTANCES

CAS Number	Chemical Name
1. 75-07-0	Acetaldehyde
2. 64-19-7	Acetic Acid
3. 108-24-7	Acetic Anhydride
4. 75-86-5	Acetone Cyanohydrin
5. 506-96-7	Acetyl Bromide
6. 75-36-5	Acetyl Chloride
7. 107-02-8	Acrolein
8. 107-13-1	Acrylonitrile
9. 124-04-9	Adipic Acid
10. 309-00-2	Aldrin
11. 10043-01-3	Aluminum Sulfate
12. 107-18-6	Allyl Alcohol
13. 107-05-1	Allyl Chloride
14. 7664-41-7	Ammonia
15. 631-61-8	Ammonium Acetate
16. 1863-63-4	Ammonium Benzoate
17. 1066-33-7	Ammonium Bicarbonate
18. 7789-09-5	Ammonium Bichromate
19. 1341-49-7	Ammonium Bifluoride
20. 10192-30-0	Ammonium Bisulfite
21. 1111-78-0	Ammonium Carbamate
22. 12125-02-9	Ammonium Chloride
23. 7788-98-9	Ammo[illegible]
24. 3012-65-5	Amm[illegible] Dibas[illegible]
25. 13826-83-0	Amm[illegible]
26. 12125-01-8	Amm[illegible]
27. 1336-21-6	Ammo[illegible]
28. 6009-70-7	Ammo[illegible]
29. 16919-19-0	Ammonium Silicofluoride
30. 7773-06-0	Ammonium Sulfamate
31. 12135-76-1	Ammonium Sulfide
32. 10196-04-0	Ammonium Sulfite
33. 14307-43-8	Ammonium Tartrate
34. 1762-95-4	Ammonium Thiocyanate
35. 7783-18-8	Ammonium Thiosulfate
36. 628-63-7	Amyl Acetate
37. 62-53-3	Aniline
38. 7647-18-9	Antimony Pentachloride
39. 7789-61-9	Antimony Tribromide
40. 10025-91-9	Antimony Trichloride
41. 7783-56-4	Antimony Trifluoride
42. 1309-64-4	Antimony Trioxide
43. 1303-32-8	Arsenic Disulfide
44. 1303-28-2	Arsenic Pentoxide
45. 7784-34-1	Arsenic Trichloride
46. 1327-53-3	Arsenic Trioxide

CAS Number	Chemical Name
47. 1303-33-9	Arsenic Trisulfide
48. 542-62-1	Barium Cyanide
49. 71-43-2	Benzene
50. 65-85-0	Benzoic Acid
51. 100-47-0	Benzonitrile
52. 98-88-4	Benzoyl Chloride
53. 100-44-7	Benzyl Chloride
54. 7440-41-7	Beryllium
55. 7787-47-5	Beryllium Chloride
56. 7787-49-7	Beryllium Fluoride
57. 13597-99-4	Beryllium Nitrate
58. 123-86-4	Butyl Acetate
59. 84-74-2	n-Butyl Phthalate
60. 109-73-9	Butylamine
61. 107-92-6	Butyric Acid
62. 543-90-8	Cadimium Acetate
63. 7789-42-6	Cadmium Bromide
64. 10108-64-2	Cadmium Chloride
65. 7778-44-1	Calcium Arsenate
66. 52740-16-6	Calcium Arsenite
67. 75-20-7	Calcium Carbide
68. 13765-19-0	Calcium Chromate
69. 592-01-8	Calcium Cyanide
70. 26264-06-2	Calcium Dodecylbenzene Sulfonate
71. 7778-54-3	Calcium Hypochlorite
72. 133-06-2	Captan
73. 63-25-2	Carbaryl
74. 1563-66-2	Carbofuran
75. 75-15-0	Carbon Disulfide
76. 56-23-5	Carbon Tetrachloride
77. 57-74-9	Chlordane
78. 7782-50-5	Chlorine
79. 108-90-7	Chlorobenzene
80. 67-66-3	Chloroform
81. 7790-94-5	Chlorosulfonic Acid
82. 2921-88-2	Chlorpyrifos
83. 1066-30-4	Chromic Acetate
84. 7738-94-5	Chromic Acid
85. 10101-53-8	Chromic Sulfate
86. 10049-05-5	Chromous Chloride
87. 544-18-3	Cobaltous Formate
88. 14017-41-5	Cobaltous Sulfamate
89. 56-72-4	Coumaphos
90. 1319-77-3	Cresol
91. 4170-30-3	Crotonaldehyde

CAS Number	Chemical Name
92. 142-71-2	Cupric Acetate
93. 12002-03-8	Cupric Acetoarsenite
94. 7447-39-4	Cupric Chloride
95. 3251-23-8	Cupric Nitrate
96. 5893-66-3	Cupric Oxalate
97. 7758-98-7	Cupric Sulfate
98. 10380-29-7	Cupric Sulfate Ammoniated
99. 815-82-7	Cupric Tartrate
100. 506-77-4	Cyanogen Chloride
101. 110-82-7	Cyclohexane
102. 94-75-7	2,4-D Acid
103. 94-11-1	2,4-D Esters
104. 50-29-3	DDT
105. 333-41-5	Diazinon
106. 1918-00-9	Dicamba
107. 1194-65-6	Dichlobenil
108. 117-80-6	Dichlone
109. 25321-22-6	Dichlorobenzene (all isomers)
110. 266-38-19-7	Dichloropropane (all isomers)
111. 26952-23-8	Dichloropropene (all isomers)
112. 8003-19-8	Dichloropropene-Dichloropropane Mixture
113. 75-99-0	2-2-Dichloropropionic Acid
114. 62-73-7	Dichlorvos
115. 60-57-1	Dieldrin
116. 109-89-7	Diethylamine
117. 124-40-3	Dimethylamine
118. 25154-54-5	Dinitrobenzene (all isomers)
119. 51-28-5	Dinitrophenol
120. 25321-14-6	Dinitrotoluene (all isomers)
121. 85-00-7	Diquat
122. 298-04-4	Disulfoton
123. 330-54-1	Diuron
124. 27176-87-0	Dodecylbenzenesulfonic Acid
125. 115-29-7	Endosulfan (all isomers)
126. 72-20-8	Endrin and Metabolites
127. 106-89-8	Epichlorohydrin
128. 563-12-2	Ethion
129. 100-41-4	Ethyl Benzene
130. 107-15-3	Ethylenediamine
131. 106-93-4	Ethylene Dibromide
132. 107-06-2	Ethylene Dichloride
133. 60-00-4	EDTA
134. 1185-57-5	Ferric Ammonium Citrate
135. 2944-67-4	Ferric Ammonium Oxalate
[illegible]	[illegible]

II. HAZARDOUS SUBSTANCES

CAS Number	Chemical Name
137. 7783-50-8	Ferric Fluoride
138. 10421-48-4	Ferric Nitrate
139. 10028-22-5	Ferric Sulfate
140. 10045-89-3	Ferrous Ammonium Sulfate
141. 7758-94-3	Ferrous Chloride
142. 7720-78-7	Ferrous Sulfate
143. 206-44-0	Fluoranthene
144. 50-00-0	Formaldehyde
145. 64-18-6	Formic Acid
146. 110-17-8	Fumaric Acid
147. 98-01-1	Furfural
148. 86-50-0	Guthion
149. 76-44-8	Heptachlor
150. 118-74-1	Hexachlorobenzene
151. 87-68-3	Hexachlorobutadiene
152. 67-72-1	Hexachloroethane
153. 70-30-4	Hexachlorophene
154. 77-47-4	Hexachlorocyclopentadiene
155. 7647-01-0	Hydrochloric Acid (Hydrogen Chloride)
156. 7664-39-3	Hydrofluoric Acid (Hydrogen Fluoride)
157. 74-90-8	Hydrogen Cyanide
158. 7783-06-4	Hydrogen Sulfide
159. 78-79-5	Isoprene
160. 42504-46-1	Isopropanolamine Dodecylbenzenesulfonate
161. 115-32-2	Kelthane
162. 143-50-0	Kepone
163. 301-04-2	Lead Acetate
164. 3687-31-8	Lead Arsenate
165. 7758-95-4	Lead Chloride
166. 13814-96-5	Lead Fluoborate
167. 7783-46-2	Lead Fluoride
168. 10101-63-0	Lead Iodide
169. 18256-98-9	Lead Nitrate
170. 7428-48-0	Lead Stearate
171. 15739-80-7	Lead Sulfate
172. 1314-87-0	Lead Sulfide
173. 592-87-0	Lead Thiocyanate
174. 58-89-9	Lindane
175. 14307-35-8	Lithium Chromate
176. 121-75-5	Malthion
177. 110-16-7	Maleic Acid
178. 108-31-6	Maleic Anhydride
179. 2032-65-7	Mercapt[illegible]ur
180. 592-04-1	Mercuri[illegible]
181. 10045-94-0	Mercuri[illegible]
182. 7783-35-9	Mercuri[illegible]
183. 592-85-8	Mercuric Thiocyanate
184. 10415-75-5	Mercurous Nitrate
185. 72-43-5	Methoxychlor
186. 74-93-1	Methyl Mercaptan
187. 80-62-6	Methyl Methacrylate
188. 298-00-0	Methyl Parathion
189. 7786-34-7	Mevinphos
190. 315-18-4	Mexacarbate
191. 75-04-7	Monoethylamine
192. 74-89-5	Monomethylamine
193. 300-76-5	Naled
194. 91-20-3	Naphthalene
195. 1338-24-5	Naphthenic Acid
196. 7440-02-0	Nickel
197. 15699-18-0	Nickel Ammonium Sulfate
198. 37211-05-5	Nickel Chloride
199. 12054-48-7	Nickel Hydroxide
200. 14216-75-2	Nickel Nitrate
201. 7786-81-4	Nickel Sulfate
202. 7697-37-2	Nitric Acid
203. 98-95-3	Nitrobenzene
204. 10102-44-0	Nitrogen Dioxide
205. 25154-55-6	Nitrophenol (all isomers)
206. 1321-12-6	Nitrotoluene
207. 30525-89-4	Paraformaldehyde
208. 56-38-2	Parathion
209. 608-93-5	Pentachlorobenzene
210. 87-86-5	Pentachlorophenol
211. 85-01-8	Phenanthrene
212. 108-95-2	Phenol
213. 75-44-5	Phosgene
214. 7664-38-2	Phosphoric Acid
215. 7723-14-0	Phosphorus
216. 10025-87-3	Phosphorus Oxychloride
217. 1314-80-3	Phosphorus Pentasulfide
218. 7719-12-2	Phosphorus Trichloride
219. 7784-41-0	Potassium Arsenate
220. 10124-50-2	Potassium Arsenite
221. 7778-50-9	Potassium Bichromate
222. 7789-00-6	Potassium Chromate
223. 7722-64-7	Potassium Permanganate
224. 2312-35-8	Propargite
225. 79-09-4	Propionic Acid
226. 123-62-6	Propionic Anhydride
227. 1336-36-3	Polychlorinated Biphenyls
228. 151-50-8	Potassium Cyanide
229. 1310-58-3	Potassium Hydroxide
230. 75-56-9	Propylene Oxide
231. 121-29-9	Pyrethrins
232. 91-22-5	Quinoline
233. 108-46-3	Resorcinol
234. 7446-08-4	Selenium Oxide
235. 7761-88-8	Silver Nitrate
236. 7631-89-2	Sodium Arsenate
237. 7784-46-5	Sodium Arsenite
238. 10588-01-9	Sodium Bichromate
239. 1333-83-1	Sodium Bifluoride
240. 7631-90-5	Sodium Bisulfite
241. 7775-11-3	Sodium Chromate
242. 143-33-9	Sodium Cyanide
243. 25155-30-0	Sodium Dodecylbenzene Sulfonate
244. 7681-49-4	Sodium Fluoride
245. 16721-80-5	Sodium Hydrosulfide
246. 1310-73-2	Sodium Hydroxide
247. 7681-52-9	Sodium Hypochlorite
248. 124-41-4	Sodium Methylate
249. 7632-00-0	Sodium Nitrate
250. 7558-79-4	Sodium Phosphate, Dibasic
251. 7601-54-9	Sodium Phosphate, Tribasic
252. 10102-18-8	Sodium Selenite
253. 7789-06-2	Strontium Chromate
254. 57-24-9	Strychnine and Salts
255. 100-420-5	Styrene
256. 12771-08-3	Sulfur Monochloride
257. 7664-93-9	Sulfuric Acid
258. 93-76-5	2,4,5-T Acid
259. 2008-46-0	2,4,5-T Amines
260. 93-79-8	2,4,5-T Esters
261. 13560-99-1	2,4,5-T Salts
262. 93-72-1	2,4,5-TP Acid
263. 32534-95-5	2,4,5-TP Acid Esters
264. 72-54-8	TDE
265. 95-94-3	Tetrachlorobenzene
266. 127-18-4	Tetrachloroethane
267. 78-00-2	Tetraethyl Lead
268. 107-49-3	Tetraethyl Pyrophosphate
269. 7446-18-6	Thallium (I) Sulfate
270. 108-88-3	Toluene
271. 8001-35-2	Toxaphene
272. 12002-48-1	Trichlorobenzene (all isomers)
273. 52-68-6	Trichlorfon
274. 25323-89-1	Trichloroethane (all isomers)
275. 79-01-6	Trichloroethylene
276. 25167-82-2	Trichlorophenol (all isomers)
277. 27323-41-7	Triethanolamine Dodecylbenzenesulfonate
278. 121-44-8	Triethylamine
279. 75-50-3	Trimethylamine
280. 541-09-3	Uranyl Acetate
281. 10102-06-4	Uranyl Nitrate
282. 1314-62-1	Vanadium Pentoxide
283. 27774-13-6	Vanadyl Sulfate
284. 108-05-4	Vinyl Acetate
285. 75-35-4	Vinylidene Chloride
286. 1300-71-6	Xylenol
287. 557-34-6	Zinc Acetate
288. 52628-25-8	Zinc Ammonium Chloride
289. 1332-07-6	Zinc Borate
290. 7699-45-8	Zinc Bromide
291. 3486-35-9	Zinc Carbonate
292. 7646-85-7	Zinc Chloride
293. 557-21-1	Zinc Cyanide
294. 7783-49-3	Zinc Fluoride
295. 557-41-5	Zinc Formate
296. 7779-86-4	Zinc Hydrosulfite
297. 7779-88-6	Zinc Nitrate
298. 127-82-2	Zinc Phenolsulfonate
299. 1314-84-7	Zinc Phosphide
300. 16871-71-9	Zinc Silicofluoride
301. 7733-02-0	Zinc Sulfate
302. 13746-89-9	Zirconium Nitrate
303. 16923-95-8	Zirconium Potassium Fluoride
304. 14644-61-2	Zirconium Sulfate
305. 10026-11-6	Zirconium Tetrachloride

APPENDIX B

This is bound separately.

APPENDIX C

This is bound separately.

APPENDIX D

NPL Characteristics Data Collection Form
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

WPB/SAS
RECEIVED
JUN 08 1992
EPA - REGION IV
ATLANTA, GA

Record Information

1. Site Name: AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL
(as entered in CERCLIS)

2. Site CERCLIS Number: SCD046507018

3. Site Reviewer: BRYAN J. WILLIAMS

4. Date: JANUARY 26, 1992

5. Site Location: LOBECO, BEAUFORT COUNTY, SOUTH CAROLINA
(City/County,State)

6. Congressional District:

7. Site Coordinates: Single

Latitude: 32 33'21.0" Longitude: 080 43'43.0"

Site Description

1. Setting: Rural

2. Current Owner: Private - Industrial

3. Current Site Status: Active

4. Years of Operation: Active Site , from and to dates: 1967 TO PRESENT

5. How Initially Identified: Unknown

6. Entity Responsible for Waste Generation:

   - Other - WASTE MANAGEMENT AREAS
   - Manufacturing
     - Other Manufacturing

7. Site Activities/Waste Deposition:

   - Surface Impoundment
   - Drum/Container Storage
   - Airborne Release/Incineration

Waste Description

8. Wastes Deposited or Detected Onsite:

   - Organic Chemicals
   - Metals
   - PCBs

Response Actions

9. Response/Removal Actions:

   - Other Removal Action Has Occurred

RCRA Information

10. For All Active Facilities, RCRA Site Status:

    - -90 Day Accumulator

Demographic Information

11. Workers Present Onsite: Yes

12. Distance to Nearest Non-Worker Individual: > 10 Feet - 1/4 Mile

13. Residential Population Within 1 Mile: 0.0

14. Residential Population Within 4 Miles: 0.0

Water Use Information

15. Local Drinking Water Supply Source:

    - Ground Water (within 4 mile distance limit)

16. Total Population Served by Local Drinking Water Supply Source: 0.0

17. Drinking Water Supply System Type for Local Drinking Water Supply Sources:

- Private

18. Surface Water Adjacent to/Draining Site:

- Wetland

HRS DOCUMENTATION RECORD
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

1. Site Name: AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL
   (as entered in CERCLIS)

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   (City/County,State)

6. Congressional District:

7. Site Coordinates: Single

   Latitude: 32 33'21.0" Longitude: 080 43'43.0"

	Score
Ground Water Migration Pathway Score (Sgw)	5.33
Surface Water Migration Pathway Score (Ssw)	42.68
Soil Exposure Pathway Score (Ss)	9.60
Air Migration Pathway Score (Sa)	2.42

Site Score	22.07

NOTE

EPA uses the terms "facility," "site," and "release" interchangeably. The term "facility" is broadly defined in CERCLA to include any area where hazardous substances have "come to be located" (CERCLA Section 109(9)), and the listing process is not intended to define or reflect boundaries of such facilities or releases. Site names, and references to specific parcels or properties, are provided for general identification purposes only. Knowledge regarding the extent of sites will be refined as more information is developed during the RI/FS and even during implementation of the remedy.

GROUND WATER MIGRATION PATHWAY SCORESHEET

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

GROUND WATER MIGRATION PATHWAY Factor Categories & Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer Aquifer: SURFICIAL AQUIFER		
1. Observed Release	550	550
2. Potential to Release		
2a. Containment	10	10
2b. Net Precipitation	10	3
2c. Depth to Aquifer	5	5
2d. Travel Time	35	35
2e. Potential to Release [lines 2a(2b+2c+2d)]	500	430
3. Likelihood of Release	550	550
Waste Characteristics		
4. Toxicity/Mobility	*	1.00E+04
5. Hazardous Waste Quantity	*	100
6. Waste Characteristics	100	32
Targets		
7. Nearest Well	50	2.00E+01
8. Population		
8a. Level I Concentrations	**	0.00E+00
8b. Level II Concentrations	**	0.00E+00
8c. Potential Contamination	**	5.00E+00
8d. Population (lines 8a+8b+8c)	**	5.00E+00
9. Resources	5	0.00E+00
10. Wellhead Protection Area	20	0.00E+00
11. Targets (lines 7+8d+9+10)	**	2.50E+01
12. Targets (including overlaying aquifers)	**	2.50E+01
13. Aquifer Score	100	5.33
GROUND WATER MIGRATION PATHWAY SCORE (Sgw)	100	5.33

* Maximum value applies to waste characteristics category.

** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	Maximum Value	Value Assigned
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	10
2b. Runoff	25	1
2c. Distance to Surface Water	25	9
2d. Potential to Release by Overland Flow [lines 2a(2b+2c)]	500	100
3. Potential to Release by Flood		
3a. Containment (Flood)	10	10
3b. Flood Frequency	50	25
3c. Potential to Release by Flood (lines 3a x 3b)	500	250
4. Potential to Release (lines 2d+3c)	500	350
5. Likelihood of Release	550	550
Waste Characteristics		
6. Toxicity/Persistence	*	1.00E+04
7. Hazardous Waste Quantity	*	100
8. Waste Characteristics	100	32
Targets		
9. Nearest Intake	50	0.00E+00
10. Population		
10a. Level I Concentrations	**	0.00E+00
10b. Level II Concentrations	**	0.00E+00
10c. Potential Contamination	**	0.00E+00
10d. Population (lines 10a+10b+10c)	**	0.00E+00
11. Resources	5	0.00E+00
12. Targets (lines 9+10d+11)	**	0.00E+00
13. DRINKING WATER THREAT SCORE	100	0.00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	Maximum Value	Value Assigned
Likelihood of Release		
14. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+08
16. Hazardous Waste Quantity	*	100
17. Waste Characteristics	1000	320
Targets		
18. Food Chain Individual	50	2.00E+01
19. Population		
19a. Level I Concentrations	**	0.00E+00
19b. Level II Concentrations	**	0.00E+00
19c. Pot. Human Food Chain Contamination	**	6.00E-07
19d. Population (lines 19a+19b+19c)	**	6.00E-07
20. Targets (lines 18+19d)	**	2.00E+01
21. HUMAN FOOD CHAIN THREAT SCORE	100	42.67

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	Maximum Value	Value Assigned
Likelihood of Release		
22. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/Bioacc.	*	5.00E+08
24. Hazardous Waste Quantity	*	100
25. Waste Characteristics	1000	320
Targets		
26. Sensitive Environments		
26a. Level I Concentrations	**	0.00E+00
26b. Level II Concentrations	**	0.00E+00
26c. Potential Contamination	**	5.75E-03
26d. Sensitive Environments (lines 26a+26b+26c)	**	5.75E-03
27. Targets (line 26d)	**	5.75E-03
28. ENVIRONMENTAL THREAT SCORE	60	0.01
29. WATERSHED SCORE	100	42.68
30. SW: OVERLAND/FLOOD COMPONENT SCORE (Sof)	100	42.68

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	Maximum Value	Value Assigned
Likelihood of Release to Aquifer Aquifer: SURFICIAL AQUIFER		
1. Observed Release	550	550
2. Potential to Release		
2a. Containment	10	10
2b. Net Precipitation	10	3
2c. Depth to Aquifer	5	5
2d. Travel Time	35	35
2e. Potential to Release [lines 2a(2b+2c+2d)]	500	430
3. Likelihood of Release	550	550
Waste Characteristics		
4. Toxicity/Mobility/Persistence	*	1.00E+04
5. Hazardous Waste Quantity	*	100
6. Waste Characteristics	100	32
Targets		
7. Nearest Intake	50	0.00E+00
8. Population		
8a. Level I Concentrations	**	0.00E+00
8b. Level II Concentrations	**	0.00E+00
8c. Potential Contamination	**	0.00E+00
8d. Population (lines 8a+8b+8c)	**	0.00E+00
9. Resources	5	0.00E+00
10. Targets (lines 7+8d+9)	**	0.00E+00
11. DRINKING WATER THREAT SCORE	100	0.00

* Maximum value applies to waste characteristics category.

** Maximum value not applicable.

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	Maximum Value	Value Assigned
Likelihood of Release		
12. Likelihood of Release (same as line 3)	550	550
Waste Characteristics		
13. Toxicity/Mobility/Persistence/Bioacc.	*	5.00E+08
14. Hazardous Waste Quantity	*	100
15. Waste Characteristics	1000	320
Targets		
16. Food Chain Individual	50	0.00E+00
17. Population		
17a. Level I Concentrations	**	0.00E+00
17b. Level II Concentrations	**	0.00E+00
17c. Pot. Human Food Chain Contamination	**	0.00E+00
17d. Population (lines 17a+17b+17c)	**	0.00E+00
18. Targets (lines 16+17d)	**	0.00E+00
19. HUMAN FOOD CHAIN THREAT SCORE	100	0.00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	Maximum Value	Value Assigned
Likelihood of Release		
20. Likelihood of Release (same as line 3)	550	550
Waste Characteristics		
21. Ecosystem Tox./Mobility/Persist./Bioacc.	*	5.00E+08
22. Hazardous Waste Quantity	*	100
23. Waste Characteristics	1000	320
Targets		
24. Sensitive Environments		
24a. Level I Concentrations	**	0.00E+00
24b. Level II Concentrations	**	0.00E+00
24c. Potential Contamination	**	0.00E+00
24d. Sensitive Environments (lines 24a+24b+24c)	**	0.00E+00
25. Targets (line 24d)	**	0.00E+00
26. ENVIRONMENTAL THREAT SCORE	60	0.00
27. WATERSHED SCORE	100	0.00
28. SW: GW to SW COMPONENT SCORE (Sgs)	100	0.00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SOIL EXPOSURE PATHWAY SCORESHEET
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

SOIL EXPOSURE PATHWAY Factor Categories & Factors RESIDENT POPULATION THREAT	Maximum Value	Value Assigned
Likelihood of Exposure		
1. Likelihood of Exposure	550	550
Waste Characteristics		
2. Toxicity	*	1.00E+04
3. Hazardous Waste Quantity	*	10
4. Waste Characteristics	100	18
Targets		
5. Resident Individual	50	0.00E+00
6. Resident Population		
6a. Level I Concentrations	**	0.00E+00
6b. Level II Concentrations	**	0.00E+00
6c. Resident Population (lines 6a+6b)	**	0.00E+00
7. Workers	15	5.00E+00
8. Resources	5	0.00E+00
9. Terrestrial Sensitive Environments	***	7.50E+01
10. Targets (lines 5+6c+7+8+9)	**	8.00E+01
11. RESIDENT POPULATION THREAT SCORE	**	7.92E+05

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.
*** No specific maximum value applies, see HRS for details.

SOIL EXPOSURE PATHWAY SCORESHEET

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

SOIL EXPOSURE PATHWAY Factor Categories & Factors NEARBY POPULATION THREAT	Maximum Value	Value Assigned
Likelihood of Exposure		
12. Attractiveness/Accessibility	100	1.00E+01
13. Area of Contamination	100	2.00E+01
14. Likelihood of Exposure	500	5.00E+00
Waste Characteristics		
15. Toxicity	*	1.00E+04
16. Hazardous Waste Quantity	*	10
17. Waste Characteristics	100	18
Targets		
18. Nearby Individual	1	1.00E+00
19. Population Within 1 Mile	**	2.10E-01
20. Targets (lines 18+19)	**	1.21E+00
21. NEARBY POPULATION THREAT SCORE	**	1.09E+02
SOIL EXPOSURE PATHWAY SCORE (Ss)	100	9.60

* Maximum value applies to waste characteristics category.

** Maximum value not applicable.

AIR PATHWAY SCORESHEET

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

AIR MIGRATION PATHWAY Factor Categories & Factors	Maximum Value	Value Assigned
Likelihood of Release		
1. Observed Release	550	0
2. Potential to Release		
2a. Gas Potential to Release	500	300
2b. Particulate Potential to Release	500	280
2c. Potential to Release	500	300
3. Likelihood of Release	550	300
Waste Characteristics		
4. Toxicity/Mobility	*	2.00E+03
5. Hazardous Waste Quantity	*	100
6. Waste Characteristics	100	18
Targets		
7. Nearest Individual	50	2.00E+01
8. Population		
8a. Level I Concentrations	**	0.00E+00
8b. Level II Concentrations	**	0.00E+00
8c. Potential Contamination	**	7.00E+00
8d. Population (lines 8a+8b+8c)	**	7.00E+00
9. Resources	5	0.00E+00
10. Sensitive Environments		
10a. Actual Contamination	***	0.00E+00
10b. Potential Contamination	***	1.00E+01
10c. Sens. Environments(lines 10a+10b)	***	1.00E+01
11. Targets (lines 7+8d+9+10c)	**	3.70E+01
AIR MIGRATION PATHWAY SCORE (Sa)	100	2.42E+00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.
*** No specific maximum value applies, see HRS for details.

WASTE QUANTITY

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

1. WASTESTREAM QUANTITY SUMMARY TABLE, SOURCE: ABANDONED LAGOON

a. Wastestream ID	
b. Hazardous Constituent Quantity (C) (lbs.)	0.00
c. Data Complete?	NO
d. Hazardous Wastestream Quantity (W) (lbs.)	0.00
e. Data Complete?	NO
f. Wastestream Quantity Value (W/5,000)	0.00E+00

2. SOURCE HAZARDOUS WASTE QUANTITY FACTOR TABLE

a. Source ID	ABANDONED LAGOON	
b. Source Type	Surface Impoundment	
c. Secondary Source Type	N.A.	
d. Source Volume (yd3) | Source Area (ft2)	18667.00	0.00
e. Source Volume/Area Value	7.47E+03	
f. Source Hazardous Constituent Quantity (HCQ) Value (sum of 1b)	0.00E+00	
g. Data Complete?	NO	
h. Source Hazardous Wastestream Quantity (WSQ) Value (sum of 1f)	0.00E+00	
i. Data Complete?	NO	
k. Source Hazardous Waste Quantity (HWQ) Value (2e, 2f, or 2h)	7.47E+03	

Source Hazardous Substances	Depth (feet)	Liquid	Concent.	Units
Cadmium	> 2	YES	2.0E-02	ppm
Chromium	> 2	NO	4.6E+01	ppm
Lead	< 2	NO	7.0E+02	ppm
Mercury	< 2	NO	1.9E+01	ppm
Naphthalene	> 2	NO	1.2E+02	ppm
PCBs	< 2	NO	1.1E+02	ppm
Trichlorobenzene, 1,2,4-	> 2	NO	2.4E+02	ppm

Documentation for Source Type:

Surface impoundment was selected because this source was formerly a lagoon.

Reference: 3

Documentation for Source Hazardous Substances:

All samples collected by G&E Engineering in March 1986. Background values were all non-detects. Soil samples L-1, and G&E-3 were used to determine observed releases. See attachment A for backgroun d concentrations.

Reference: 3, 17

Documentation for Source Volume:

Volume for this source was calculated using sampling data showing waste at a depth of 14 feet. the surficial demensions were arrived at using the sample location map generated in the NUS SSI Phase II. 14 feet x 200 feet x 180 feet = 18,667 cubic yards.

Reference: 3, 17

WASTE QUANTITY

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

1. WASTESTREAM QUANTITY SUMMARY TABLE, SOURCE: DRUM STORAGE AREA

a. Wastestream ID	
b. Hazardous Constituent Quantity (C) (lbs.)	0.00
c. Data Complete?	NO
d. Hazardous Wastestream Quantity (W) (lbs.)	0.00
e. Data Complete?	NO
f. Wastestream Quantity Value (W/5,000)	0.00E+00

2. SOURCE HAZARDOUS WASTE QUANTITY FACTOR TABLE

a. Source ID	DRUM STORAGE AREA
b. Source Type	Contaminated Soil
c. Secondary Source Type	N.A.
d. Source Volume (yd3) | Source Area (ft2)	0.00 | 7475.00
e. Source Volume/Area Value	2.20E-01
f. Source Hazardous Constituent Quantity (HCQ) Value (sum of 1b)	0.00E+00
g. Data Complete?	NO
h. Source Hazardous Wastestream Quantity (WSQ) Value (sum of 1f)	0.00E+00
i. Data Complete?	NO
k. Source Hazardous Waste Quantity (HWQ) Value (2e, 2f, or 2h)	2.20E-01

Documentation for Source Type:

Contaminated soil best suited the drum source area, as the other categories were were less accurate.

Reference: 3

Documentation for Source Hazardous Substances:

No surface or subsurface soils were collected from this source, and groundwater samples cannot be used to characterize a source.

Reference: 3, 17

Documentation for Source Area:

the drum storage area was computed using the SSI Phase II sample location map for approximate dimensions. Since soil samples were not taken for this source, no depth could be accurately estimated. 115 feet x 65 feet = 7475 square feet.

Reference: 3, 17

1. WASTESTREAM QUANTITY SUMMARY TABLE, SOURCE: BURN SITE

a. Wastestream ID	
b. Hazardous Constituent Quantity (C) (lbs.)	0.00
c. Data Complete?	NO
d. Hazardous Wastestream Quantity (W) (lbs.)	0.00
e. Data Complete?	NO
f. Wastestream Quantity Value (W/5,000)	0.00E+00

2. SOURCE HAZARDOUS WASTE QUANTITY FACTOR TABLE

a. Source ID	BURN SITE	
b. Source Type	Contaminated Soil	
c. Secondary Source Type	N.A.	
d. Source Volume (yd3) | Source Area (ft2)	0.00	14625.00
e. Source Volume/Area Value	4.30E-01	
f. Source Hazardous Constituent Quantity (HCQ) Value (sum of 1b)	0.00E+00	
g. Data Complete?	NO	
h. Source Hazardous Wastestream Quantity (WSQ) Value (sum of 1f)	0.00E+00	
i. Data Complete?	NO	
k. Source Hazardous Waste Quantity (HWQ) Value (2e, 2f, or 2h)	4.30E-01	

Source Hazardous Substances	Depth (feet)	Liquid	Concent.	Units
Cadmium	< 2	NO	1.0E-01	ppm
Chromium	< 2	NO	5.6E+02	ppm
Lead	< 2	NO	5.3E+01	ppm
Mercury	< 2	NO	1.8E-01	ppm
Naphthalene	< 2	NO	7.5E-01	ppm
PCBs	< 2	NO	1.6E+02	ppm
Trichlorobenzene, 1,2,4-	< 2	NO	6.1E-01	ppm

Documentation for Source Type:

The contaminated soil source type was selected as the most accurate type because the other types were inaccurate.

Reference: 3

Documentation for Source Hazardous Substances:

All samples were collected by G&E Engineering in March 1986. Background water and soil samples W-1 were non-detects for the parameters listed for this source. Soil samples S-1 (unknown depth) and G&E-9 were used for all parameters. See attachment A for back ground and sample concentrations.

Reference: 3, 17

Documentation for Source Area:

The sample location map in the NUS SSI Phase II was used to calculate the area of the source.
225 feet x 65 feet = 14,625 square feet.

Reference: 3

WASTE QUANTITY
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

1. WASTESTREAM QUANTITY SUMMARY TABLE, SOURCE: STRESSED VEGETATION

a. Wastestream ID	
b. Hazardous Constituent Quantity (C) (lbs.)	0.00
c. Data Complete?	NO
d. Hazardous Wastestream Quantity (W) (lbs.)	0.00
e. Data Complete?	NO
f. Wastestream Quantity Value (W/5,000)	0.00E+00

2. SOURCE HAZARDOUS WASTE QUANTITY FACTOR TABLE

a. Source ID	STRESSED VEGETATION	
b. Source Type	Contaminated Soil	
c. Secondary Source Type	N.A.	
d. Source Volume (yd3) | Source Area (ft2)	0.00	37500.00
e. Source Volume/Area Value	1.10E+00	
f. Source Hazardous Constituent Quantity (HCQ) Value (sum of 1b)	0.00E+00	
g. Data Complete?	NO	
h. Source Hazardous Wastestream Quantity (WSQ) Value (sum of 1f)	0.00E+00	
i. Data Complete?	NO	
k. Source Hazardous Waste Quantity (HWQ) Value (2e, 2f, or 2h)	1.10E+00	

Source Hazardous Substances	Depth (feet)	Liquid	Concent.	Units
Chromium	< 2	NO	3.3E+00	ppm
Lead	< 2	NO	3.8E+00	ppm

Documentation for Source Type:

The stressed vegetation area was identified as a contaminated soil source type, because no other sort of controlled actions took place here.

Reference: 3

Documentation for Source Hazardous Substances:

All samples were collected by G&E Engineering in March 1986. Background water and soil samples W-1 were both non-detects for the pertinant parameters. Soil sample D-1 contained 3.3 ppm and 3.8 ppm of chromium and lead respectively. The data is shown in attachment A.

Reference: 3, 17

Documentation for Source Area:

Source area was calculated using the sample location map in the NUS SSI Phase II.
250 feet x 150 feet = 37,500 square feet

Reference: 3

WASTE QUANTITY

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

3. SITE HAZARDOUS WASTE QUANTITY SUMMARY

No.	Source ID	Migration Pathways	Vol. or Area Value (2e)	Constituent or Wastestream Value (2f,2h)	Hazardous Waste Qty. Value (2k)
1	ABANDONED LAGOON	GW-SW-SE-A	7.47E+03	0.00E+00	7.47E+03
2	DRUM STORAGE AREA	GW-SW-SE-A	2.20E-01	0.00E+00	2.20E-01
3	BURN SITE	GW-SW-SE-A	4.30E-01	0.00E+00	4.30E-01
4	STRESSED VEGETATION	GW-SW-SE-A	1.10E+00	0.00E+00	1.10E+00

WASTE QUANTITY

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

4. PATHWAY HAZARDOUS WASTE QUANTITY AND WASTE CHARACTERISTICS SUMMARY TABLE

Migration Pathway	Contaminant Values		HWQVs*	WCVs**
Ground Water	Toxicity/Mobility	1.00E+04	100	32
SW: Overland Flow, DW	Tox./Persistence	1.00E+04	100	32
SW: Overland Flow, HFC	Tox./Persis./Bioacc.	5.00E+08	100	320
SW: Overland Flow, Env	Etox./Persis./Bioacc.	5.00E+08	100	320
SW: GW to SW, DW	Tox./Persistence	1.00E+04	100	32
SW: GW to SW, HFC	Tox./Persis./Bioacc.	5.00E+08	100	320
SW: GW to SW, Env	Etox./Persis./Bioacc.	5.00E+08	100	320
Soil Exposure:Resident	Toxicity	1.00E+04	10	18
Soil Exposure: Nearby	Toxicity	1.00E+04	10	18
Air	Toxicity/Mobility	2.00E+03	100	18

* Hazardous Waste Quantity Factor Values

** Waste Characteristics Factor Category Values

Note: SW = Surface Water
GW = Ground Water
DW = Drinking Water Threat
HFC = Human Food Chain Threat
Env = Environmental Threat

GROUND WATER PATHWAY AQUIFER SUMMARY
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

No.	Aquifer ID	Type	Overlaying No.	Inter-Connected with	Likelihood of Release	Targets
1	SURFICIAL AQUIFER	Non K	0	0	550	2.50E+01
2	Tertiary Limestone	Non K	1	0	210	6.30E+01

Containment

No.	Source ID	HWQ Value	Containment Value
1	ABANDONED LAGOON	7.47E+03	10
2	DRUM STORAGE AREA	2.20E-01	10
3	BURN SITE	4.30E-01	10
4	STRESSED VEGETATION	1.10E+00	10
	Containment Factor		10

Documentation for Ground Water Containment, Source ABANDONED LAGOON:

Sampling data indicates that a release to groundwater has occured from this source area. Further, this source area is not lined.

Reference: 3,6

Documentation for Ground Water Containment, Source DRUM STORAGE AREA:

The drum storage area is given a groundwater containment value of 10 because there is no evidence of a liner being present.

Reference: 3

Documentation for Ground Water Containment, Source BURN SITE:

A containment factor value of 10 was selected for this source because the specific conditions for this source type were not described in HRS table 3-2 under contaminated soils.

Reference: 3

Documentation for Ground Water Containment, Source STRESSED VEGETATION:

The stressed vegetation received a containment value of 10 because its situation was not specifically described in HRS table 3-2

Reference: 3

Net Precipitation

Net Precipitation (inches)	6.00

Documentation for Net Precipitation:

Average annual rainfall is 50 inches, and annual evapotranspiration is 44 inches, yielding a net annual precipitation of 6 inches.

Reference: 13

Aquifer: SURFICIAL AQUIFER

Type of Aquifer: Non Karst

Overlaying Aquifer: 0

Interconnected with: 0

Documentation for SURFICIAL AQUIFER Aquifer:

The uppermost hydrogeologic unit at American Color & Chemical is the surface water table. This unit consists primarily of quartz sand and lenses of clay to a depth of 35-40 feet bls. Although the saturated thickness of this unit is dependant on climactic conditions, elevations of nearby streams indicate the water table is between 5 and 10 feet bls.

Reference: 11, 12, 16, 17

OBSERVED RELEASE

No.	Well ID	Well Type	Distance (miles)	Level of Contamination
1	onsite monitoring	Monitoring Well	0.000	Level I

Well No.	Hazardous Substance	Concent.	MCL	Cancer	RFD	Units
1	Cadmium	2.0E+01	1.0E+01	0.0E+00	1.8E+01	ppb
1	Chromium	1.7E+03	5.0E+01	0.0E+00	1.8E+02	ppb
1	Lead	9.4E+02	5.0E+01	0.0E+00	0.0E+00	ppb
1	Mercury	4.0E+00	2.0E+00	0.0E+00	1.1E+01	ppb
1	PCBs	1.1E+02	0.0E+00	4.5E-03	0.0E+00	ppb

Observed Release Factor 550

Documentation for Well onsite monitoring :

All samples were collected by G&E Engineering in March 1986. Monitoring well L-7 was used for cadmium, well G&E 10 was used for Chromium, and well W-9 was used for PCBs, lead, and mercury. All background concentrations and detects are shown in attachment A.

Reference: 3, 17

POTENTIAL TO RELEASE

Containment

Containment Factor	10	

Net Precipitation

Net Precipitation Factor	3	

Depth to Aquifer

A. Depth of Hazardous Substances	14.00	feet

Documentation for Depth of Hazardous Substances:

PCB's were detected in the lagoon at three times background or greater to depths of 14 feet.

Reference: 3, p. 17

B. Depth to Aquifer from Surface	10.00	feet

Documentation for Depth to Aquifer from Surface :

Saturated thickness of this unit is dependant on rainfall; however elevations of nearby streams indicate the water table is between 5 and 10 feet bls.

Reference: 12; 16, p. 379

C. Depth to Aquifer (B - A)	0.00	feet

Depth to Aquifer Factor 5

Travel Time

Are All Layers Karst? NO

Documentation for Karst Layers:

The formations present in this area are not consistent with those commonly found in karst terrain.

Reference: 11, 12

Thickness of Layer(s) with Lowest Conductivity 35.00 feet

Documentation for Thickness of Layers with Lowest Conductivity:

The water table aquifer is comprised of alluvial and fluvial deposits made up of quartz sand and lenses of clay to a depth of 35 to 40 feet bls.

Reference: 11, 17

Hydraulic Conductivity (cm/sec) 1.0E-04

Documentation for Hydraulic Conductivity:

The hydraulic conductivity for this formation wis approximately 10-4 cm\s.

Reference: 11, 17

GROUND WATER PATHWAY LIKELIHOOD OF RELEASE SURFICIAL AQUIFER AQUIFER
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Travel Time Factor	35

==

Potential to Release Factor	430

Aquifer: Tertiary Limestone

Type of Aquifer: Non Karst

Overlaying Aquifer: 1

Interconnected with: 0

Documentation for Tertiary Limestone Aquifer:

The upper Tertiary Limestone aquifer consists of highly permeable fossiliferous limestone and is the primary source of groundwater in Beaufort County. This aquifer is divided into an upper and lower unit, but are interconnected. the lower unit is moderately productive and not as extensively used.

Reference: 10,14,15

OBSERVED RELEASE

No.	Well ID	Well Type	Distance (miles)	Level of Contamination
- N/A and/or data not specified				

Observed Release Factor 0

POTENTIAL TO RELEASE

Containment

Containment Factor	10	

Net Precipitation

Net Precipitation Factor	3	

Depth to Aquifer

A. Depth of Hazardous Substances	14.00	feet

Documentation for Depth of Hazardous Substances:

The lowest depth at which waste has been identified is 14 feet in the abandoned lagoon, sample number L-33 for Arochlor 1248.

Reference: 3

B. Depth to Aquifer from Surface	90.00	feet

Documentation for Depth to Aquifer from Surface :

The surficial aquifer extends to between 35 and 40 feet bls. Additionally, 50 feet of green clay from the Hawthorne and Cooper formations separate the surficial from the Tertiary Limestone aquifers. This means the top of the Tertiary is approximately 90 feet bls.

Reference: 11, 12, 17

C. Depth to Aquifer (B - A) 76.00 feet

Depth to Aquifer Factor 3

Travel Time

Are All Layers Karst? NO

Documentation for Karst Layers:

There is no evidence to support the existence of karst in the study area. Quartz, clays and permeable limestone are not classic karst formations.

Reference: 10, 11, 13, 14, 15

Thickness of Layer(s) with Lowest Conductivity 50.00 feet

Documentation for Thickness of Layers with Lowest Conductivity:

The aquitard separating the surficial from the Tertiary Limestone aquifers is approximately 50 feet of stiff green clay.

Reference: 11, 17

Hydraulic Conductivity (cm/sec) 1.0E-07

Documentation for Hydraulic Conductivity:

The hydraulic conductivity of the green clay layer is 10 -7 cm/sec.

Reference: 11, 17

GROUND WATER PATHWAY LIKELIHOOD OF RELEASE Tertiary Limestone AQUIFER
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Travel Time Factor	15
Potential to Release Factor	210

GROUND WATER PATHWAY WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 1 ABANDONED LAGOON

Source Hazardous Waste Quantity Value: 7466.80

Hazardous Substance	Toxicity Value	Mobility Value	Toxicity/ Mobility Value
Cadmium	10000	1.00E+00	1.00E+04
Chromium	10000	1.00E-02	1.00E+02
Lead	10000	2.00E-05	2.00E-01
Mercury	10000	2.00E-05	2.00E-01
Naphthalene	1000	2.00E-03	2.00E+00
PCBs	10000	2.00E-09	2.00E-05
Trichlorobenzene, 1,2,4-	1000	2.00E-03	2.00E+00

GROUND WATER PATHWAY WASTE CHARACTERISTICS

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 2 DRUM STORAGE AREA

Source Hazardous Waste Quantity Value: 0.22

Hazardous Substance	Toxicity Value	Mobility Value	Toxicity/ Mobility Value

Source: 3 BURN SITE

Source Hazardous Waste Quantity Value: 0.43

Hazardous Substance	Toxicity Value	Mobility Value	Toxicity/ Mobility Value
Cadmium	10000	1.00E+00	1.00E+04
Chromium	10000	1.00E-02	1.00E+02
Lead	10000	2.00E-05	2.00E-01
Mercury	10000	2.00E-05	2.00E-01
Naphthalene	1000	2.00E-03	2.00E+00
PCBs	10000	2.00E-09	2.00E-05
Trichlorobenzene, 1,2,4-	1000	2.00E-03	2.00E+00

GROUND WATER PATHWAY WASTE CHARACTERISTICS

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 4 STRESSED VEGETATION

Source Hazardous Waste Quantity Value: 1.10

Hazardous Substance	Toxicity Value	Mobility Value	Toxicity/ Mobility Value
Chromium	10000	1.00E-02	1.00E+02
Lead	10000	2.00E-05	2.00E-01

GROUND WATER PATHWAY WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Hazardous Substances Found in an Observed Release

Well No.	Observed Release Hazardous Substance	Toxicity Value	Mobility Value	Toxicity/ Mobility Value
1	Cadmium	10000	1.00E+00	1.00E+04
1	Chromium	10000	1.00E+00	1.00E+04
1	Lead	10000	1.00E+00	1.00E+04
1	Mercury	10000	1.00E+00	1.00E+04
1	PCBs	10000	1.00E+00	1.00E+04

GROUND WATER PATHWAY WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Toxicity/Mobility Value from Source Hazardous Substances:	1.00E+04
Toxicity/Mobility Value from Observed Release Hazardous Substances:	1.00E+04
Toxicity/Mobility Factor:	1.00E+04
Sum of Source Hazardous Waste Quantity Values:	7.47E+03
Hazardous Waste Quantity Factor:	100
Waste Characteristics Factor Category:	32

Population by Well

No.	Well ID	Sample Type	Distance (miles)	Level of Contamination	Population
-	N/A and/or data not specified				

Level I Population Factor: 0.00

Level II Population Factor: 0.00

GROUND WATER PATHWAY TARGETS FOR AQUIFER SURFICIAL AQUIFER
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Potential Contamination by Distance Category

Distance Category (miles)	Population	Value
> 0 to 1/4	5.0	4.00E-01
> 1/4 to 1/2	8.0	2.00E-01
> 1/2 to 1	15.0	5.00E-01
> 1 to 2	70.0	1.00E+00
> 2 to 3	114.0	2.10E+00
> 3 to 4	56.0	4.00E-01

Potential Contamination Factor: 5.000

Documentation for Target Population > 0 to 1/4 mile Distance Category:

The population served by drinking water wells was computed using USGS 7.5 minute topo maps and the Bureau of Census data of 2.59 persons per household in Beaufort County. there were no municipal service areas in the study area. A well driller estmated that the surficial aquifer only supplies 5% of the population in the area.
2 houses x 2.59 people = 5 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 1/4 to 1/2 mile Distance Category:

Same justification as the 0 to 1/4 mile radius.
3 houses x 2.59 people = 8 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 1/2 to 1 mile Distance Category:

Same justification as the 0 to 1/4 mile radius.
6 houses x 2.59 people = 15 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 1 to 2 miles Distance Category:

same justification as the 0 to 1/4 mile radius.
27 houses x 2.59 people = 70 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 2 to 3 miles Distance Category:

same justification as the 0 to 1/4 mile radius.
44 houses x 2.59 people = 114 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 3 to 4 miles Distance Category:

Same justification as the 0 to 1/4 mile radius.
27 houses x 2.59 people = 56 persons

Reference: 2, 3, 20, 21

Nearest Well

Level of Contamination: Potential
Distance in miles: 0.25

Nearest Well Factor: 2.00E+01

Documentation for Nearest Well:

The nearest well suppling drinking water from the surficial aquifer is one quarter mile from the site (the Anderson well).

Reference: 3

Resources

Resource Use: NO

Resource Factor: 0.00E+00

Documentation for Resources:

No resources were identified which were defined in the HRS Section 3.3.3.

Reference:

Wellhead Protection Area

No wellhead protection area

Wellhead Protection Area Factor: 0.00E+00

Documentation for Wellhead Protection Area:

No wellhead protection areas identified.

Reference:

Population by Well

No.	Well ID	Sample Type	Distance (miles)	Level of Contamination	Population
	- N/A and/or data not specified				

Level I Population Factor: 0.00

Level II Population Factor: 0.00

Potential Contamination by Distance Category

Distance Category (miles)	Population	Value
> 0 to 1/4	8.0	4.00E-01
> 1/4 to 1/2	10.0	2.00E-01
> 1/2 to 1	138.0	5.20E+00
> 1 to 2	627.0	9.40E+00
> 2 to 3	1028.0	2.12E+01
> 3 to 4	501.0	4.20E+00

Potential Contamination Factor: 41.000

Documentation for Target Population > 0 to 1/4 mile Distance Category:

The population relying on the Tertiary Limestone aquifer was computed using the USGS topo maps to perform a house count, multiplying by 2.59, the Bureau of Census household average for Beaufort County. Then, I subtracted the 5% of the population that uses the surficial aquifer for their potable supplies. There are no municipal systems that rely on the surficial aquifer for their supply of potable water in the study area.
3 houses x 2.59 people = 8 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 1/4 to 1/2 mile Distance Category:

Same rationale as the 0 to 1/4 mile radius.
4 houses x 2.59 people = 10

Reference: 2, 3, 20, 21

Documentation for Target Population > 1/2 to 1 mile Distance Category:

Same rationale as the 0 to 1/4 mile radius score.
53 house x 2.59 people = 138 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 1 to 2 miles Distance Category:

Same rationale as the 0 to 1/4 mile radius score.
241 houses x 2.59 people = 627 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 2 to 3 miles Distance Category:

same rationale as the 0 to 1/4 mile radius score.
397 houses x 2.59 people = 1028 persons

Reference: 2, 3, 20, 21

Documentation for Target Population > 3 to 4 miles Distance Category:

Same rationale as the 0 to 1/4 mile radius score.
193 houses x 2.59 people = 501 persons

Reference: 2, 3, 20, 21

Nearest Well

Level of Contamination: Potential
Distance in miles: 0.11

Nearest Well Factor: 2.00E+01

Documentation for Nearest Well:

Ms. Sally Burgess, located 600 feet southeast of the facility,obtains her drinking water from a private well on her property.

Reference: 18,27

Resources

Resource Use: NO

Resource Factor: 0.00E+00

Documentation for Resources:

No resources were identified as defined by HRS Section 3.3.3.

Reference:

Wellhead Protection Area

No wellhead protection area

Wellhead Protection Area Factor: 0.00E+00

Documentation for Wellhead Protection Area:

No wellhead protection areas identified in the study area.

Reference:

SURFACE WATER PATHWAY SEGMENT SUMMARY

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

No.	Segment ID	Segment Type	Water Type	Start Point (mi)	End Point (mi)	Average Flow (cfs)
1	CAMPELL CREEK	Coastal Ti	Brack	0.00	0.75	N.A.
2	WHALE BRANCH	Coastal Ti	Brack	0.75	5.25	N.A.
3	COOSAW RIVER	Coastal Ti	Brack	5.25	17.75	N.A.

SURFACE WATER PATHWAY OVERLAND FLOW/FLOOD COMPONENT LIKELIHOOD OF RELEASE
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

OBSERVED RELEASE

No.	Sample ID	Sample Type	Distance (miles)	Level of Contamination DW	HFC	Env
1	MD-664	Benthic	0.200	Potential	Level I	Potential

Sample No.	Hazardous Substance	Concent.	Units
1	PCBs	9.5E-01	ppm

Observed Release Factor 550

Documentation for Observed Release, Sample MD-664:

Observed release for this sample was determined by comparing the PCB concentration to all others collected in the study. MD-664 is more than four times greater in concentration than samples collected both upstream and downstream of the site. The fact that this is a tidally influenced watershed could explain why concentrations are so similar according to overall distance from the site rather than distance downstream from the site.

Reference: 8

POTENTIAL TO RELEASE

Potential to Release by Overland Flow

Containment

No.	Source ID	HWQ Value	Containment Value
1	ABANDONED LAGOON	7.47E+03	10
2	DRUM STORAGE AREA	2.20E-01	10
3	BURN SITE	4.30E-01	10
4	STRESSED VEGETATION	1.10E+00	10

Containment Factor: 10

Documentation for Overland Flow Containment, Source ABANDONED LAGOON:

A value of 10 was selected because several contaminants were detected outside the abandoned lagoon source area, such as trichloroethene, chromium, and lead.

Reference: 3

Documentation for Overland Flow Containment, Source DRUM STORAGE AREA:

The drum storage area was valued at a 10 for containment due to its not having an engineered cover or a run on/run off control system

Reference: 3, 18

Documentation for Overland Flow Containment, Source BURN SITE:

The burn site has a containment value of 10 because there is no run off control system or an engineered cover for the area

Reference: 3, 18

Documentation for Overland Flow Containment, Source STRESSED VEGETATION:

The stressed vegetation area has a containment of 10 because there is no runoff control system or engineered cover

Reference: 3,18

Distance to Surface Water

Distance to Surface Water:	1320.0 feet
Distance to Surface Water Factor:	9

Documentation for Distance to Surface Water:

Distance to surface water was computed based on the overland distance from the nearest of the sources to the marsh surrounding Campbell Creek.

Reference: 2, 3

Runoff

A. Drainage Area:	26.0 acres

Documentation for Drainage Area:

Because no reconnaissance was performed for this site, the drainage area was estimated based on the topographical maps for the site and information from the SI report.

Reference: 2, 3

B. 2-year, 24-hour Rainfall:	5.0 inches

Documentation for Rainfall:

The 2-year, 24-hour rainfall is 5.0 inches as found in the Rainfall Frequency Atlas of the United States

Reference: 14

C. Soil Group: A
Coarse-textured soils with high infiltration rates

Documentation for Soil Group:

Soil group type was based on HRS Table 4-3

Reference:

Runoff Factor: 1

===

Potential to Release by Overland Flow Factor: 100

SURFACE WATER PATHWAY OVERLAND FLOW/FLOOD COMPONENT LIKELIHOOD OF RELEASE
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Potential to Release by Flood

No.	Source ID	HWQ Value	Flood Containment Value	Flood Frequency Value	Potential to Release by Flood
1	ABANDONED LAGOON	7.47E+03	10	25	250
2	DRUM STORAGE AREA	2.20E-01	10	25	250
3	BURN SITE	4.30E-01	10	25	250
4	STRESSED VEGETATION	1.10E+00	10	25	250

Potential to Release by Flood Factor: 250

Documentation for Flood Containment, Source ABANDONED LAGOON:

This source is not contained against flood, as waste was found in surface soils (at depths of less than 2 feet). Also, no effective cap or runoff control measures were present.

Reference: 3

Documentation for Flood Frequency, Source ABANDONED LAGOON:

According to flood insurance rate maps for Beaufort County, South Carolina, the AC&C facility is located in a 100 year floodplain.

Reference: 25

Documentation for Flood Containment, Source DRUM STORAGE AREA:

There is no documentation that the source was/is designed, constructed, operated or maintained to prevent a washout of wastes to the environment.

Reference: 3,18

Documentation for Flood Frequency, Source DRUM STORAGE AREA:

According to FEMA flood insurance rate maps, the facility is located in an area of 100 year floodplain.

Reference: 25

Documentation for Flood Containment, Source BURN SITE:

The burn site has no documentation to show that it was designed, operated, and constructed to prevent a runoff of waste to the environment.

Reference: 3,18

Documentation for Flood Containment, Source STRESSED VEGETATION:

Since the stressed vegetation area was/is not a managed waste area, it is highly unlikely that any measures were installed to prevent a release to the environment of any wastes present.

Reference: 3, 18

SW PATHWAY: OVERLAND/FLOOD DRINKING WATER THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 1 ABANDONED LAGOON

Source Hazardous Waste Quantity Value: 7466.80

Hazardous Substance	Toxicity Value	Persistence Value	Toxicity/ Persistence Value
Cadmium	10000	1.00E+00	1.00E+04
Chromium	10000	1.00E+00	1.00E+04
Lead	10000	1.00E+00	1.00E+04
Mercury	10000	1.00E+00	1.00E+04
Naphthalene	1000	4.00E-01	4.00E+02
PCBs	10000	1.00E+00	1.00E+04
Trichlorobenzene, 1,2,4-	1000	4.00E-01	4.00E+02

SW PATHWAY: OVERLAND/FLOOD DRINKING WATER THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 2 DRUM STORAGE AREA

Source Hazardous Waste Quantity Value: 0.22

Hazardous Substance	Toxicity Value	Persistence Value	Toxicity/ Persistence Value

SW PATHWAY: OVERLAND/FLOOD DRINKING WATER THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 3 BURN SITE

Source Hazardous Waste Quantity Value: 0.43

Hazardous Substance	Toxicity Value	Persistence Value	Toxicity/ Persistence Value
Cadmium	10000	1.00E+00	1.00E+04
Chromium	10000	1.00E+00	1.00E+04
Lead	10000	1.00E+00	1.00E+04
Mercury	10000	1.00E+00	1.00E+04
Naphthalene	1000	4.00E-01	4.00E+02
PCBs	10000	1.00E+00	1.00E+04
Trichlorobenzene, 1,2,4-	1000	4.00E-01	4.00E+02

Source: 4 STRESSED VEGETATION

Source Hazardous Waste Quantity Value: 1.10

Hazardous Substance	Toxicity Value	Persistence Value	Toxicity/ Persistence Value
Chromium	10000	1.00E+00	1.00E+04
Lead	10000	1.00E+00	1.00E+04

Hazardous Substances Found in an Observed Release

Sample No.	Observed Release Hazardous Substance	Toxicity Value	Persistence Value	Toxicity/ Persistence Value

- N/A and/or data not specified

SW PATHWAY: OVERLAND/FLOOD DRINKING WATER THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Toxicity/Persistence Value from Source Hazardous Substances:	1.00E+04
Toxicity/Persistence Value from Observed Release Hazardous Substances:	1.00E+04
Toxicity/Persistence Factor:	1.00E+04
Sum of Source Hazardous Waste Quantity Values:	7.47E+03
Hazardous Waste Quantity Factor:	100
Waste Characteristics Factor Category:	32

SW PATHWAY: OVERLAND FLOW/FLOOD COMPONENT DRINKING WATER THREAT TARGETS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Level I Concentrations

- N/A and/or data not specified

Level II Concentrations

- N/A and/or data not specified

Most Distant Level I Sample

- N/A and/or data not specified

Most Distant Level II Sample

- N/A and/or data not specified

SW PATHWAY: OVERLAND FLOW/FLOOD COMPONENT DRINKING WATER THREAT TARGETS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Level I Concentrations

Intake	Distance Along the In-water Segment from the Probable Point of Entry (miles)	Population
- N/A and/or data not specified		

Population Served by Level I Intakes: 0.0

Level I Population Factor: 0.00E+00

Level II Concentrations

Intake	Distance Along the In-water Segment from the Probable Point of Entry (miles)	Population
- N/A and/or data not specified		

Population Served by Level II Intakes: 0.0

Level II Population Factor: 0.00E+00

Potential Contamination

Intake ID	Average Annual Flow (cfs)	Population Served
- N/A and/or data not specified		

Documentation for Intake :

There are no drinking water intakes along the 15 mile surface water pathway.

Reference: 20

Type of Surface Water Body	Total Population	Dilution-Weighted Population
- N/A and/or data not specified		

Dilution-Weighted Population Served
by Potentially Contaminated Intakes: 0.0

Potential Contamination Factor: 0.0

Nearest Intake

Location of Nearest Drinking Water Intake: N.A.

Nearest Intake Factor: 0.00

Resources

Resource Use: NO

Resource Value: 0.00E+00

Documentation for Resources:

No resources identified.

Reference:

SW PATHWAY: OVERLAND/FLOOD HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 1 ABANDONED LAGOON

Source Hazardous Waste Quantity Value: 7466.80

Hazardous Substance	Toxicity Value	Persistence Value	Bio-accum. Value	Toxicity/ Persistence/ Bioaccum. Value
Cadmium	10000	1.00E+00	5.00E+03	5.00E+07
Chromium	10000	1.00E+00	5.00E+02	5.00E+06
Lead	10000	1.00E+00	5.00E+03	5.00E+07
Mercury	10000	1.00E+00	5.00E+04	5.00E+08
Naphthalene	1000	4.00E-01	5.00E+00	2.00E+03
PCBs	10000	1.00E+00	5.00E+04	5.00E+08
Trichlorobenzene, 1,2,4-	1000	4.00E-01	5.00E+02	2.00E+05

SW PATHWAY: OVERLAND/FLOOD HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 2 DRUM STORAGE AREA

Source Hazardous Waste Quantity Value: 0.22

Hazardous Substance	Toxicity Value	Persistence Value	Bio-accum. Value	Toxicity/Persistence/Bioaccum. Value

SW PATHWAY: OVERLAND/FLOOD HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 3 BURN SITE

Source Hazardous Waste Quantity Value: 0.43

Hazardous Substance	Toxicity Value	Persistence Value	Bio-accum. Value	Toxicity/ Persistence/ Bioaccum. Value
Cadmium	10000	1.00E+00	5.00E+03	5.00E+07
Chromium	10000	1.00E+00	5.00E+02	5.00E+06
Lead	10000	1.00E+00	5.00E+03	5.00E+07
Mercury	10000	1.00E+00	5.00E+04	5.00E+08
Naphthalene	1000	4.00E-01	5.00E+00	2.00E+03
PCBs	10000	1.00E+00	5.00E+04	5.00E+08
Trichlorobenzene, 1,2,4-	1000	4.00E-01	5.00E+02	2.00E+05

SW PATHWAY: OVERLAND/FLOOD HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 4 STRESSED VEGETATION

Source Hazardous Waste Quantity Value: 1.10

Hazardous Substance	Toxicity Value	Persistence Value	Bio-accum. Value	Toxicity/ Persistence/ Bioaccum. Value
Chromium	10000	1.00E+00	5.00E+02	5.00E+06
Lead	10000	1.00E+00	5.00E+03	5.00E+07

SW PATHWAY: OVERLAND/FLOOD HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Hazardous Substances Found in an Observed Release

Sample No.	Observed Release Hazardous Substance	Toxicity Value	Persistence Value	Bio-accum. Value	Toxicity/ Persistence/ Bioaccum. Value

- N/A and/or data not specified

SW PATHWAY: OVERLAND/FLOOD HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Toxicity/Persistence/Bioaccumulation Value from Source Hazardous Substances:	5.00E+08
Toxicity/Persistence/Bioaccumulation Value from Observed Release Hazardous Substances:	5.00E+08
Toxicity/Persistence/Bioaccumulation Factor:	5.00E+08
Sum of Source Hazardous Waste Quantity Values:	7.47E+03
Hazardous Waste Quantity Factor:	100
Waste Characteristics Factor Category:	320

Level I Concentrations

Sample ID: MD-664
Sample Medium: Benthic
Location: 0.20 miles

Hazardous Substance	Hazardous Substance Concentration	FDAAL Benchmark Concentration	Units
PCBs	9.5E-01	0.0E+00	ppm

Documentation for MD-664:

Observed release for this sample was determined by comparing the PCB concentration to all others collected in the study. MD-664 is more than four times greater in concentration than samples collected both upstream and downstream of the site. The fact that this is a tidally influenced watershed could explain why concentrations are so similar according to overall distance from the site rather than distance downstream from the site.

Reference: 8

Level II Concentrations

- N/A and/or data not specified

Most Distant Level I Sample

Sample ID: MD-664
Distance from the Probable Point of Entry: 0.20 miles

Documentation for MD-664:

Observed release for this sample was determined by comparing the PCB concentration to all others collected in the study. MD-664 is more than four times greater in concentration than samples collected both upstream and downstream of the site. The fact that this is a tidally influenced watershed could explain why concentrations are so similar according to overall distance from the site rather than distance downstream from the site.

Reference: 8

Most Distant Level II Sample

- N/A and/or data not specified

Level I Concentrations

Fishery	Annual Production (pounds)	Human Food Chain Population Value
- N/A and/or data not specified		

Sum of Human Food Chain Population Values: 0.00E+00

Level I Concentrations Factor: 0.00E+00

Documentation for CAMPELL CREEK Fishery:

This fishery is closed to harvest of any shellfish or benthic organism.

Reference: 9

SW PATHWAY: OVERLAND FLOW/FLOOD COMPONENT HUMAN FOOD CHAIN THREAT TARGETS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Level II Concentrations

Fishery	Annual Production (pounds)	Human Food Chain Population Value
- N/A and/or data not specified		

Sum of Human Food Chain Population Values: 0.00E+00

Level II Concentrations Factor: 0.00E+00

SW PATHWAY: OVERLAND FLOW/FLOOD COMPONENT HUMAN FOOD CHAIN THREAT TARGETS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Potential Contamination

Fishery	Annnual Production (pounds)	Type of Surface Water Body	Average Annual Flow (cfs)	Pop. Value (Pi)	Dilution Weight (Di)	Pi*Di
2 WHALE BRANCH	1.0	Coastal	1000	0.0	1.00E-04	3.00E-06
3 COOSAW RIVER	1.0	Coastal	10000	0.0	1.00E-04	3.00E-06

Sum of (Pi*Di): 6.00E-06

Potential Human Food Chain Contamination Factor: 6.00E-07

Documentation for WHALE BRANCH Fishery:

This fishery has recently been opened to harvest, but there is no documentation of any fishing harvest amounts; an estimate of 1 pound was made.

Reference: 9

Documentation for COOSAW RIVER Fishery:

The Coosaw River is major branch of this tributary and it is almost certain that someone catches and consumes at least one fish annually from this water body. Hence, a low estimate of 1 pound was used to compute this number.

Reference: 2, 9

Food Chain Individual

Location of Nearest Fishery: WHALE BRANCH
Distance from the Probable Point of Entry: 0.75 miles
Type of Surface Water Body: Coastal Tidal Area
Dilution Weight: 0.0001000
Level of Contamination: Bioaccumulation > 500

Food Chain Individual Factor: 20.00

Documentation for WHALE BRANCH:

The surface water pathway is as described for the Campbell Creek portion of this pathway.

Reference: 2, 24

SW PATHWAY: OVERLAND FLOW/FLOOD ENVIRONMENTAL THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 1 ABANDONED LAGOON

Source Hazardous Waste Quantity Value: 7466.80

Hazardous Substance	Eco-toxicity Value	Persistence Value	Bio-accum. Value	Ecotoxicity/ Persistence/ Bioaccum. Value
Cadmium	1000	1.00E+00	5.00E+03	5.00E+06
Chromium	10	1.00E+00	5.00E+02	5.00E+03
Lead	1000	1.00E+00	5.00E+03	5.00E+06
Mercury	10000	1.00E+00	5.00E+04	5.00E+08
Naphthalene	1000	4.00E-01	5.00E+03	2.00E+06
PCBs	10000	1.00E+00	5.00E+04	5.00E+08
Trichlorobenzene, 1,2,4-	100	4.00E-01	5.00E+02	2.00E+04

SW PATHWAY: OVERLAND FLOW/FLOOD ENVIRONMENTAL THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 2 DRUM STORAGE AREA

Source Hazardous Waste Quantity Value: 0.22

Hazardous Substance	Eco-toxicity Value	Persistence Value	Bio-accum. Value	Ecotoxicity/ Persistence/ Bioaccum. Value

SW PATHWAY: OVERLAND FLOW/FLOOD ENVIRONMENTAL THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 3 BURN SITE

Source Hazardous Waste Quantity Value: 0.43

Hazardous Substance	Eco-toxicity Value	Persistence Value	Bio-accum. Value	Ecotoxicity/ Persistence/ Bioaccum. Value
Cadmium	1000	1.00E+00	5.00E+03	5.00E+06
Chromium	10	1.00E+00	5.00E+02	5.00E+03
Lead	1000	1.00E+00	5.00E+03	5.00E+06
Mercury	10000	1.00E+00	5.00E+04	5.00E+08
Naphthalene	1000	4.00E-01	5.00E+03	2.00E+06
PCBs	10000	1.00E+00	5.00E+04	5.00E+08
Trichlorobenzene, 1,2,4-	100	4.00E-01	5.00E+02	2.00E+04

SW PATHWAY: OVERLAND FLOW/FLOOD ENVIRONMENTAL THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 4 STRESSED VEGETATION

Source Hazardous Waste Quantity Value: 1.10

Hazardous Substance	Eco-toxicity Value	Persistence Value	Bio-accum. Value	Ecotoxicity/ Persistence/ Bioaccum. Value
Chromium	10	1.00E+00	5.00E+02	5.00E+03
Lead	1000	1.00E+00	5.00E+03	5.00E+06

SW PATHWAY: OVERLAND FLOW/FLOOD ENVIRONMENTAL THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Hazardous Substances Found in an Observed Release

Sample No.	Observed Release Hazardous Substance	Eco-toxicity Value	Persistence Value	Bio-accum. Value	Ecotoxicity/ Persistence/ Bioaccum. Value

- N/A and/or data not specified

SW PATHWAY: OVERLAND FLOW/FLOOD ENVIRONMENTAL THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Ecotoxicity/Persistence/Bioaccummulation Value from Source Hazardous Substances:	5.00E+08
Ecotoxicity/Persistence/Bioaccummulation Value from Observed Release Hazardous Substances:	5.00E+08
Ecotoxicity/Persistence/Bioaccummulation Factor:	5.00E+08
Sum of Source Hazardous Waste Quantity Values:	7.47E+03
Hazardous Waste Quantity Factor:	100
Waste Characteristics Factor Category:	320

Level I Concentrations

- N/A and/or data not specified

Level II Concentrations

- N/A and/or data not specified

Most Distant Level I Sample

- N/A and/or data not specified

Most Distant Level II Sample

- N/A and/or data not specified

SW PATHWAY: OVERLAND FLOW/FLOOD COMPONENT ENVIRONMENTAL THREAT TARGETS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Level I Concentrations

Sensitive Environment	Distance from Probable Point of Entry to Sensitive Env. (miles)	Sensitive Environment Value
- N/A and/or data not specified		

Sum of Sensitive Environments Values: 0

Wetlands

Wetland	Distance from Probable Point of Entry to Wetland (miles)	Wetlands Frontage (miles)
- N/A and/or data not specified		

Total Wetlands Frontage: 0.00 Miles Total Wetlands Value: 0

Sum of Sensitive Environments Value + Wetlands Value: 0.00E+00

Level I Concentrations Factor: 0.00E+00

SW PATHWAY: OVERLAND FLOW/FLOOD COMPONENT ENVIRONMENTAL THREAT TARGETS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Level II Concentrations

Sensitive Environment	Distance from Probable Point of Entry to Sensitive Env. (miles)	Sensitive Environment Value
- N/A and/or data not specified		

Sum of Sensitive Environments Values: 0

Wetlands

Wetland	Distance from Probable Point of Entry to Wetland (miles)	Wetlands Frontage (miles)
- N/A and/or data not specified		

Total Wetlands Frontage: 0.00 Miles   Total Wetlands Value: 0

Sum of Sensitive Environments Value + Wetlands Value: 0.00E+00

Level II Concentrations Factor: 0.00E+00

Potential Contamination

Sensitive Environments

Type of Surface Water Body	Sensitive Environment	Sensitive Environment Value

Wetlands

Type of Surface Water Body	Sensitive Environment	Wetlands Frontage	Wetlands Value
Coastal Tidal Area	1 CAMPELL CREEK	1.50	50
Coastal Tidal Area	2 WHALE BRANCH	8.00	150
Coastal Tidal Area	3 COOSAW RIVER	11.00	250

Documentation for Sensitive Environment CAMPELL CREEK:

Documentation of the measurement for wetlands was done using the USGS topo maps in 7.5 minute scale. wetlands were measured along both sides of the waterway and totaled 1.5 miles.

Reference: 2

Documentation for Sensitive Environment WHALE BRANCH:

Wetlands measurements were made on both sides of the waterway and totaled 8 miles in length

Reference: 2

Documentation for Sensitive Environment COOSAW RIVER:

Wetlands measurements were made on both sides of the waterway and totaled 11 miles in length.

Reference: 2

SW PATHWAY: OVERLAND FLOW/FLOOD COMPONENT ENVIRONMENTAL THREAT TARGETS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Type of Surface Water Body	Sum of Sens. Environment Values(Sj)	Sum of Wetland Frontage Values(Wj)	Dilution Weight (Dj)	Dj(Wj+Sj)
Coastal Tidal Waters	0	500	1.00E-04	5.00E-02

Sum of Dj(Wj+Sj): 5.00E-02
Sum of Dj(Wj+Sj)/10: 5.00E-03

Potential Contamination Sensitive Environment Factor: 5.75E-03

SOIL EXPOSURE PATHWAY RESIDENT POPULATION THREAT LIKELIHOOD OF EXPOSURE
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Likelihood of Exposure

No.	Source ID	Level of Contamination
1	ABANDONED LAGOON	Level I
3	BURN SITE	Level I
4	STRESSED VEGETATION	Level II

Likelihood of Exposure Factor: 550

Documentation for Area of Contamination, Source ABANDONED LAGOON:

The volume of the lagoon was estimated at 18,667 cubic yards, based on dimensions of 200 feet long, 180 feet wide, and contamination found at a depth of 14 feet. These figures were drawn from the site sketch (Figure 4) of the source area in the NUS Screening Site Inspection, Phase II.

Reference: 3

Documentation for Area of Contamination, Source DRUM STORAGE AREA:

The area of the drum storage source was calculated at 7475 square feet, based on a length of 115 feet by 65 feet. These dimensionswere arrived at by using the Sample location map in the NUS Screening Site Inspection Phase II; figure 6, precisely.

Reference: 3

Documentation for Area of Contamination, Source BURN SITE:

Area for the Burn site was based on a length of 225 feet by 65 feet, using the sample location map (figure 7) for this source in the NUS Screening Site Inspection Phase II. Total area is 14,625 square feet.

Reference: 3

SOIL EXPOSURE PATHWAY RESIDENT POPULATION THREAT LIKELIHOOD OF EXPOSURE
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Documentation for Area of Contamination, Source STRESSED VEGETATION:

The stressed vegetation area covers approximately 37,500 square feet (250 feet by 150 feet), based on the sample location map generated for the Screening Site Inspection Phase II.

Reference: 3

Source No.	Hazardous Substance	Depth (ft.)	Concent.	Cancer	RFD	Units
1	Cadmium	> 2	2.0E-02	0.0E+00	0.0E+00	ppm
1	Chromium	> 2	4.6E+01	0.0E+00	0.0E+00	ppm
1	Lead	< 2	7.0E+02	0.0E+00	0.0E+00	ppm
1	Mercury	< 2	1.9E+01	0.0E+00	1.7E+02	ppm
1	Naphthalene	> 2	1.2E+02	0.0E+00	0.0E+00	ppm
1	PCBs	< 2	1.1E+02	7.6E-02	0.0E+00	ppm
1	Trichlorobenzene, 1,2,4-	> 2	2.4E+02	0.0E+00	0.0E+00	ppm
3	Cadmium	< 2	1.0E-01	0.0E+00	2.9E+02	ppm
3	Chromium	< 2	5.6E+02	0.0E+00	2.9E+03	ppm
3	Lead	< 2	5.3E+01	0.0E+00	0.0E+00	ppm
3	Mercury	< 2	1.8E-01	0.0E+00	1.7E+02	ppm
3	Naphthalene	< 2	7.5E-01	0.0E+00	2.3E+03	ppm
3	PCBs	< 2	1.6E+02	7.6E-02	0.0E+00	ppm
3	Trichlorobenzene, 1,2,4-	< 2	6.1E-01	0.0E+00	7.6E+02	ppm
4	Chromium	< 2	3.3E+00	0.0E+00	2.9E+03	ppm
4	Lead	< 2	3.8E+00	0.0E+00	0.0E+00	ppm

Documentation for Source ABANDONED LAGOON, Contaminants:

All samples collected by G&E Engineering in March 1986. Background values were all non-detects. Soil samples L-1, and G&E-3 were used to determine observed releases. See attachment A for backgroun d concentrations.

Reference: 3, 17

Documentation for Source DRUM STORAGE AREA, Contaminants:

No surface or subsurface soils were collected from this source, and groundwater samples cannot be used to characterize a source.

Reference: 3, 17

Documentation for Source BURN SITE, Contaminants:

All samples were collected by G&E Engineering in March 1986. Background water and soil samples W-1 were non-detects for the parameters listed for this source. Soil samples S-1 (unknown depth) and G&E-9 were used for all parameters. See attachment A for back ground and sample concentrations.

Reference: 3, 17

Documentation for Source STRESSED VEGETATION, Contaminants:

All samples were collected by G&E Engineering in March 1986. Background water and soil samples W-1 were both non-detects for the pertinant parameters. Soil sample D-1 contained 3.3 ppm and 3.8 ppm of chromium and lead respectively. The data is shown in attachment A.

Reference: 3, 17

SOIL EXPOSURE PATHWAY RESIDENT POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 1 ABANDONED LAGOON

Source Hazardous Waste Quantity Value: 0.00

Hazardous Substance	Toxicity Value
Lead	10000
Mercury	10000
PCBs	10000

SOIL EXPOSURE PATHWAY RESIDENT POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 3 BURN SITE

Source Hazardous Waste Quantity Value: 0.43

Hazardous Substance	Toxicity Value
Cadmium	10000
Chromium	10000
Lead	10000
Mercury	10000
Naphthalene	1000
PCBs	10000
Trichlorobenzene, 1,2,4-	1000

SOIL EXPOSURE PATHWAY RESIDENT POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 4 STRESSED VEGETATION

Source Hazardous Waste Quantity Value: 1.10

Hazardous Substance	Toxicity Value
Chromium	10000
Lead	10000

SOIL EXPOSURE PATHWAY RESIDENT POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Toxicity Factor:	1.00E+04
Sum of Source Hazardous Waste Quantity Values:	1.53E+00
Hazardous Waste Quantity Factor:	10
Waste Characteristics Factor Category:	18

Targets

Level I Population: 0.0 Value: 0.00

Documentation for Level I Population:

There is no resident population associated with this site.

Reference: 2, 3

Level II Population: 0.0 Value: 0.00

Documentation for Level II Population:

There is no resident population associated with this site.

Reference: 2, 3

Workers: 75.0 Value: 5.00

Documentation for Workers:

The Lobeco Products Inc., facility currently employs 75 full time staff members.

Reference: 3

Resident Individual: Potentia Value: 0.00

Resources: NO Value: 0.00

Documentation for Resources:

No resources identified.

Reference:

Terrestial Sensitive Environment	Value
RANGES OF FED. E	75

Terrestrial Sensitive Environments Factor: 75.00

Documentation for Terrestrial Environment RANGES OF FED. E:

The ranges of several federally endangered species extends through the study area. These animals are: the Bald Eagle, Red cockaded woodpecker, Shortnosed sturgeon and the West indian manatee.

Reference: 21, 26

SOIL EXPOSURE PATHWAY NEARBY POPULATION THREAT LIKELIHOOD OF EXPOSURE
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Likelihood of Exposure

No.	Source ID	Level of Contamination	Attractiveness/ Accessibility	Area of Contam. (sq. feet)
1	ABANDONED LAGOON	Level I	5	36000
3	BURN SITE	Level I	5	14625
4	STRESSED VEGETATION	Level II	10	37500

Highest Attractiveness/Accessibility Value: 10
Sum of Eligible Areas Of Contamination (sq. feet): 88125
Area of Contamination Value: 20

Likelihood of Exposure Factor Category: 5

Documentation for Attractiveness/Accessibility, Source ABANDONED LAGOON:

The abandoned lagoon is located within the AC&C facility's fenced area and has no recreational usage.

Reference: 3

Documentation for Attractiveness/Accessibility, Source DRUM STORAGE AREA:

The drum area is given a value of 5 because the source area is entirely enclosed by the facility's fence. Further, the facility is located in a very rural area.

Reference: 3

Documentation for Attractiveness/Accessibility, Source BURN SITE:

The burn site is entirely within the fenced boundary of the AC&C fac ility.

Reference: 3

Documentation for Attractiveness/Accessibility, Source STRESSED VEGETATION:

A value of 10 was assigned to the stressed vegetation source area because it is easily accessable to the public, but has no recreational usage.

Reference: 3

Source No.	Hazardous Substance	Depth (ft.)	Concent.	Cancer	RFD	Units
1	Cadmium	> 2	2.0E-02	0.0E+00	0.0E+00	ppm
1	Chromium	> 2	4.6E+01	0.0E+00	0.0E+00	ppm
1	Lead	< 2	7.0E+02	0.0E+00	0.0E+00	ppm
1	Mercury	< 2	1.9E+01	0.0E+00	1.7E+02	ppm
1	Naphthalene	> 2	1.2E+02	0.0E+00	0.0E+00	ppm
1	PCBs	< 2	1.1E+02	7.6E-02	0.0E+00	ppm
1	Trichlorobenzene, 1,2,4-	> 2	2.4E+02	0.0E+00	0.0E+00	ppm
3	Cadmium	< 2	1.0E-01	0.0E+00	2.9E+02	ppm
3	Chromium	< 2	5.6E+02	0.0E+00	2.9E+03	ppm
3	Lead	< 2	5.3E+01	0.0E+00	0.0E+00	ppm
3	Mercury	< 2	1.8E-01	0.0E+00	1.7E+02	ppm
3	Naphthalene	< 2	7.5E-01	0.0E+00	2.3E+03	ppm
3	PCBs	< 2	1.6E+02	7.6E-02	0.0E+00	ppm
3	Trichlorobenzene, 1,2,4-	< 2	6.1E-01	0.0E+00	7.6E+02	ppm
4	Chromium	< 2	3.3E+00	0.0E+00	2.9E+03	ppm
4	Lead	< 2	3.8E+00	0.0E+00	0.0E+00	ppm

Documentation for Source ABANDONED LAGOON, Contaminants:

All samples collected by G&E Engineering in March 1986. Background values were all non-detects. Soil samples L-1, and G&E-3 were used to determine observed releases. See attachment A for backgroun d concentrations.

Reference: 3, 17

Documentation for Source DRUM STORAGE AREA, Contaminants:

No surface or subsurface soils were collected from this source, and groundwater samples cannot be used to characterize a source.

Reference: 3, 17

Documentation for Source BURN SITE, Contaminants:

All samples were collected by G&E Engineering in March 1986. Background water and soil samples W-1 were non-detects for the parameters listed for this source. Soil samples S-1 (unknown depth) and G&E-9 were used for all parameters. See attachment A for back ground and sample concentrations.

Reference: 3, 17

Documentation for Source STRESSED VEGETATION, Contaminants:

All samples were collected by G&E Engineering in March 1986. Background water and soil samples W-1 were both non-detects for the pertinant parameters. Soil sample D-1 contained 3.3 ppm and 3.8 ppm of chromium and lead respectively. The data is shown in attachment A.

Reference: 3, 17

SOIL EXPOSURE PATHWAY NEARBY POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 1 ABANDONED LAGOON

Source Hazardous Waste Quantity Value: 0.00

Hazardous Substance	Toxicity Value
Lead	10000
Mercury	10000
PCBs	10000

SOIL EXPOSURE PATHWAY NEARBY POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 3 BURN SITE

Source Hazardous Waste Quantity Value: 0.43

Hazardous Substance	Toxicity Value
Cadmium	10000
Chromium	10000
Lead	10000
Mercury	10000
Naphthalene	1000
PCBs	10000
Trichlorobenzene, 1,2,4-	1000

SOIL EXPOSURE PATHWAY NEARBY POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 4 STRESSED VEGETATION

Source Hazardous Waste Quantity Value: 1.10

Hazardous Substance	Toxicity Value
Chromium	10000
Lead	10000

SOIL EXPOSURE PATHWAY NEARBY POPULATION THREAT WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Toxicity Factor:	1.00E+04
Sum of Source Hazardous Waste Quantity Values:	1.53E+00
Hazardous Waste Quantity Factor:	10
Waste Characteristics Factor Category:	18

Nearby Individual

Population within 1/4 mile: 13.0

Nearby Individual Value: 1.0

Population Within 1 Mile

Travel Distance Category	Number of People	Value
> 0 to 1/4 mile	13.0	0.0
> 1/4 to 1/2 mile	78.0	0.1
> 1/2 to 1 mile	153.0	0.1
	Population Within 1 Mile Factor:	0.2

Documentation for Population > 0 to 1/4 mile Distance Category:

Population within a 0.25 mile radius of the facility is based on a specific house count from the reconnaissance and US Dept. of Commerce Bureau of Census average household population for Beaufort County, South Carolina.
5 houses x 2.59 persons/house = 12.95 persons

Reference: 2, 21

Documentation for Population > 1/4 to 1/2 mile Distance Category:

There are 30 houses within the 1/4 to 1/2 mile radius ring for AC&C. Using 2.59 persons per household in Beaufort County, South Carolina, (Bureau of Census data), this equates to approximately 78 people.
30 houses x 2.59 persons/household = 77.7 persons

Reference: 2, 21

Documentation for Population > 1/2 to 1 mile Distance Category:

59 Houses were identified within the 1/2 to 1 mile radius at American Color & Chemical, this house count having been performed using U.S.G.S topographical maps, and multiplied by the Bureau of Census household average of 2.59 persons per household in Beaufort County, South Carolina. This roughly equates to 153 people.
59 houses x 2.59 persons/household = 152.81 people

Reference: 2, 21

AIR PATHWAY LIKELIHOOD OF RELEASE

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

OBSERVED RELEASE

No.	Sample ID	Distance (miles)	Level of Contamination
-	N/A and/or data not specified		

Observed Release Factor: 0

AIR PATHWAY LIKELIHOOD OF RELEASE
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Gas Migration Potential

GAS POTENTIAL TO RELEASE

Source ID	Source Type	Gas Contain. Value (A)	Gas Source Type Value (B)	Gas Migrtn. Potent. Value (C)	Sum (B+C)	Gas Potential to Rel. Value A(B+C)
ABANDONED LAGOON	Surface Impoundment	10	19	11	30	300
BURN SITE	Contaminated Soil	10	0	11	11	110

Gas Potential to Release Factor: 300

Documentation for Gas Containment, Source ABANDONED LAGOON:

According to the federal Register, Volume 55, No. 241, page 51652 table 6-3, the score for all situations not specifically listed in the table is 10.

Reference:

Documentation for Source Type, Source ABANDONED LAGOON:

Surface impoundment was selected because this source was formerly a lagoon.

Reference: 3

Documentation for Gas Containment, Source DRUM STORAGE AREA:

HRS table 6-3 states that any circumstance not covered in the table is to be assigned avalue of 10.

Reference:

Documentation for Source Type, Source DRUM STORAGE AREA:

Contaminated soil best suited the drum source area, as the other categories were were less accurate.

Reference: 3

Documentation for Gas Containment, Source BURN SITE:

HRS table 6-3 states that any condition not covered in the table is to receive a value 10.

Reference:

Documentation for Source Type, Source BURN SITE:

The contaminated soil source type was selected as the most accurate type because the other types were inaccurate.

Reference: 3

Documentation for Gas Containment, Source STRESSED VEGETATION:

HRS table 6-3 states that any situation not covered in the table is to receive a value of 10.

Reference:

Documentation for Source Type, Source STRESSED VEGETATION:

The stressed vegetation area was identified as a contaminated soil source type, because no other sort of controlled actions took place here.

Reference: 3

AIR PATHWAY LIKELIHOOD OF RELEASE

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: ABANDONED LAGOON

Gaseous Hazardous Substance	Hazardous Substance Gas Migration Potential Value
Mercury	11
Naphthalene	11
Trichlorobenzene, 1,2,4-	17

Average of Gas Migration Potential Value for 3 Hazardous Substances: 13.000

Gas Migration Potential Value From Table 6-7: 11

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201
44

September 1, 1989

Mr. Sonny Andrews
Lobeco Products, Incorporated
P. O. Box 1346
Beaufort, SC 29901

RE: Lobeco Products, Inc.
Beaufort County

Dear Mr. Andrews:

Enclosed is a revised draft copy of the Amendment to Consent Order 87-65-W. I have discussed these revisions with all parties and my impression is that the revisions should be acceptable. If you concur, it is requested that you sign the Amendment and forward it to Mr. Jim Fields who, in turn, will forward the document to Mr. Ralph Mellom. It's requested that the signed Amendment be returned to us by September 13, 1989. A copy of the fully executed Agreement will be provided to all parties.

If you or others have any questions, please let me know (734-5296).

Sincerely yours,

Russell W. Sherer

Russell W. Sherer, Director
Division of Water Quality
Assessment and Enforcement
Environmental Quality Control

RWS/al

cc: Jim Fields, McNair Law Firm
Ralph Mellom, Olgletree, Deakins, Nash, Smoak and Stewart
Sandra Hursey
George Nelson
Andy Yasinsac

AIR PATHWAY LIKELIHOOD OF RELEASE

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: DRUM STORAGE AREA

Gaseous Hazardous Substance	Hazardous Substance Gas Migration Potential Value

Average of Gas Migration Potential Value for 3 Hazardous Substances: 0.000

Gas Migration Potential Value From Table 6-7: 0

STATE OF SOUTH CAROLINA

BEFORE THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

IN RE: Tenneco Resins, Inc.
American Color & Chemical Corporation
Lobeco Products, Inc.
Beaufort County

AMENDMENT TO CONSENT ORDER 87-65-W

WHEREAS, the South Carolina Department of Health and Environmental Control (Department) issued Consent Order 87-65-W to Tenneco Resins, Inc., American Color and Chemical Corporation, and Lobeco Products, Inc. (referred to collectively as the Respondents) on July 25, 1987; and,

WHEREAS, On October 19, 1988, the Respondents submitted to the Department a Remedial Action Plan (Plan) including an implementation schedule, in accordance with Order requirements; and,

WHEREAS, by letter of February 27, 1989, the Department approved the Plan, including the implementation schedule, for the removal of high level contamination at the abandoned lagoon and the abandoned burn site; and,

WHEREAS, due to discussions at a meeting on April 13, 1989, the parties have decided to amend the Consent Order to govern the remediation of the abandoned lagoon and abandoned burn site and the discharge of groundwater recovered during this remediation; and,

WHEREAS, the Department and the Respondents understand there remains a need to define the horizontal and vertical extent of ground-water contamination at certain areas at the Lobeco Products, Inc. facility; and,

WHEREAS, it is in the best interest of the Department, the Public and the Respondents to implement the Plan as expeditiously as possible and that such implementation not be delayed by protracted discussions among the Respondents as to their individual responsibility for further defining the extent of contamination.

AIR PATHWAY LIKELIHOOD OF RELEASE

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: BURN SITE

Gaseous Hazardous Substance	Hazardous Substance Gas Migration Potential Value
Mercury	11
Naphthalene	11
Trichlorobenzene, 1,2,4-	17

Average of Gas Migration Potential Value for 3 Hazardous Substances: 13.000

Gas Migration Potential Value From Table 6-7: 11

NOW, THEREFORE, IT IS ORDERED, CONSENTED TO AND AGREED that the Respondent shall:

1. Implement the Plan in accordance with the approved schedule. The final remediation design/work plan shall be submitted to the Department no later than thirty (30) days after the execution of this Amendment or October 15, 1989, whichever is sooner. The Safety plan, to be completed by the Respondent's contractor, shall be completed in accordance with OSHA standards and approved by the Department before work at the site(s) begins.

2. Perform analysis of oysters for organics (volatiles and acid and base/neutral extractables) and metals (arsenic, cadmium, chromium, copper, lead and nickel) and report the results to the Department within forty-five (45) days after sampling. The analysis shall be performed before the pretreatment system for the ground-water dewatering process is placed into service and, within sixty (60) days after the pretreatment system is no longer in use. Samples shall be taken from the mouth of Campbell Creek, near the confluence of Huspah Creek and Whale Branch, and from the mouth of Haulover Creek. If either of the required sampling dates falls between the period July - November, it may be substituted for the NPDES permit requirement.

3. While the pretreatment system for the contaminated ground-water is in use:

   (a) The flow limit of the NPDES permit (average) shall be increased to .45 MGD. All other NPDES permit effluent parameters shall remain unchanged.

   (b) The PCB level in the discharge from the pretreatment system shall not exceed 0.5 ug/l. The discharge shall be monitored for PCBs twice per week and the results submitted to the Department as an attachment to the monthly discharge monitoring report.

IT IS FURTHER ORDERED AND AGREED that the Respondent shall be responsible for obtaining all Department permits to construct and [illegible]. This shall include, but not be limited to, permits for ground-water monitoring wells and the pretreatment system.

IT IS FURTHER ORDERED AND AGREED that this Amendment shall be incorporated into Consent Order 87-65-W.

IT IS FURTHER ORDERED AND AGREED that failure to comply with any provision of this Order shall be grounds for appropriate sanctions and further enforcement action.

THE SOUTH CAROLINA DEPARTMENT OF
HEALTH AND ENVIRONMENTAL CONTROL

BY: ______________________________
Michael D. Jarrett
Commissioner

BY: ______________________________
James A. Joy, III, P.E., Chief
Bureau of Water Pollution Control

Date: ________________, 1989
Columbia, South Carolina

WE CONSENT:

______________________________ Date: ______________________________
Tenneco Resins, Inc.

______________________________ Date: ______________________________
American Color and Chemical
Corporation

[illegible] Date: September 5, 1989
Lobeco Products, Inc.

______________________________ Date: ______________________________
Water Quality Assessment and
Enforcement Division

______________________________ Date: ______________________________
Attorney for the Department

AIR PATHWAY LIKELIHOOD OF RELEASE
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: STRESSED VEGETATION

Gaseous Hazardous Substance	Hazardous Substance Gas Migration Potential Value

Average of Gas Migration Potential Value for 3 Hazardous Substances: 0.000

Gas Migration Potential Value From Table 6-7: 0

Particulate Migration Potential

PARTICULATE POTENTIAL TO RELEASE

Source ID	Source Type	Partic. Contain. Value (A)	Partic. Source Type Value (B)	Partic. Migrtn. Potent. Value (C)	Sum (B+C)	Partic. Potential to Rel. Value A(B+C)
ABANDONED LAGOON	Surface Impoundment	10	22	6	28	280
BURN SITE	Contaminated Soil	10	0	6	6	60
STRESSED VEGETATION	Contaminated Soil	10	22	6	28	280

Particulate Potential to Release Factor: 280

Documentation for Particulate Containment, Source ABANDONED LAGOON:

HRS table 6-9 states that any situation not exactly covered in the table is to be scored as a 10.

Reference:

Documentation for Source Type, Source ABANDONED LAGOON:

Surface impoundment was selected because this source was formerly a lagoon.

Reference: 3

RMT INC.

11 Regency Hills Drive
P.O. Box 16778
Greenville, SC 29606
Phone: 803-292-1921
FAX: 803-244-1554

August 18, 1989

Mr. Jim Miller
NUS Corporation
1927 Lakeside Parkway, Suite 614
Tucker, Georgia 30084

Subject: Transmittal of Requested Reports on the Lobeco Site

Dear Jim:

Here are copies of the "Lobeco Site Environmental Assessment - Results and Proposed Remedial Action Plans" for American Color and Chemical Corporation and Tenneco Resins, Inc. and the Appendices for that report. I hope that these documents will be of value during the preparation of your report.

I have also enclosed for your use a copy of a Private Well Water Quality Reconnaissance Study in the vicinity of the Lobeco Site prepared by SCDHEC during May, 1989. After our conversation today, I remembered that I had recently received a copy of this study and thought it might be useful to you.

If I can be of further assistance, please call me at (803) 281-0030.

Sincerely,

RMT, Inc.

Chuck Sherron

Chuck Sherron
Project Manager

Enclosures
cc: Mr. Sam Lane (letter only)
Mr. George Fletcher (letter only)
File 643.20 (T) (letter only)

Documentation for Particulate Containment, Source DRUM STORAGE AREA:

HRStable 6-9 states that any situation not covered specifically in the table is to be valued at 10.

Reference:

Documentation for Source Type, Source DRUM STORAGE AREA:

Contaminated soil best suited the drum source area, as the other categories were were less accurate.

Reference: 3

Documentation for Particulate Containment, Source BURN SITE:

HRS table 6-9 says that any situation not covered in the table is to be valued at 10.

Reference:

Documentation for Source Type, Source BURN SITE:

The contaminated soil source type was selected as the most accurate type because the other types were inaccurate.

Reference: 3

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

August 3, 1989

MEMORANDUM

TO: File
Lobeco Products
Charleston County

FROM: Sandra L. Hursey, EQM SLH
Enforcement Section

SUBJECT: Telephone Conversations
August 3, 1989

John Meeks telephoned this morning and wanted to know the status of the Amendment. I told him that it was my understanding the ball was in their court; the other parties had sent a proposed amendment to Brantley Harvey. I suggested he talk with him.

A few minutes later Brantley Harvey called to tell me he hadn't gotten the proposed amendment from Ralph Mellom until July 25th and hadn't had time to finish his review. He promised a response by mid-week next week.

SLH/sh
cc: George Nelson
Steve Thomas
Andy Yasinsac

Documentation for Particulate Containment, Source STRESSED VEGETATION:

HRS table 6-9 states that any situation not covered in the table is to be valued at 10.

Reference:

Documentation for Source Type, Source STRESSED VEGETATION:

The stressed vegetation area was identified as a contaminated soil source type, because no other sort of controlled actions took place here.

Reference: 3

Documentation for Particulate Migration Potential:

The particulate migration factor value was derived using HRS Figure 6-2.

Reference:

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

MEMORANDUM

TO: George Nelson, P.E., Director
Low Country District

Clyde M. Livingston

FROM: Clyde M. Livingston, P.G., Manager
Geohydrologic Section
Water Pollution Control Bureau

RE: Lobeco Products, Inc.
Vicinity Private Well Water Quality Reconnaissance
Beaufort County

DATE: July 25, 1989

SCDHEC laboratory analyses of samples taken from six (6) private water supply wells near Lobeco Products, Inc. on 5/25/89 by staff hydrologists have been received and reviewed. Analysis for organics and inorganics indicates both the sampled wells and adjacent water supplies to be of satisfactory ground-water quality respective of the parameters evaluated and normal to the hydrogeologic conditions of the Low Country area.

The attached location map provides sample locations, resident names and sampling conditions. Copies of the individual laboratory reports are included both for the District file and for distribution to the individual well owners.

Please advise if you have any questions or anticipate difficulty in distribution of the data to the corresponding well owners.

CL/sr

Enclosures:
1. Location map of sampled wells.
2. List of well owner names and well conditions at time of sampling.
3. Laboratory analyses from 5/25/89 sampling.

cc: Lobeco Products, Inc.
P.O. Box 815, SC Highway 38
Lobeco, SC 29931 w/enc.

RMT
100 Verdae Blvd.
P.O. Box 16778
Greenville, SC 29606 w/enc.

Sandra Hursey, EQM, Enforcement Section wo/enc.
Bart Ruiter, Director, Industrial and Agricultural Wastewater Div. wo/enc.

Source: ABANDONED LAGOON

Particulate Hazardous Substance
Cadmium
Chromium
Lead
Mercury
Naphthalene
PCBs

nearby

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

MEMORANDUM

TO: Sandra Hursey, EQM
Division of Water Quality Assessment and Enforcement

FROM: B. Thomas Knight, Hydrogeologist
Geohydrologic Section
Division of Water Quality Assessment and Enforcement

Tom Knight

RE: Lobeco
May 24 and 25, 1989 Private Water Supply Well Survey and Sampling
Beaufort County

Date: May 26, 1989

On May 24, 1989, Christine Sanford, Clyde Livingston and the writer located private water supply wells within approximately one-quarter mile radius around the old burn site and the old lagoon at the Lobeco Plant. Information from the survey was used to determine which wells downgradient from the Lobeco sites were to be sampled on May 25, 1989. The following information was gathered during the well survey:

1) Gilbert Well. According to Mr. Roy Gilbert, Mr. Pulaski from Beaufort (out of business) drilled the 60 foot deep well. The well serves three people in the Gilbert house and two mobile homes also located on the property. The well is constructed of 1.5 inch diameter galvanized steel with a suction type pump.

2) Lane Well. According to Ms. Dianne Lane (Post Office Box 790, Lobeco, S. C. 29931), the well water has a bad taste and is used mostly for watering, cooking, cleaning and bathing. The well serves three people and no information is known about the well. The well is constructed of a 2 inch diameter galvanized steel with a suction type pump.

3) Unknown Home #1. No one could be located at this residence. A swimming pool is located behind the house and the well is constructed of a 2 inch galvanized steel pipe with a suction type pump.

4) Brantley Well. According to Ms. Judy Brantley (P.O. Box 681, Lobeco, S. C. 29931), a man from Walterboro installed the deep well about 10 years ago. The well serves four people and is constructed of 4 inch diameter PVC pipe with a suction type pump.

5) Powell Well. According to Mr. Evan Powell, who lives on the east side of the road and whose son lives on the west side of the road, the water supply well in the horse pasture is 160 feet deep, is 10 years old and was drilled by Mr. Pulaski. The well at Mr. Evan Powell's residence (house well) is 160 feet deep and was installed by Mr. Peterson out of Estill. According to Mr. Powell, the wells across the street (Lane, Brantley, Gilbert, etc.) are 160 feet to 180 feet deep. The only well driller out of Beaufort (Bellam?) has installed some of the wells in the area.

6) Rei Well. According to Ms. Annie May Rei (Route 1, Box 224, Dale, S. C. 29914), the well is deep. The well serves at least five people and is constructed of a two inch steel pipe with a jet type pump. The well serves at least three people.

7) Graham Well. No information could be obtained on this well and the well could not be positively located. According to Ms. Rei, a Mr. Fred Graham and another person reside at the trailer. Mr. Graham is presently sick and is with his mother, Henrietta Graham in Beaufort.

8) Austin Well and Residence. According to Ms. Ertha Austin, the Rei and Graham residences are located on Austin property. The home, not in use, belongs to her mother. This well is constructed of a 4 inch PVC pipe and has a submersible type pump. The well at the Austin residence is located behind the old house, is over 100 feet, is the deepest well in the area and was installed over thirty years ago by Mr. Pinkney in Beaufort. The well serves at least five people. A suction type pump is used on the well. The well could not be observed directly due to extensive covering.

9. Glenn Well. According to Ms. Ronald Glenn, the well is 125 feet deep. Five people are being served by the well. The Department sampled the well about one year before the plant explosion. PBC's were detected in the first analysis of the well, but were not detected in the confirmation analysis. A driller off of Rebock Road in Beaufort (Mr. Pulaski?) drilled the well.

10) Anderson Well. The depth of the well is unknown, but is thought to be shallow. The well serves four people, has a suction type pump, and is two inches in diameter. The day of the well survey, the well had quit working. That afternoon, a neighbor lowered the well piping about two to three feet and primed the well. Black silt was produced from the well for a short time after it started working.

Source: DRUM STORAGE AREA

Particulate Hazardous Substance

Source: BURN SITE

Particulate Hazardous Substance
Cadmium
Chromium
Lead
Mercury
Naphthalene
PCBs

11) Unknown Home #2. The well is two inches in diameter, has a suction type pump and serves seven people.

12) Williams Well. The well is constructed of two inch pipe and is fitted with a suction type pump. Water from the well tastes bad and the well serves two people.

13) Kenlaw Well. The well is constructed of two inch pipe with a suction type pump. The water has a bad taste and serves two people.

14) Lamb Well. The well is constructed of two inch pipe with a suction type pump. The well serves four people.

15) Burgess Well. (Route 1, Box 230, Seabrook, S. C. 29940). The well is constructed of two inch pipe with a jet type pump. The well serves two people.

16) Carroll Well. The well is 5 or 6 years old and serves three people. Dickenson Well Services (524-2274) drilled the well. Water from the well has a strong smell and is tinted yellow. The well is connected to a large holding tank.

On May 26, 1989, Ray Livingston and the writer sampled the Lane, Graham, Glenn, Anderson, Burgess and Carroll water supply wells for volatile organics, priority pollutant metals, selected secondary metals, acid base and neutral extractable components, PBC's, alkalinity and total dissolved solids. Metal samples were acidified in the field. Samples were placed in a cooler with ice after collection and transported to the DHEC lab. The Ph was not measured due to faulty equipment. See Table One (attached) for additional information on individual samples.

If you have any questions, please feel free to contact me at 734-5243.

Enclosure: Location map of wells
Table One, Sampling Notes

cc: George Nelson, Director
Low Country District EQC

Christine Sanford, Hydrogeologist
Trident District EQC

Andy Yasinsac, Manager
Division of Industrial and Agricultural Wastewater

Tom Kurimcak, Director
Analytical Services Division

Ground Water Protection Division Files

TABLE ONE

Sample Identification	LAME 1	GRAHAM 2	GLENN 3	ANDERSON 4	BUGRESS 5	CARROLL 6
Time Collected	10:25 & 13:00*	11:00 &12:50*	11:25	11:45	12:10	12:35
Temperature	22°C	21°C	21.5°C	24°C	21°C	23°C
Specific Conductance T°=25°C	301 umhos/cm	298 umhos/cm	338 umhos/cm	362 umhos/cm	314 umhos/cm	395 umhos/cm
Length of time well purged	10 minutes	10 minutes	10 minutes	1 minute	15 minutes	15 minutes
Sample Collection Point	Copper/bronze Spigot in front of home	Copper/bronze Spigot behind trailer	Copper/bronze Spigot at well	Brass? Spigot on side of western most trailer	Copper/bronze Spigot behind trailer	Copper/bronze Spigot in front of trailer
COMMENTS:	Sample was clear with a slight H_2S odor. Dark spongy precipitate noticed in PCB sample upon delivery to lab. *The well was sampled for PBC's after purging well for 5 minutes.	Sample was clear with a moderate H_2S odor. Thermoplastic water line. *The well was sampled for PCB's after purging for 3 minutes.	Sample was clear with a moderate H_2S odor.	Sample was clear with a very slight pesticide like odor. Due to well going dry, well was purged only long enought to clear the line. Family recently used well.	Sample was clear with a slight H_2S odor and sweet odor. Well was purged longer due to large holding tank. Thermoplastic water line.	Sample was clear with a slight H_2S odor. Well was purged longer due to large holding tank. The well is also located a long distance from the sampling point. Thermoplastic water line.

Source: STRESSED VEGETATION

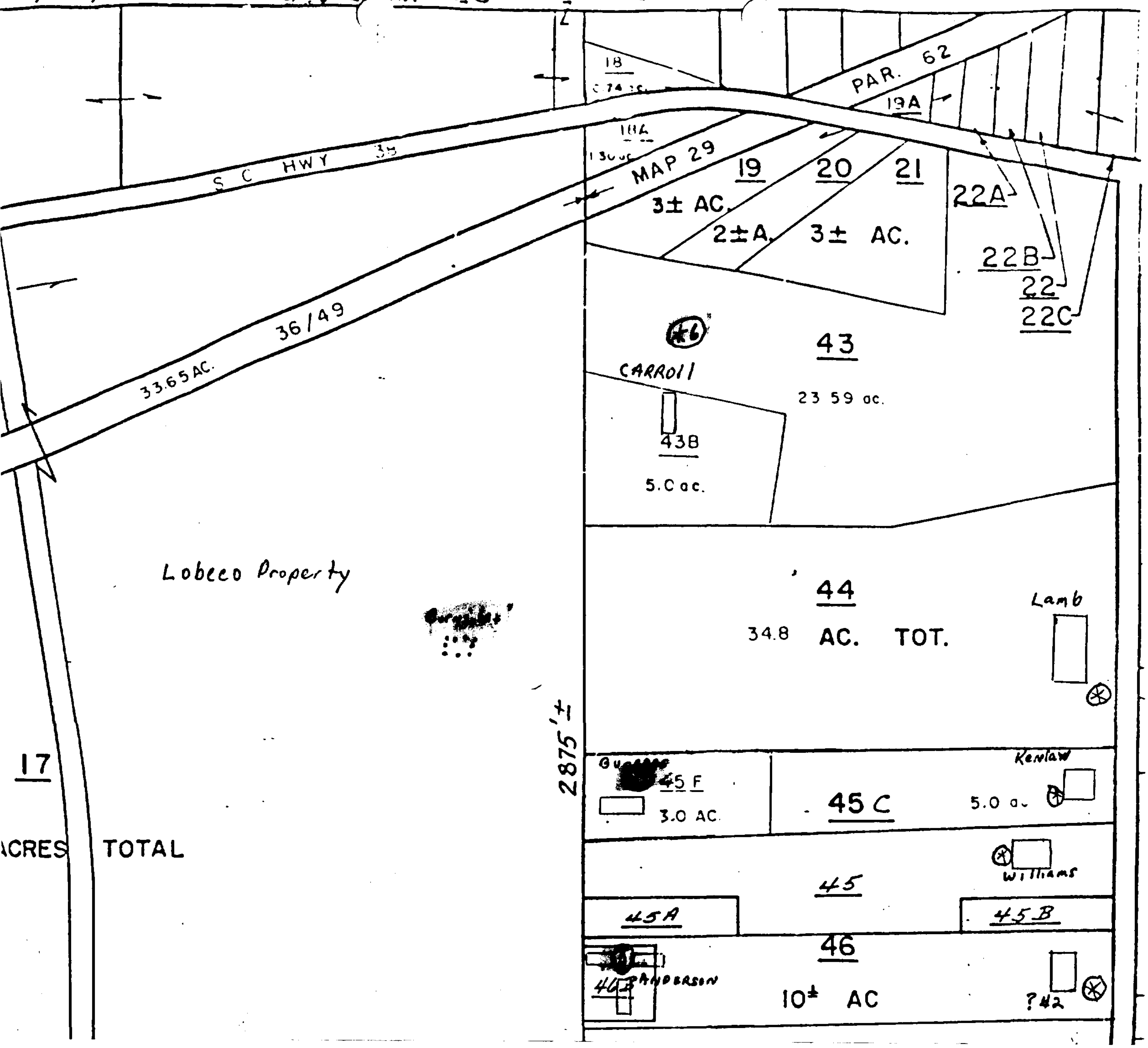
Particulate Hazardous Substance
Chromium
Lead

AIR PATHWAY WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 1 ABANDONED LAGOON

Source Hazardous Waste Quantity Value: 7466.80

Hazardous Substance	Toxicity Value	Gas Mobility Value	Particulate Mobility Value	Toxicity/ Mobility Value
Cadmium	10000	NA	8.00E-05	8.00E-01
Chromium	10000	NA	8.00E-05	8.00E-01
Lead	10000	NA	8.00E-05	8.00E-01
Mercury	10000	2.00E-01	8.00E-05	2.00E+03
Naphthalene	1000	2.00E-01	8.00E-05	2.00E+02
PCBs	10000	NA	8.00E-05	8.00E-01
Trichlorobenzene, 1,2,4-	1000	1.00E+00	NA	1.00E+03


See Sheet 28
PAR. 62
19A
18
18A
S C HWY 35
MAP 29
19
20
21
3± AC.
2± A.
3± AC.
22A
22B
22
22C
43
23 59 ac.
CARROll
43B
5.C ac.
36/49
33.65 AC.
Lobeco Property
44
34.8 AC. TOT.
Lamb
2875'±
17
ACRES TOTAL
45 F
3.0 AC.
45 C
5.0 ac
Kenlaw
45
Williams
45A
45B
46
10± AC
46B
ANDERSON
?#2

AIR PATHWAY WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 2 DRUM STORAGE AREA

Source Hazardous Waste Quantity Value: 0.22

Hazardous Substance	Toxicity Value	Gas Mobility Value	Particulate Mobility Value	Toxicity/ Mobility Value

WPC

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Solid Waste and Hydrology

Sample Location NEAR LOBECO CHEM. County BEAUFORT

Sample Type GROUND-WATER Comments PRIVATE WELL SAMPLES (DOWN GRADIENT)

Date 5/25/89 Collected by LIVINGSTON ~~KNIGHT~~ An "X" in the small column indicates test requested

	#1	#2	#3		#1	#2	#3
Time Collected (Milit.)	1025	1100	1125		1025	1100	1125
Sample Point	LANE	GRAHM	GLENN		LANE	GRAHM	GLENN
Lab No. 052689	0151	0152	0153		0151	0152	0153
NH_3-N, mg/l				Calcium			
NO_3/NO_2-N, mg/l				Magnesium			
TKN				Sodium			
Nitrite, N, mg/l				Potassium			
T-P,				Arsenic	X	X	X
Hardness, mg/l				Barium	X	X	X
Cl, mg/l				Cadmium	X	X	X
SO_4 mg/l				Chromium	X	X	X
Flashpoint, °F				Copper	X	X	X
Solids, Total, mg/l				Iron	X	X	X
Solids, Tot. Diss, mg/l	X	X	X	Lead	X	X	X
Solids, %				Manganese			
pH				Mercury	X	X	X
Alkalinity mg/l	X	X	X	Nickel	X	X	X
Fluoride, mg/l				Selenium	X	X	X
TOC				Silver	X	X	X
Phenols, µg/l				Zinc	X	X	X
COD							
Cyanide, mg/l							
MBAS, mg/l							

Remarks:
ACIDIFIED IN FIELD
SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWAC
Phone (734-5309/5243)

Date Received in Regional Laboratory ______ by ______

Date Released from Regional Laboratory ______ by ______

Date Received in Central Laboratory 5-26-89 by E Cox

Date Released from Spec & A. A. Section 7-10-89 by [illegible]

Date Released from Metals Section 7-10-89 by [illegible]

DHEC 40-89 (01/81) White - Program; Yellow - Program; Pink - Program; Gold - Lab

EJS

AIR PATHWAY WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 3 BURN SITE

Source Hazardous Waste Quantity Value: 0.43

Hazardous Substance	Toxicity Value	Gas Mobility Value	Particulate Mobility Value	Toxicity/ Mobility Value
Cadmium	10000	NA	8.00E-05	8.00E-01
Chromium	10000	NA	8.00E-05	8.00E-01
Lead	10000	NA	8.00E-05	8.00E-01
Mercury	10000	2.00E-01	8.00E-05	2.00E+03
Naphthalene	1000	2.00E-01	8.00E-05	2.00E+02
PCBs	10000	NA	8.00E-05	8.00E-01
Trichlorobenzene, 1,2,4-	1000	1.00E+00	NA	1.00E+03

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Organic Compounds in Solid Waste and Hydrology Samples

WPC

Sample Location NEAR LOBECO CHEM. County BEAUFORT

Comments RESIDENTIAL WELLS (PRIVATE) DOWN GRADIENT

Date 5/25/89 Collected By LIVINGSTON / KNIGHT

An "X" in the small column indicates test requested.

Sample Type: 1. Water 2. Soil/Sediment 3. Hazardous Waste 4. Other

Time Collected (Milit.)		#1 LANE Res.		#2 GRAHM Res.		#3 GLENN Res.
Station No.	X	1300/1025	X	1250/1100	X	1125 (time)
Lab. No. 052689		0151		0152		0153
Chlorinated hydrocarbon - Pesticides						
Endrin (µg/L or µg/Kg)						
Lindane (µg/L or µg/Kg)						
Methoxychlor (µg/L or µg/Kg)						
Toxaphene (µg/L or µg/Kg)						
Organophosphate - Pesticides (µg/L or µg/Kg)						
PCBs (µg/L or µg/Kg)						
	X		X		X	
Base Neutral/Acid Extractables	X		X		X	
Volatile Organics	X		X		X	
Petroleum Hydrocarbons						

Comments SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC phone (734-5309/5243)

Date Received in Regional Laboratory ______ By ______

Date Released from Regional Laboratroy ______ By ______

Date Received in Central Laboratory 05-26-89 By E Cox

Date Released from Organic Section 7-10-89 By TCK

DHEC 40-90 (7/87)

AIR PATHWAY WASTE CHARACTERISTICS

AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Source: 4 STRESSED VEGETATION

Source Hazardous Waste Quantity Value: 1.10

Hazardous Substance	Toxicity Value	Gas Mobility Value	Particulate Mobility Value	Toxicity/ Mobility Value
Chromium	10000	NA	8.00E-05	8.00E-01
Lead	10000	NA	8.00E-05	8.00E-01

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Solid Waste and Hydrology

WPC

Sample Location: NEAR LOBECO CHEM. County: BEAUFORT
Sample Type: GROUND WATER Comments: PRIVATE WELLS (DOWN GRADIENT)
Date: 5/25/89 Collected by: LIVINGSTON KNIGHT
An "X" in the small column indicates test requested

		#4		#5		#6
Time Collected (Milit.)		1145		1210		1235
Sample Point		ANDERSON		BARGESS		CARROL
Lab No. 052689	✓	0154	✓	0155	✓	0156
NH_3-N, mg/l						
NO_3/NO_2-N, mg/l						
TKN						
Nitrite, N, mg/l						
T-P,						
Hardness, mg/l						
Cl, mg/l						
SO_4 mg/l						
Flashpoint, °F						
Solids, Total, mg/l						
Solids, Tot. Diss, mg/l	X		X		X	
Solids, %						
pH						
Alkalinity mg/l	X		X		X	
Fluoride, mg/l						
TOC						
Phenols, µg/l						
COD						
Cyanide, mg/l						
MBAS, mg/l						

		#4		#5		#6
Time Collected		1145		1210		1235
Sample Point		ANDERSON		BARGESS		CARROL
Lab No.		0154		0155		0156
Calcium						
Magnesium						
Sodium						
Potassium						
Arsenic	X		X		X	
Barium	X		X		X	
Cadmium	X		X		X	
Chromium	X		X		X	
Copper	X		X		X	
Iron	X		X		X	
Lead	X		X		X	
Manganese						
Mercury	X		X		X	
Nickel	X		X		X	
Selenium	X		X		X	
Silver	X		X		X	
Zinc	X		X		X	

Remarks:
ACIDIFIED IN FIELD
SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC
phone 734-5309/5243

Date Received in Regional Laboratory ____ by ____
Date Released from Regional Laboratory ____ by ____
Date Received in Central Laboratory 5-26-89 by EClay
Date Released from Spec & A. A. Section ____ by ____
Date Released from Metals Section 07-05-89 by [illegible]

DHEC 40-89 (01/81) White - Program; Yellow - Program; Pink - Program; Gold - Lab

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Organic Compounds in Solid Waste and Hydrology Samples

WPC

Sample Location: NEAR LOBECO CHEM. County: BEAUFORT

Comments: RESIDENTIAL WELLS (PRIVATE) DOWN GRADIENT

Date: 5/25/89 Collected By: LIVINGSTON / KNIGHT

An "X" in the small column indicates test requested.

Sample Type: 1. Water 2. Soil/Sediment 3. Hazardous Waste 4. Other

Time Collected (Milit.)		#4 ANDERSON		#5 BURGESS		#6 CARROLL
Station No.	X	1145 (time)	X	1210 (time)	X	1235 (time)
Lab. No. 052689		0154		0155		0156
Chlorinated hydrocarbon - Pesticides						
Endrin (µg/L or µg/Kg)						
Lindane (µg/L or µg/Kg)						
Methoxychlor (µg/L or µg/Kg)						
Toxaphene (µg/L or µg/Kg)						
Organophosphate - Pesticides (µg/L or µg/Kg)						
PCBs (µg/L or µg/Kg)	X		X		X	
Base Neutral/Acid Extractables	X		X		X	
Volatile Organics	X		X		X	
Petroleum Hydrocarbons						

Comments: SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC (Phone 734-5309 / 5243)

Date Received in Regional Laboratory ________ By ________

Date Released from Regional Laboratroy ________ By ________

Date Received in Central Laboratory 5-26-89 By E Coy

Date Released from Organic Section 07-05-89 By [illegible]

DHEC 40-90 (7/87)

Hazardous Substances Found in an Observed Release

Sample ID	Observed Release Hazardous Substance	Particulate Toxicity/ Mobility Value	Gas Toxicity/ Mobility Value

- N/A and/or data not specified

Documentation for Particulate Mobility:

HRS Figure 6-3 was used to determine particulate mobility values. The site is located in Lobeco, South Carolina.

Reference: 2

AIR PATHWAY WASTE CHARACTERISTICS
AMERICAN COLOR & CHEMICAL/VENTURE CHEMICAL - 05/28/92

Toxicity/Mobility Value from Source Hazardous Substances:	2.00E+03
Toxicity/Mobility Value from Observed Release Hazardous Substances:	0.00E+00
Toxicity/Mobility Factor:	2.00E+03
Sum of Source Hazardous Waste Quantity Values:	7.47E+03
Hazardous Waste Quantity Factor:	100
Waste Characteristics Factor Category:	18

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Organic Compounds in Solid Waste and Hydrology Samples

WPC

Sample Location: NEAR LOBECO County: BEAUFORT

Comments: FIELD BLANK

Date: 5/25/89 Collected By: LIVINGSTON/Knight

An "X" in the small column indicates test requested.

Sample Type: 1. Water 2. Soil/Sediment 3. Hazardous Waste 4. Other: FIELD BLANK

Time Collected (Milit.)						
Station No.		LANE RES				
Lab. No. 052689		0150				
Chlorinated hydrocarbon - Pesticides						
Endrin (µg/L or µg/Kg)						
Lindane (µg/L or µg/Kg)						
Methoxychlor (µg/L or µg/Kg)						
Toxaphene (µg/L or µg/Kg)						
Organophosphate - Pesticides (µg/L or µg/Kg)						
PCBs (µg/L or µg/Kg)						
Base Neutral/Acid Extractables						
Volatile Organics	X					
Petroleum Hydrocarbons						

Comments: SEND RESULTS TO EITHER LIVINGSTON OR KNIGHT IN GEOHYDROLOGIC SECTION BWPC phone (734-5309 / 5243)

Date Received in Regional Laboratory ______ By ______

Date Released from Regional Laboratroy ______ By ______

Date Received in Central Laboratory 5-26-89 By ECox

Date Released from Organic Section 6-12-89 By TKK

DHEC 40-90 (7/87)

Actual Contamination

No.	Sample ID	Distance (miles)	Level of Contamination
-	N/A and/or data not specified		

Potential Contamination

Distance Categories Subject to Potential Contamination	Population	Value
Onsite	75.0	5.3000
> 0 to 1/4 mile	13.0	0.4000
> 1/4 to 1/2 mile	78.0	0.3000
> 1/2 to 1 mile	153.0	0.3000
> 1 to 2 miles	697.0	0.3000
> 2 to 3 miles	1210.0	0.4000
> 3 to 4 miles	730.0	0.0700

Potential Contaminantion Factor: 7.0000

Documentation for Population Onsite Distance Category:

75 people are currently employed at the AC&C facility.

Reference: 3

Documentation for Population > 0 to 1/4 mile Distance Category:

A topographic house count for the distance ring in question, multiplied by 2.59 (the county average persons/household) yielded the number of residents for that ring.
5 houses x 2.59 people = 13 persons

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526390150
CHARGE NUMBER : WFC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JUNE 12TH, 1989
RELEASE DATE : 06/12/89 12:34:35
DT COLLECTED : 05/25/89 00:00:00
SAMPLE MEDIUM : WATER
STATION CODE : BLANK

ANALYSIS	STORET	RESULT
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0

Reference: 2, 21

Documentation for Population > 1/4 to 1/2 mile Distance Category:

same justification as the 0 to 1/4 mile ring.
30 houses x 2.59 people = 78 persons

Reference: 2, 21

Documentation for Population > 1/2 to 1 mile Distance Category:

Same justification as the 0 to 1/4 mile ring.
59 houses x 2.59 people = 153 persons

Reference: 2, 21

Documentation for Population > 1 to 2 miles Distance Category:

Same justification as the 0 to 1/4 mile radius.
269 houses x 2.59 people = 697 persons

Reference: 2, 21

Documentation for Population > 2 to 3 miles Distance Category:

Same justification as the 0 to 1/4 mile radius.
467 houses x 2.59 people = 1210 persons

Reference: 2, 21

****
*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526890100 | MONDAY JUNE 12TH, 1989
CHARGE NUMBER : WPC | RELEASE DATE : 06/12/89 12:34:38
COLLECTED BY : C LIVINGSTON | DT COLLECTED : 05/25/89 00:00:00
COUNTY : BEAUFORT | SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL | STATION CODE : BLANK

PAGE 2

ANALYSIS	STORET	RESULT
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

clean

COMMENTS:

Documentation for Population > 3 to 4 miles Distance Category:

Same justification as the 0 to 1/4 mile radius.
282 houses x 2.59 people = 730 persons

Reference: 2, 21

****
* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890181
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/26/89 10:25:00
SAMPLE MEDIUM : WATER
STATION CODE : #1

ANALYSIS	STORET	RESULT
LKALINITY MG/L	00410	195
RSENIC UG/L	01002	<5
CENAPHTHENE UG/L	34205	<4.0
CENAPHTHYLENE UG/L	34200	<4.0
NTHRACENE UG/L	34220	<4.0
ENZO(A)ANTHRACENE UG/L	34526	<4.0
ENZO(B)FLUORANTHENE UG/L	34230	<4.0
ENZO(K)FLUORANTHENE UG/L	34242	<4.0
ENZO(A)PYRENE UG/L	34247	<4.0
ENZO(GHI)PERYLENE UG/L	34521	<4.0
UTYLBENZYL PHTHALATE UG/L	34292	<4.0
IS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
IS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
IS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
IS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
-CHLORONAPHTHALENE UG/L	34581	<4.0
-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
RYSENE UG/L	34320	<4.0
IBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
I-N-BUTYLPHTHALATE UG/L	39110	5.85
,3-DICHLOROBENZENE UG/L	34566	<4.0
,2-DICHLOROBENZENE UG/L	34536	<4.0
,4-DICHLOROBENZENE UG/L	34571	<4.0
,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

Nearest Individual Factor

Level of Contamination: Potential
Distance in miles: 0 to 1/8

Nearest Individual Value: 20

Documentation for Nearest Individual:

Using the site layout map in the NUS SSI Phase II, the burn site is located roughly 150 feet east of the three buildings that are presently in use at the facility.

Reference: 3, 17

Resources

Resource Use: NO

Resource Value: 0

Documentation for Resources:

No resources were identified as defined by HRS section 3.3.3.

Reference:

****
* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890101 MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/10/89 1?:?9:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/26/89 10:25:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #1

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

****
* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0524890191 MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/26/89 10:25:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #1

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

Actual Contamination, Sensitive Environments

Sensitive Environment	Distance (miles)	Sensitive Environment Value
- N/A and/or data not specified		

Actual Contamination, Wetlands

Distance Category	Wetland Acreage	Wetland Acreage Value
- N/A and/or data not specified		

Sensitive Environments Actual Contamination Factor: 0.000
(Sum of Sensitive Environments + Wetlands Values)

Potential Contamination, Sensitive Environments

Sensitive Environment	Distance (miles)	Sensitive Environment Value	Distance Weight	Weighted Value/10
CAMPELL CREEK	0.000	0	1.0000	0.000
RANGES OF END.SP.	0.000	75	1.0000	7.500

Sum of Sensitive Environments Weighted Values/10: 7.500

Potential Contamination, Wetlands

Distance Category	Wetland Acreage	Wetland Acreage Value	Distance Weight	Weighted Value/10
> 1/4 to 1/2 mile	90.0	75.0	0.0540	0.405
> 0 to 1/4 mile	70.0	75.0	0.2500	1.875

Total Wetland Acreage: 160.0

Sum of Wetland Weighted Acreage Values/10: 2.280

Sensitive Environment Potential Contamination Factor: 10.000

Documentation for Sensitive Environment CAMPELL CREEK:

None of the source area are located in a wetland.

Reference: 2, 3

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0528890151 MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/26/89 10:25:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #1

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	10
IRON UG/L	01045	40
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	70
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	230
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

Documentation for Sensitive Environment CAMPELL CREEK:

Using the 7.5 minute topos, the wetland acreage was estimated by roughly selecting the extent of wetlands in each distance ring.

Reference: 2

Documentation for Sensitive Environment CAMPELL CREEK:

The acreage of wetlands was estimated using the USGS 7.5 minute topo maps.

Reference: 2

Documentation for Sensitive Environment RANGES OF END.SP.:

The ranges of several endangered species extend through the study area, including the West Indian manatee, Bald eagle, shortnosed sturgeon, and red-cockaded woodpecker.

Reference: 21, 26

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890131
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/26/89 10:25:00
SAMPLE MEDIUM : WATER
STATION CODE : #1

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

OVERSIZED

DOCUMENT

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL       *
*               ANALYTICAL SERVICES DIVISION LABORATORY  REPORT              *
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  SAMPLE NUMBER : 0526390151                MONDAY JULY 10TH, 1989
  CHARGE NUMBER : WPC                       RELEASE DATE : 07/10/89 15:39:02
  COLLECTED BY  : C LIVINGSTON              DT COLLECTED : 05/26/89 10:25:00
  COUNTY        : BEAUFORT                  SAMPLE MEDIUM : WATER
  SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL    STATION CODE : #1

ANALYSIS                                    STORET  RESULT
______________________________________________________________PAGE 6  ___
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COMMENTS:

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL        *
*              ANALYTICAL SERVICES DIVISION LABORATORY  REPORT                *
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SAMPLE NUMBER : 052689Ú152 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:00:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #2

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	185
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
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SAMPLE NUMBER : 052S690132
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/25/89 11:00:00
SAMPLE MEDIUM : WATER
STATION CODE : #2

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

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SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

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SAMPLE NUMBER : 052889.102
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/25/89 11:00:00
SAMPLE MEDIUM : WATER
STATION CODE : #2

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890152
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 10TH, 1989
RELEASE DATE : 07/10/89 15:39:02
DT COLLECTED : 05/25/89 11:00:00
SAMPLE MEDIUM : WATER
STATION CODE : #2

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	180
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	230
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	210
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

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SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

ANALYTICAL SERVICES DIVISION LABORATORY REPORT

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SAMPLE NUMBER : [illegible]52[illegible]89[illegible]1[illegible]2 MONDAY JULY 10TH, 1989

CHARGE NUMBER : WPC RELEASE DATE : 07/10/89 15:[illegible]

COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 11:[illegible]:00

COUNTY : BEAUFORT SAMPLE MEDIUM : WATER

SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : [illegible]

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 052[illegible]89[illegible]1[illegible]2	MONDAY JULY 10TH, 1989
CHARGE NUMBER : A[illegible]C	RELEASE DATE : 07/10/89 1[illegible]:[illegible]9:02
COLLECTED BY : C LIVINGSTON	DT COLLECTED : 05/25/89 11:00:00
COUNTY : BEAUFORT	SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL	STATION CODE : #2

ANALYSIS STORET RESULT

COMMENTS:

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 052[illegible]90133 MONDAY JULY 10TH, 1989
CHARGE NUMBER : WFC RELEASE DATE : 07/10/89 1[illegible]:[illegible]:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 11:25:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : 43

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	185
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890153 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WFC — RELEASE DATE : 07/10/89 15:59:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:25:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #3

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

[S]OUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENT[AL] CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPO[R]T

SAMPLE NUMBER : 0526890153		MONDAY JULY 10TH, 1[9]89	
CHARGE NUMBER : WPC		RELEASE DATE : 07/1[?]/89 15:39	
COLLECTED BY : C LIVINGSTON		DT COLLECTED : 05/25/89 11:25	
COUNTY : BEAUFORT		SAMPLE MEDIA : WATER	
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL		STATION CODE :	

PAGE 3

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34336	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/L		<4.0
BENZOIC ACID UG/KG	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78303	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
[M]ERCURY UG/L	71900	<0.2
[SI]LVER UG/L	01077	<30
[BA]RIUM UG/L	01007	<50
[CAD]MIUM UG/L	01027	<10
[CHR]OMIUM UG/L	01034	<10

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL           *
*              ANALYTICAL SERVICES DIVISION LABORATORY  REPORT                   *
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SAMPLE NUMBER : 0526890153 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:25:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #3

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	40
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	50
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	250
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

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SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

ANALYTICAL SERVICES DIVISION LABORATORY REPORT

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SAMPLE NUMBER : 0526890153 — MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/10/89 15:39:02
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 11:35:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #3

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890153 MONDAY JULY 10TH, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/10/89 13:39:02
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 11:25:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #3

ANALYSIS STORET RESULT

COMMENTS:

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
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SAMPLE NUMBER : 0526890154
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 11:45:00
SAMPLE MEDIUM : WATER
STATION CODE : #4

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	200
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

clm

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890154
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 11:45:00
SAMPLE MEDIUM : WATER
STATION CODE : #4

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

Clean

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT
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SAMPLE NUMBER : 0526890154 MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 11:45:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #4

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

clean

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526890154
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 11:45:00
SAMPLE MEDIUM : WATER
STATION CODE : #4

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	20
IRON UG/L	01045	280
MANGANESE UG/L	01055	10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	90
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	270
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

clean

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890154
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 11:45:00
SAMPLE MEDIUM : WATER
STATION CODE : #4

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

sbm

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526890154 | MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC | RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON | DT COLLECTED : 05/25/89 11:45:00
COUNTY : BEAUFORT | SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL | STATION CODE : #4

ANALYSIS STORET RESULT

COMMENTS:

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION LABORATORY REPORT

SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	176
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

clean

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SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
****

SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

NALYSIS	STORET	RESULT
IETHYL PHTHALATE UG/L	34336	<4.0
IMETHYL PHTHALATE UG/L	34341	<4.0
,4-DINITROTOLUENE UG/L	34611	<4.0
,6-DINITROTOLUENE UG/L	34626	<4.0
I-N-OCTYLPHTHALATE UG/L	34596	<4.0
LUORANTHENE UG/L	34376	<4.0
LUORENE UG/L	34381	<4.0
EXACHLOROBENZENE UG/L	39700	<4.0
EXACHLOROBUTADIENE UG/L	34391	<4.0
EXACHLOROETHANE UG/L	34396	<4.0
NDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
SOPHORONE UG/L	34408	<4.0
APHTHALENE UG/L	34696	<4.0
ITROBENZENE UG/L	34447	<4.0
-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
HENANTHRENE UG/L	34461	<4.0
YRENE UG/L	34469	<4.0
,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
-CHLOROPHENOL UG/L	34586	<4.0
,4-DICHLOROPHENOL UG/L	34601	<4.0
,4-DIMETHYL PHENOL UG/L	34606	<4.0
,4-DINITROPHENOL UG/L	34616	<4.0
-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
-NITROPHENOL UG/L	34591	<4.0
-NITROPHENOL UG/L	34646	<4.0
:NTACHLOROPHENOL UG/L	39032	<4.0

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL     *
*              ANALYTICAL SERVICES DIVISION LABORATORY  REPORT              *
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SAMPLE NUMBER : 0526890155 — WEDNESDAY JULY 5TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 12:10:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL — STATION CODE : #5

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

deu

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	40
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	30
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	230
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

clean

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*   SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL   *
*   ANALYTICAL SERVICES DIVISION LABORATORY REPORT   *
****

SAMPLE NUMBER : 0526890155 — WEDNESDAY JULY 5TH, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 12:10:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL   STATION CODE : #5

PAGE 5

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

clean

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*************************************************************************************
*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL              *
*               ANALYTICAL SERVICES DIVISION LABORATORY  REPORT                     *
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SAMPLE NUMBER : 0526890155
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

WEDNESDAY JULY 5TH, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:10:00
SAMPLE MEDIUM : WATER
STATION CODE : #5

ANALYSIS	STORET	RESULT

OMMENTS:

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *

* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *

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SAMPLE NUMBER : 0526890156 MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 12:35:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #6

ANALYSIS	STORET	RESULT
ALKALINITY MG/L	00410	212
ARSENIC UG/L	01002	<5
ACENAPHTHENE UG/L	34205	<4.0
ACENAPHTHYLENE UG/L	34200	<4.0
ANTHRACENE UG/L	34220	<4.0
BENZO(A)ANTHRACENE UG/L	34526	<4.0
BENZO(B)FLUORANTHENE UG/L	34230	<4.0
BENZO(K)FLUORANTHENE UG/L	34242	<4.0
BENZO(A)PYRENE UG/L	34247	<4.0
BENZO(GHI)PERYLENE UG/L	34521	<4.0
BUTYLBENZYL PHTHALATE UG/L	34292	<4.0
BIS(2-CHLOROETHYL)ETHER UG/L	34273	<4.0
BIS(2-CHLOROETHOXY)METHANE UG/L	34278	<4.0
BIS(2-ETHYLHEXYL)PHTHALATE UG/L	39100	<4.0
BIS(2-CHLOROISOPROPYL)ETHER UG/L	34283	<4.0
4-BROMOPHENYL PHENYL ETHER UG/L	34636	<4.0
2-CHLORONAPHTHALENE UG/L	34581	<4.0
4-CHLOROPHENYL PHENYL ETHER UG/L	34641	<4.0
CHRYSENE UG/L	34320	<4.0
DIBENZO(A,H)ANTHRACENE UG/L	34556	<4.0
DI-N-BUTYLPHTHALATE UG/L	39110	<4.0
1,3-DICHLOROBENZENE UG/L	34566	<4.0
1,2-DICHLOROBENZENE UG/L	34536	<4.0
1,4-DICHLOROBENZENE UG/L	34571	<4.0
3,3'-DICHLOROBENZIDINE UG/L	34631	<4.0

clean

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*       SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL           *
*                ANALYTICAL SERVICES DIVISION LABORATORY  REPORT                *
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SAMPLE NUMBER : 0526890156
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:35:00
SAMPLE MEDIUM : WATER
STATION CODE : #6

ANALYSIS	STORET	RESULT
DIETHYL PHTHALATE UG/L	34336	<4.0
DIMETHYL PHTHALATE UG/L	34341	<4.0
2,4-DINITROTOLUENE UG/L	34611	<4.0
2,6-DINITROTOLUENE UG/L	34626	<4.0
DI-N-OCTYLPHTHALATE UG/L	34596	<4.0
FLUORANTHENE UG/L	34376	<4.0
FLUORENE UG/L	34381	<4.0
HEXACHLOROBENZENE UG/L	39700	<4.0
HEXACHLOROBUTADIENE UG/L	34391	<4.0
HEXACHLOROETHANE UG/L	34396	<4.0
INDENO(1,2,3-CD)PYRENE UG/L	34403	<4.0
ISOPHORONE UG/L	34408	<4.0
NAPHTHALENE UG/L	34696	<4.0
NITROBENZENE UG/L	34447	<4.0
N-NITROSODI-N-PROPYLAMINE UG/L	34428	<4.0
PHENANTHRENE UG/L	34461	<4.0
PYRENE UG/L	34469	<4.0
1,2,4-TRICHLOROBENZENE UG/L	34551	<4.0
4-CHLORO-3-METHYL PHENOL UG/L	34452	<4.0
2-CHLOROPHENOL UG/L	34586	<4.0
2,4-DICHLOROPHENOL UG/L	34601	<4.0
2,4-DIMETHYL PHENOL UG/L	34606	<4.0
2,4-DINITROPHENOL UG/L	34616	<4.0
2-METHYL-4,6-DINITROPHENOL UG/L	34657	<4.0
2-NITROPHENOL UG/L	34591	<4.0
4-NITROPHENOL UG/L	34646	<4.0
PENTACHLOROPHENOL UG/L	39032	<4.0

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
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SAMPLE NUMBER : 0526890156 MONDAY JULY,3RD, 1989
CHARGE NUMBER : WPC RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON DT COLLECTED : 05/25/89 12:35:00
COUNTY : BEAUFORT SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL STATION CODE : #6

ANALYSIS	STORET	RESULT
PHENOL UG/L	34694	<4.0
2,4,6-TRICHLOROPHENOL UG/L	34621	<4.0
BENZIDINE UG/L	39120	<4.0
HEXACHLOROCYLCOPENTADIENE UG/L	34386	<4.0
N-NITROSODIMETHYLAMINE UG/L	34438	<4.0
N-NITROSODIPHENYLAMINE UG/L	34433	<4.0
ANILINE UG/L	77089	<4.0
BENZYL ALCOHOL UG/L	77147	<4.0
2-METHYLPHENOL UG/L		<4.0
4-METHYLPHENOL UG/KG		<4.0
BENZOIC ACID UG/L	77247	<4.0
4-CHLOROANILINE UG/L		<4.0
2-METHYL NAPHTHALENE UG/L	77416	<4.0
2,4,5-TRICHLOROPHENOL UG/L	77687	<4.0
2-NITROANILINE UG/L		<4.0
3-NITROANILINE UG/L	78300	<4.0
DIBENZOFURAN UG/L	81302	<4.0
4-NITROANILINE UG/L		<4.0
AZOBENZENE UG/L	77625	<4.0
MERCURY UG/L	71900	<0.2
SILVER UG/L	01077	<30
BARIUM UG/L	01007	<50
CADMIUM UG/L	01027	<10
CHROMIUM UG/L	01034	<10

clean

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* SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL *
* ANALYTICAL SERVICES DIVISION LABORATORY REPORT *
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SAMPLE NUMBER : 0526890156
CHARGE NUMBER : WPC
COLLECTED BY : C LIVINGSTON
COUNTY : BEAUFORT
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL

MONDAY JULY 3RD, 1989
RELEASE DATE : 07/03/89 14:14:39
DT COLLECTED : 05/25/89 12:35:00
SAMPLE MEDIUM : WATER
STATION CODE : #6

ANALYSIS	STORET	RESULT
COPPER UG/L	01042	<10
IRON UG/L	01045	340
MANGANESE UG/L	01055	<10
NICKEL UG/L	01067	<20
LEAD UG/L	01051	<50
ZINC UG/L	01092	10
PCB 1016 UG/L	34671	<0.5
PCB 1221 UG/L	39488	<0.5
PCB 1232 UG/L	39492	<0.5
PCB 1242 UG/L	39496	<0.5
PCB 1248 UG/L	39500	<0.5
PCB 1254 UG/L	39504	<0.5
PCB 1260 UG/L	39508	<0.5
PCB 1262 UG/L		<0.5
SELENIUM UG/L	01147	<5
TOTAL DISS SOLIDS MG/L	70300	290
BENZENE UG/L	34030	<2.0
BROMODICHLOROMETHANE UG/L	32101	<2.0
BROMOFORM UG/L	32104	<2.0
BROMOMETHANE UG/L	34413	<2.0
CARBON TETRACHLORIDE UG/L	32102	<2.0

clean

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*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL                *
*                 ANALYTICAL SERVICES DIVISION LABORATORY  REPORT                     *
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SAMPLE NUMBER : 0526890156 — MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC — RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON — DT COLLECTED : 05/25/89 12:35:00
COUNTY : BEAUFORT — SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL   STATION CODE : #6

ANALYSIS	STORET	RESULT
CHLOROBENZENE UG/L	34301	<2.0
CHLOROETHANE UG/L	34311	<2.0
2-CHLOROETHYLVINYL ETHER UG/L	34576	<2.0
CHLOROFORM UG/L	32106	<2.0
CHLOROMETHANE UG/L	34418	<2.0
DIBROMOCHLOROMETHANE UG/L	32105	<2.0
1,2-DICHLOROBENZENE UG/L	34536	<2.0
1,3-DICHLOROBENZENE UG/L	34566	<2.0
1,4-DICHLOROBENZENE UG/L	34571	<2.0
1,1-DICHLOROETHANE UG/L	34496	<2.0
1,2-DICHLOROETHANE UG/L	34531	<2.0
1,1-DICHLOROETHENE UG/L	34501	<2.0
TRANS-1,2-DICHLOROETHENE UG/L	34546	<2.0
1,2-DICHLOROPROPANE UG/L	34541	<2.0
CIS-1,3-DICHLOROPROPENE UG/L	34704	<2.0
TRANS-1,3-DICHLOROPROPENE UG/L	34699	<2.0
ETHYL BENZENE UG/L	34371	<2.0
METHYLENE CHLORIDE UG/L	34423	<2.0
1,1,2,2-TETRACHLOROETHANE UG/L	34516	<2.0
TETRACHLOROETHENE UG/L	34475	<2.0
TOLUENE UG/L	34010	<2.0
1,1,1-TRICHLOROETHANE UG/L	34506	<2.0
1,1,2-TRICHLOROETHANE UG/L	34511	<2.0
TRICHLOROETHENE UG/L	39180	<2.0
TRICHLOROFLUOROMETHANE UG/L	34488	<2.0
VINYL CHLORIDE UG/L	39175	<2.0

clean

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********************************************************************************
*        SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL         *
*                ANALYTICAL SERVICES DIVISION LABORATORY  REPORT                *
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SAMPLE NUMBER : 0526890156 | MONDAY JULY 3RD, 1989
CHARGE NUMBER : WPC | RELEASE DATE : 07/03/89 14:14:39
COLLECTED BY : C LIVINGSTON | DT COLLECTED : 05/25/89 12:35:00
COUNTY : BEAUFORT | SAMPLE MEDIUM : WATER
SAMPLE DESCRIPTION : NEAR LOBECO CHEM - WELL | STATION CODE : #6

ANALYSIS | STORET | RESULT

COMMENTS:

NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: Brian Holaway, EPA

DATE: **August 18, 1989**

FROM: Carol Northern and Jim Miller NUS Corporation

COPIES: To file

SUBJECT: American Color & Chemical/Venture Chemical

REFERENCE: F4-8904-54

Meeting at EPA 8/18/89 at 10:00am: Discussed Screening Site Inspection. Agreed that the findings from previous site investigations could be used in place of sampling during the SSI.

FIT was authorized to conduct a non-sampling SSI which will consist of an extensive target survey.

Project Manager, Jim Miller will conduct the target survey and prepare an SSI report using previous sampling data.

Copies of previous reports have been requested from the consulting firms. FIT was authorized to pay any costs associated with obtaining these reports.

CDN 8/18/89
J.M. 8/18/89

LOBECO PRODUCTS, INC.

P.O. BOX 815
LOBECO, SOUTH CAROLINA 29931

(803) 846-8171

SC HWY. 38
LOBECO, SOUTH CAROLINA 29931

August 14, 1989

Mr. Jim Miller
NUS Corporation
1927 Lakeside Parkway
Suite 614
Tucker, GA 30084

re: Groundwater Assessments; Lobeco Products, Inc., Beaufort County, SC

Dear Jim:

In accordance with my telephone conversation today with Bryan Holloway of EPA, I am forwarding herewith the five original documents of the two (2) groundwater assessments completed for this facility. The initial study was completed by G & E Engineering dated April and November, 1986. The follow-up assessment was conducted by RMT with report dated September, 1988. Individual titles are listed below:

Ongoing Soil and Groundwater Study, G & E Engineering, Inc.
(1) Volume I, dated November, 1986
(2) Volume II, dated April, 1986
(3) Revised Text and Addendum, dated April, 1986

Lobeco Site Environmental Assessment, RMT, Inc.
(4) one volume, dated September, 1988
(5) Appendices, dated September, 1988

Since these are the only copies of these documents, please copy as needed and return these original books to Lobeco Products, Inc. Please acknowledge receipt of referenced documents by signing the letter of receipt and returning in the enclosed addressed envelope.

Please advise if there are questions.

Sincerely,

John Meeks

John M. Meeks
Vice President

JMM:nls

cc: R. S. Andrews, President, Lobeco Products, Inc.
E. L. Barnhart, President, Hydroscience, Inc.
W. B. Harvey, Esquire, Harvey & Battey, P.A.
S. M. Lane, Lane Environmental Services
B. Holloway, EPA Region III

Received 5 documents from LPI.
Jim Miller

NUS CORPORATION
SUPERFUND DIVISION

INTERNAL CORRESPONDENCE

TO: Brian Holcomb

DATE: 8/7/89

FROM: Carol Parrish

COPIES:

SUBJECT: American Oil & Chemical/Central Chemical

Attached is a copy of the Site Access Information letter dated June 14, 1989.

Additional site representatives are:

Mr. John Meeks
V.P. for Environmental Concerns
(803) 846-8171

Mr. Sonny Andrews
President
(803) 525-6611

If I can assist you in any way please let me know.

(I will send consent order as soon as I receive a copy from LHCC)

NUS 064 58 1182

Lobeco file

RECEIVED
AUG 17 1989
RECEIVED

RECEIVED
AUG 4 1989
WATER QUALITY ASSESSMENT AND ENFORCEMENT DIVISION

LESC

Lane Environmental Services Corporation

August 1, 1989

Ms. Sandra L. Hursey
South Carolina Department
of Health & Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Dear Sandra:

On July 31, 1989, the offices of LANE ENVIRONMENTAL SERVICES CORPORATION relocated to the Innsbrook Corporate Center. Innsbrook is just west of Richmond on U.S. Route 250, near the intersection of I-64 and I-295. The new address is:

Suite 112
4191 Innslake Drive
Glen Allen, Virginia 23060

Our new telephone listings are:

Karen J. Harkey	804/346-9827
H. Hobson King	804/346-9842
Nelda C. Lane	804/346-9827
Samuel M. Lane	804/346-9831
Margit W. Ray	804/346-9945
Fax Number	804/747-0207

Thank you for all of your assistance in the past. We look forward to our continued association.

Yours very truly,

Sam ke

Samuel M. Lane
President

cc: Andy Yasinac and Russell Sherer

cc Russ

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

July 20, 1989

Mr. Victor M. Granquist
Environmental Manager
Lobeco Products, Inc.
P. O. Box 815
Lobeco, SC 29931

Re: New Product Notice-Wastewater
Beaufort County

Dear Mr. Granquist:

You premanufacturing notification of June 19, 1989, has been reviewed. There are some questions about effects of the proposed activity, and approval to manufacture the new chemical cannot be granted until these matters are dealt with. We discussed the questions by phone on July 17, 1989, and they are confirmed as follows:

1. Please provide information on the additional ammonia and organic nitrogen added to the wastewater treatment plant load.

2. Please provide information on the effect on ammonia discharges, such as inhibition, etc.

3. The toxicity of the discharge with new-product wastewater is below the present limit; although, there does not appear to be increased toxicity. The conclusion from this is uncertain.

4. Information is needed on the potential for discharge of priority pollutants, hazardous chemicals, and the other pollutants for which monitoring is required in the permit (Part III.A.13).

5. Use of o-phenylenediamine suggests that with chlorination the discharge could contain 4-chloro-o-phenylendiamine, which is a listed carcinogen. Information confirming or denying this potential is needed.

6. In other chemical plants use of sodium sulfhydrate (NaSH) has caused severe problems, including drastic inhibition of biological treatment. Amounts of the material, spill potential, and production controls or pretreatment methods are of concern along with results from treatability work.

RECEIVED
JUL 24 1989
RECEIVED

NUS
CORPORATION
1927 LAKESIDE PARKWAY
SUITE 614
TUCKER, GEORGIA 30084
404-938-7710

C-586-6-9-120

June 14, 1989

Mr. Brian Holaway
Site Investigation and Support Branch
Waste Management Division
Environmental Protection Agency
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Subject: Site Access Information
American Color and Chemical/Venture Chemical
Lobeco, Beaufort County, South Carolina
TDD No. F4-8904-54

Dear Mr. Holaway:

The American Color & Chemical/Venture Chemical property is owned by Lobeco Products, Inc., SC Hwy. 83, Lobeco, South Carolina, 29931. The plant manager is Mr. Jim Huckabee. Mr. Huckabee's phone number is (803) 846-8171.

American Color & Chemical/Venture Chemical is now Lobeco Products. The facility is located 12 miles northwest of Beaufort, South Carolina.

FIT has scheduled the SSI for the week of September ~~4~~ 11, 1989. Jim Miller is the Project Manager. If you require any more information for site access, please let me know.

Very truly yours,

Carol Northern

Carol D. Northern
South Carolina Section Coordinator

Approved:

Michael Prof

CDN/kw

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

Penny - Please send Roy Livingston the results of your sample of private wells near Lobeco Inc
TK

MEMORANDUM

TO: Sandra Hursey, Environmental Quality Manager
Division of Water Quality Assessment and Enforcement Division

FROM: Tom Knight, Hydrogeologist OK
Geohydrologic Section
Water Quality Assessment & Enforcement Division

RE: Lobeco
April 13, 1989 Meeting
~~April 28,~~ 1989 Site Visit
Colleton County

Date: May 10, 1989

Vic Grainquist (Lobeco), Clyde Livingston and the writer visited the referenced facility to observe the site. Underground storage tanks were noted approximately 40 feet from well V-1. Several homes with water supply wells were noted adjacent to the Lobeco site. These water supply wells were not noted in G&E Engineering's April 1986 Report (Ongoing Soil and Groundwater and Conceptualized Cleanup Plan) on the map of water supply wells within a one half mile radius of the facility. The appropriate facility(s) must locate and obtain appropriate construction details for all water supply wells within a 1/4 mile radius of the burnsite and the abandoned lagoon site. This information must be submitted in map form and added to a table showing the homeowner or facility name.

The three closest potable water supply wells to each area must be sampled, at a minimum, for all constituents detected in ground-water in that area (priority pollutant metals, volatile organics, acid extractable organics, PCBs, total dissolved solids, field specific conductance, alkalinity and field pH).

Due to the nearby water supply wells, it is even more important that all contaminated ground water onsite be remediated. In areas where slurry walls are going to be installed, a plan should be formulated for additional assessment to completely define the horizontal and vertical extent of ground-water contamination and to remediate contaminated ground water not addressed by the current recovery system. This plan should address pertinent items per the writer's January 31, 1989 memorandum.

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Regarding the analytical results for the ATW and BTW composite samples presented during the April 18, 1989 meeting, it should be noted that these are both composite samples from five wells. Such a composite sample probably includes ground water from both highly impacted and slightly or non-impacted wells. These samples probably do not represent actual levels of ground-water contamination at any point (i.e., due to the wells location in the source area, any impacted well may indicate a substantial contaminant plume but be located near the upgradient termination of that plume). Even considering this, ground waters at both locations are substantially impacted as indicated by the composite samples.

If you have any questions, please feel free to contact me at 734-5243.

TK/sr

cc: George Nelson, Director
Low Country District EQC

Chistine Sanford, Hydrogeologist
Trident District EQC

Andy Yasinsac, Engineer
Division of Industrial and Agricultural Wastewater

Ground-Water Protection Division files

RECEIVED

MAY 8 1989

WATER QUALITY ASSESSMENT
AND ENFORCEMENT DIVISION

Lane Environmental Services Corporation

May 5, 1989

Ms. Sandra L. Hursey
S.C. Dept. or Health and
Environmental Control
2600 Bull Street
Columbia, SC 29201

Ref: Authentication of 25-ppm PCB Clean-up Action Level

Dear Ms. Hursey:

Copies of RMT, Inc. references to site-specific PCB clean-up levels are attached. These and related information are discussed in the following paragraphs.

1. 40CFR761.120 "Scope" (July 1, 1989)

   - Section 120(a)(1) states that "Existing spills (spills which occurred prior to May 4, 1987) are excluded from the scope of this policy...", as it relates to clean-up of new or recent spill events.

   - Section 120(a)(4) further notes that "There may (also) be exceptional (spill) situations that require less stringent clean-up or a different approach because of factors associated with the particular spill. These factors may mitigate expected exposures and risks or make clean-up to these requirements impractical."

   - Section 120(c) states that "EPA retains the flexibility to allow less stringent or alternative decontamination measures based upon site-specific considerations. EPA will exercise this flexibility if the responsible party demonstrates that clean-up to the numerical levels is clearly unwarranted because of risk-mitigating factors", etc.

2. 40CFR761.125 "Requirements for PCB Spill Clean-up" (July 1, 1988)

   - Section 125(c)(3)(v) states that for spills in restricted access areas other than outdoor electrical substations, "Soil contaminated by the spill will be cleaned to 25 ppm PCBs by weight." The abandoned lagoon and burn site are restricted access areas.

3. RMT Case Histories

A. College Point Site, Queens, N.Y.
(See attachment)

B. Mobray Engineering Company, Greenville, Ala.
(See attachment)

C. Marty's GMC, Kingston, Mass.
(See attachment)

D. Confidential Client

RMT, Inc. performed work for a confidential client in Bay City, Michigan that involved removal of PCB contaminated soil. The action level of 25 ppm was negotiated with the Michigan Department of Natural Resources and was supported by Region V of the US EPA. The remedial action included removal of approximately 190 cubic yards of affected soil and disposal in an off-site secure landfill.

I believe that the foregoing and attached information effectively demonstrate the flexibility that EPA exercises in establishing clean-up standards on a site-specific basis. In applying this information to the Lobeco site it should be noted that both the abandoned lagoon and burn site are remote, limited access areas. Further, their encapsulation during and after remediation eliminates exposure pathways and precludes access to any potential receptors; clearly representing "risk-mitigating factors" as referenced in 40CFR120(c).

I think that we have answered the concerns raised at our April 13 meeting re a defensible clean-up level for PCBs in the soil at the Lobeco plant site, but if you have any questions or comments regarding this communication, please let me know.

Yours very truly,

Samuel M. Lane

Samuel M. Lane

SML/ncl

cc: P. Marchesi, w/ attach.
J.M. Meeks, w/ attach.
R.D. Towe, w/ attach.

South Carolina Department of Health and Environmental Control

Penny
Do you have the Lobeco wastewater files?
Russell

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

M E M O R A N D U M

TO: File
Lobeco Products, Inc.
Beaufort County

FROM: Sandra L. Hursey, EQM SLH
Enforcement Section

SUBJECT: Meeting
April 13, 1989

DATE: April 17, 1989

On Thursday, April 13, 1989, a meeting was held between the Department and the parties to Consent Order 87-65-W - Tenneco Resins, Inc., American Color and Chemical Corporation and Lobeco Products, Inc. - to discuss issues related to the Remedial Action Plan proposed by the Respondents. The roster of attendees is attached.

The meeting began with one of the consultants stating that they planned remediation of the soil at the abandoned lagoon and old burn area to a level of 25ppm PCB's instead of the 50ppm originally proposed. The consultants believed, from "literature" they had read, that the lower level would be acceptable under EPA's regulations. (A Department representative offered the comment that the 25ppm was applicable to a spill clean up.)

The contaminated soil will be transported to Alabama for disposal in a landfill approved by EPA to accept PCB wastes. After the remediation has been completed, the excavations will be backfilled and covered with low permeability soil for containment purposes. Should the situation in Alabama change so that the landfill will not accept the contaminated soil, the Respondents are considering on-site incineration as another alternative.

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what about heavy metals?

The major items of discussion were:

1) <u>Ground-water Remediation at Abandoned Lagoon and Old Burn Site Areas:</u> The ground-water pumped off the sites in preparation for the remediation will contain PCB's as well as organics and heavy metals. The consultants propose treating this water by sending it through two carbon columns and discharging it to the plant's wastewater treatment system. The Department thought a modification to the NPDES Permit would be necessary for this waste substream. Requirements for testing the effluent for PCB's and possible other parameters would have to be added to the permit. This process would, by law, include a public notice period.

The Respondents objected to this suggestion for several reasons:

a) The length of time involved in the modification process. It would unnecessarily delay the project.

b) They didn't consider this as a major change in the treatment process. They were not requesting a change in effluent limits and the 40 to 50 gal/min discharge would only last for two or three months.

c) The Consent Order had already addressed the process and stated that "upon approval of the remediation plan and schedule, the schedule will become an enforceable part of the Order."

One of the Respondent's attorneys suggested that any additional effluent requirements be placed in an order. The order could contain a provision that if PCB's are detected in the effluent, the discharge cease. The Department agreed to look into the feasibility of proceeding in this manner. If a change in the permit is required, the permit can be re-issued rather than merely modified.

2) <u>Landfill Permit:</u> A landfill permit might be required to backfill the excavated area because the soil will still contain some PCB's. The Respondents objected to this also. One of the consultants said that precedents had been set in that other cleanups he had worked on had not required a landfill permit if the soil had been "cleaned" to an acceptable level. Department personnel stated that if the soil were "clean" it wouldn't matter. However, once the soil is "disturbed," the need for a permit will have to be decided by the Permitting Section of the Bureau of Solid and Hazardous Waste. The Department agreed to look into this issue.

3) <u>Ground-Water Contamination:</u> The ground-water at the old burn site and abandoned lagoon areas is contaminated, although not to a significant degree. The attached monitoring results are from five wells at each of those locations. The monitoring wells were existing ones and the consultant pointed out that some of the older ones were not installed in accordance with current Department regulations. The purpose of the samples was to aid in the design of the carbon columns and treatment system for use in the dewatering process at the sites. The results were presented at the meeting as an <u>indication</u> of the degree of ground-water contamination in the areas in question.

Ground-water monitoring will be required after site remediation. Initially it can be included in the construction permit. If low frequency monitoring will be required when the project is "completed," the monitoring requirements can be included in the NPDES Permit when it is reissued.

4) <u>Risk Assessment:</u> The critical factor in determining the need for a risk assessment will be required is whether Respondents can provide the Department with information on whether 25ppm PCB's is a "safe" level. The Department's position was, if the information provided by the consultants is inconclusive, a risk assessment may be required. One of the consultants said a risk assessment had not been included in the proposed plan was because of the information available and because the PCB's left at the site would be encapsulated. He also stated that of the three elements in risk assessment - source, pathway and receptacle - he felt two them, source and pathway, had been removed by the proposed plan.

A Department representative pointed out that the Respondents should make sure they have fully defined the area of contamination. Slurry walls will have to be constructed outside any area of known contamination. Test results indicate the highest level of contamination in the area to be at the southern end of the burn site. He suggested the Respondents hand-auger borings to the south of the burn site until an area uncontaminated with PCB's is found. As for any areas contaminated by an explosion which had occurred at the site several years ago (December 1987, part of the burn site), one of the consultants stated that the proposal had taken care of areas negotiated via the order ,i.e., the Respondents had reached an agreement on <u>shared</u> interests. They would not agree on anything beyond that scope.

During the course of the meeting the Respondents were made aware that the following Department permits will be required during the course of the project:

a) A construction permit from the Bureau of Water Pollution Control for the installation of the ground-water monitoring wells;
b) A construction permit from the Bureau of Water Pollution Control for the carbon columns (The PER and application can be submitted before the final design is completed);
c) A permit from the Bureau of Air Quality Control may be required if on-site incineration is utilized;
d) A NPDES Permit modification or reissuance (may be handled in an order) by the Bureau of Water Pollution Control; and,
e) A land-fill permit from the Bureau of Solid and Hazardous Waste if determined to be required.

The Department also suggested that the Respondents get in touch with TOSCA at EPA. It may or may not be interested in the project. The Respondents stated that they had established such contact.

Before the meeting closed, it was agreed that in about a week (no later than Monday, April 24, 1989) the consultants would provide the Department with information concerning the safety level of PCB's and additional engineering information on the issue of additional borings south of the burn site. After intra-agency discussion, the Department is to decide the issues of amending the order vs. permits.

SLH/sh
cc: George Nelson
Russ Sherer
Andy Yasinsac
Ray Livingston
Tom Wright
Coleman Miles
Steve Thomas

CONFERENCE REGISTER

LOBECO PRODUCTS, et al.

APRIL 13, 1989
(Date)

	Attendants (Please Print)	Affiliation
1.	SAMUEL M. LANE	LANE ENVIRONMENTAL SERVICES
2.	ROGER TOWE	TENNECO, INC.
3.	RALPH M. MELLOM	OGLETREE LAW FIRM - TENN.
4.	DAVID Nichols	RMT (LANE ENV.)
5.	RAY LIVINGSTON	SCDHEC
6.	TOM Knight	SC DHEC
7.	Coleman Miles	SC DHEC
8.	Russ Shaver	SCDHEC
9.	Robert Grost	HYDROSCIENCE
10.	W. Brantley Harvey Jr.	atty for Lobeco Products
11.	[illegible]	[illegible] Products Co.
12.	PRIMO MARCHESI	American Cyanamid Chem Corp
13.	Andy Yasinsac	SCDHEC Industrial WW
14.	Sandra Hursey	" WW Enforcement
15.	Jim Fields	McNAIR LAW FIRM - American Cyanamid
16.		
17.		
18.		
19.		
20.		

ANALYSIS OF COMPOSITE GROUND WATER SAMPLES FROM THE LAGOON AND BURN SITE

	Lagoon	Burn Site
Parameter *	ATW Comp.	BTW Comp.
Arsenic	0.009	<0.006
Beryllium	0.076	0.036
Cadmium	0.009	0.0012
Chromium	0.027	ND
Cyanide	<0.025	ND
Mercury	<0.0002	0.0003
Nickel	0.08	<0.04
Silver	0.003	ND
Zinc	0.58	<0.04
Phenols	0.22	0.022
Benzene	0.008	ND
Bromoform	ND	ND
Chloroform	0.003	ND
Methylene Chloride	ND	ND
Toluene	0.002	ND
Trichloroethylene	0.140	1.800
Naphthalene	0.360	ND
1,2,4 - Trichlorobenzene	0.690	0.003
PCB 1248	0.011	0.0018

* All concentrations in ppm.

Samples taken mid-February 19[illegible]

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

March 17, 1989

MEMORANDUM

TO: Sandra Hursey, EQM
Division of Water Quality Assessment and Enforcement

FROM: Tom Knight, Hydrogeologist TK
Hydrogeological Section
Division of Water Quality Assessment and Enforcement

SUBJECT: Lobeco
March 6, 1989 letter proposing analyses for wells V-1, 4 and 5
December 15, 1988 monitoring results for V-4 and 5
Beaufort County

The referenced submittals have been reviewed and the following comments are offered:

1) The proposed analyses are a beginning point to address comments per the writer's January 30, 1989 memorandum. All of the comments must be addressed. The report of the two independent analyses was proposed for submittal in mid May, 1989. This submittal needs to include a proposal/response specifically addressing the writer's comments.

2) The elevated specific conductance (5650 umhos/cm at 25^{o}C) and the low pH (3.8) in well V-5 and to a lesser extent well V-4 must be explained. In addition to earlier parameters, analyses for calcium, sodium, potassium, magnesium, iron, sulfate, chloride and carbonic acid/bicarbonate and any anions/cations in the wastewater which may contribute to the observed values are recommended. The appropriate evidence/justification will have to be submitted if natural or other conditions are thought to be causing the observed values.

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3) The TOC in well V-5 remains elevated and must be explained.

If you have any questions, please feel free to contact me at 734-5243.

TK/jf

cc: George Nelson, Director
Low Country District EQC

Andy Yasinsac, P.E.
Division of Industrial & Agricultural Wastewater

Christine Sanford, Hydrogeologist
Trident District EQC

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

MEMORANDUM

TO: Sandra Hursey
Division of Water Quality Assessment and Enforcement

FROM: Wilson C. Miles, Jr. WCM
Site Engineering Section
Bureau of Solid and Hazardous Waste Management

RE: Lobeco Products, Inc. aka American Color & Chemical/Venture
September, 1988 Site Environmental Assessment
Beaufort County

DATE: February 10, 1989

The Division of Site Engineering and Screening has reviewed the above referenced document and offers comments on sections 8 (Remedial Alternatives) and 9 (Proposed Remedial Action Plan).

In general, this document has been put together in a concise, organized manner.

Section 8.1 Remediation of PCBs

In subsections 8.1.1 and 8.1.2 and following it is imperative to note that a level of removal of PCB laden soils of 50 ppm in no way corresponds to a clean-up level. This is due to the lack of a definite risk assessment that addresses the sources(s), pathway(s), and receptor(s) (namely public and environmental) pertaining to an uncontrolled hazardous waste site.

Section 8.4 Excavation of Buried Materials

As mentioned in this section excessive rainwater run-on to the pits will be prevented. However, no provisions have been made should remediation be in process during periods of heavy rain. Also, no source removal action is complete unless all grossly contaminated soils have been removed along with the previously disposed of material.

Section 9.1 Site Overview

Several of the bullets (namely #5 and #6) do not provide a sound basis, in part or in whole, for the statement that "the soil, sediment, and groundwater at the Lobeco site do not represent significant threat to human health or the environment". This can only be determined by a qualified risk assessment.

Section 9.2 <u>Abandoned Lagoon Area</u>

Addition of kilm dust to a material to absorb water is not dewatering. It is also important to note that the basis for determining the clean-up level based on a risk assessment has not been addressed. In subsection 9.2.2, any efforts to pursue an on-site RCRA - type vault would need approval from the Hazardous Waste Permitting Section of this Bureau.

Section 9.3 <u>Old Burn Site</u>

The determination of the severity of threat to human health or the environment can primarily be addressed through a risk assessment.

In conclusion, to pursue the proposed remediation plan the following must be noted:

1. It is preferable to leave the soils which are contaminated at a level less than 50 ppm in place should it be decided to not address them at this time.

2. Should it be necessary to remove contaminated soil (less than 50 ppm) prior to testing; placement back in the pit would need approval from the Solid Waste Permitting Section of this Bureau.

3. Without a risk assessment, a technical basis for a clean-up level can not be made and, as a result, the Department can not make a determination that adequate measures were taken to insure the protection of human health and the environment.

Should you have any questions, please call.

WCM/njw

cc: Keith Lindler
George Nelson, Low Country District Office

George Nelson

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

MEMORANDUM

TO: Andy Yasinsac
Industrial and Agricultural Wastewater

FROM: Rick Renfrow *Rick Renfrow*
Water Quality Monitoring Section

THRU: Edward Younginer, Manager *Edward Younginer*
Water Quality Monitoring Section

SUBJECT: Proposed Remedial Action Plan
Lobeco Products, Inc., and Campbell Creek
Beaufort County, S.C.

DATE: January 4, 1989

This section has reviewed the Site Environmental Assessment and the Proposed Remedial Action Plan at the Lobeco Products Site and Campbell Creek submitted by RMT Engineering and Environmental Management Services. As requested, the following comments are submitted for your consideration.

In previous sampling efforts by SCDHEC, S.C. Wildlife and Marine Resources and Venture (Lobeco) PCBs have become of major concern in sediments as well as tissues (oysters and crabs) in Campbell Creek. As indicated, the highest levels of PCB in both tissues and sediments have been located in the area near the Lobeco discharge. More recent monitoring (oyster tissue) indicates that there has not been significant migration of PCBs south toward Whale Branch.

We agree that the PCB contaminated sediments in Campbell Creek near the discharge should be left undisturbed. Resuspension of sediments could cause a subsequent increase in the movement of PCBs resulting in an increased potential for contamination of oysters and crabs in a larger area of Campbell Creek and in Whale Branch. Additional tracking of PCB contamination should be conducted via monitoring of oyster tissue and sediment at several locations in Campbell Creek at least annually.

Any contaminants found in groundwater and having potential for reaching Campbell Creek should also be monitored in sediment and oyster tissue at least annually. Toxicity testing should be conducted on "contaminated" groundwater (treated or untreated) before being discharged into Campbell Creek.

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If you have any questions, please call me at 734-5398.

RR/EY/al
cc: Russ Sherer
Bart Ruiter
Coleman Miles
Harry Mathis
George Nelson

Tenny - into Lobeco file

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

Low Country District
Environmental Quality Control
149 Ribaut Square
Beaufort, S.C. 29902
(803) 524-9760

July 14, 1988

M E M O R A N D U M

TO: Andy Yasinsac

FROM: George Nelson

RE: Lobeco Products - your letter of 7-8-88 to Granquist - Tidal Flow

Please keep in mind that the tidal flow for Port Royal Sound, St.Helena Sound and Calibogue Sound is different from most other estuaries in the state. Ours have very little or no fresh water flow into them so that the flushing action is decreased. Even though the tidal velocities are high the water remains in the system for a longer period of time. I suggest we require Lobeco to demonstrate what the true dilution is based on residence time if you don't have that information already.

This concern becomes even more critical when one remembers that they apparently have authorization to use the wastewater treatment facility for incidental spills(see attached). How much of this occurs and of what magnitude we don't know as they apparently don't have to keep records. I dont't think we have any records of Lobeco Products reporting any spills in the past 2 1/2 years.

I don't believe that their biological plant can do more than dilute some of the material on hand. I think it would be prudent for the Department to require them to keep records of spills even though enforcement may be impracticable.

cc: Russ Sherer
Sandra Hursey

Penny - info
Lobeco file

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

Low Country District
Environmental Quality Control
149 Ribaut Square
Beaufort, S.C. 29902
(803) 524-9760

July 14, 1988

M E M O R A N D U M

TO: Andy Yasinsac

FROM: George Nelson

RE: Lobeco Products - your letter of 7-8-88 to Granquist - Tidal Flow

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This concern becomes even more critical when one remembers that they apparently have authorization to use the wastewater treatment facility for incidental spills(see attached). How much of this occurs and of what magnitude we don't know as they apparently don't have to keep records. I dont't think we have any records of Lobeco Products reporting any spills in the past 2 1/2 years.

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cc: Russ Sherer
Sandra Hursey

South Carolina Department of Health and Environmental Control

Gen ww file

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

APR 28 1986

April 24, 1986

MEMORANDUM

TO: Sandra Hursey, Wastewater Enforcement

FROM: Andy Yasinsac, Industrial Wastewater Section Andy Yasinsac

RE: Venture Chemical Co.
NPDES Permit #SC0000914
Beaufort County

There are a number of submittals and concerns relating to the Venture Chemical Company discharge including:

1. Oyster analysis required under Part III, Item 16.
2. Effluent disinfection studies.
3. Effluent toxicity reduction report.
4. Effluent toxicity tests.
5. Request to substitute shrimp testing.
6. Request to terminate weekly PCB analyses.

Results of oyster analysis for metals were about 3 months late. In addition, organics analysis should report identifiable peaks even though they are not priority pollutants. Quantification of those chemicals for which analysis is required under Part III, Item 13 seems reasonable.

The results of the effluent disinfection studies are of some concern. To begin with, a disinfection test in which all undisinfected wastewater already meets effluent limits is uncertain. This criticism of the test is valid despite the fact that meeting the permit limits, in general, is desirable. Another question about the testing is the indication that 25 mg/l of ozone provides no disinfection despite the statement in Wastewater Treatment Plant Design, WPCF MOP 8, that 5-8 mg/l of ozone should be sufficient to disinfect secondary effluent. A particular concern is that no results of ozone analyses in the treated wastewater are reported. Results of analyses for other disinfecting chemicals should also be provided. A final uncertainty relates to the toxicity test results. To begin with, the results of even the undisinfected wastewater test are all more toxic than any other oyster test reported, the least of which has been above 20 percent. Moreover, the results are surprisingly consistent (5 of 6 tests within the range of 12.6 to 14.0 percent) even if all tests had been carried out with the very same wastewater. Neither of these comments negates the results of the tests, but they do indicate a need for additional testing. The reported results seem to be for a single test under each condition.

In general, the toxicity reduction report is a rather disappointing response to the permit requirement. It essentially consists of numerous generalities without data to support them. As a matter of fact, some of the generalities are in direct conflict with the conventional wisdom of sanitary engineering such as the report contention that powdered activated carbon in the treatment system may contribute to toxicity, instead of the reverse. More specific comments on the report are as follows:

1. Item 1.1 of the report says. "Recent macroinvertebrate data and NPDES data verify that Venture's efforts have been effective." However, our biologist (Butch Younginer) says there continue to be indications of impact ("stress"). Also, the toxicity test of late November and during January showed severe toxicity. These suggest that the macroinvertebrate survey, carried out before either of the bad tests, is no longer valid.

2. Item 2.1 says "...no chemical pollutants attributable solely to the Venture operations were observed." This is not true. As an example 1, 1',-sulfonyl-bis-[4-chloro] benzene was found in the effluent in November '83 and in the sediment in November '84.

3. Item 3.1 says Venture has been "...using the following techniques: -eliminate products which could present toxicity problems..." The products eliminated should be specifically stated and removed from the list of chemicals Venture is allowed to make.

4. Also, other "techniques" include, "institute new equalization systems and improve existing equalization systems." Specifically what changes have been made? Any physical changes should be permitted. Procedures should be included in an operating manual.

5. Item 3.2 says "...desorption of refractory compounds can result in increased toxicity", and "addition of powdered activated carbon... has been discontinued." Information at the time carbon addition began indicated that carbon reduced effluent toxicity. No information to contradict this has been submitted. In a letter of July 3, 1985, it was specifically suggested that carbon treatment be evaluated.

6. Procedures set up related to "oxygen uptake and nutrient considerations" should be submitted for review.

7. Any procedures set up to reduce toxicity should be clearly, fully described in a written submittal.

8. The flow reduction that has been accomplished by Venture can be expected to contribute to improve treatment and stream conditions. As such, it is appropriate to modify the NPDES permit to reduce the flow limit, and a limit of about 0.25 million gallons per day (MGD) seems appropriate for monthly average based on the last 6 months of data (through December, 1985).

The recent toxicity tests show that adequate control of toxicity is far from being realized. In addition, the instream evaluation continues to show stress to indigenous organisms, despite there being considerable improvement. The conclusion that no additional facilities are necessary is not supported. Therefore, much more detailed work on this matter is needed. Further evaluation and additional treatment are needed so effluent toxicity is consistently reduced to a suitable level.

Two of the three recent shrimp toxicity test exhibited results much worse than is described by the permit limits. Technical evaluation of that leads to two conclusions:

(1.) An additional complete instream survey should be carried out immediately.

(2.) A means to accomplish ammonia removal should be developed promptly.

The requested substitution of shrimp testing for oyster larva testing has provided suitable biological data regarding the effluent during this winter and should be approved for testing through February, 1986. However, oyster larva testing should resume during March, 1986. Separately, as this need for substitution may recur, additional information must be submitted by Venture before October 31, 1986. This includes at least three parallel tests on shrimp and oysters, with wastewater and treatment conditions equivalent to those occurring at the time of the substitution. Also, other approval of substitution will only be given where documentation of the necessity for such is provided to the department.

As to the requested reduction of PCB analysis, this should continue to be done weekly until an agreement is reached on potential PCB sludge.

AY/sgr

cc: Mike Marcus
George Nelson, DHEC, Beaufort

South Carolina Department of Health and Environmental Control

Jack -
Jay -
place in Jay's file

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

December 18, 1985

Mr. J.M. Meeks, Plant Manager
Venture Chemicals, Incorporated
Post Office Box 815
Lobeco, South Carolina 29931

RE: Notice of Violation
Venture Chemicals, Incorporated
NPDES Permit #SC0000914
Beaufort County

Dear Mr. Meek:

Part III 13.B. of your NPDES Permit requires that you monitor PCB's on a weekly basis with the results reported to the Department when you submit your Discharge Monitoring Reports. However, a review of the files indicates that the weekly sampling has not been conducted.

Please review your permit and submit to my attention within fifteen (15) days of receipt of this notice a statement indicating whether or not you are in compliance with Part I.B.1. of the NPDES Permit; if not, explain corrective action being taken and the date compliance can be expected.

Failure to comply with the conditions of the NPDES Permit violates Sections 48-1-90 and 48-1-110 of the South Carolina Code of Laws, 1976, and makes you amenable to the civil penalties as set forth in Section 48-1-330 of the Code, i.e., a civil penalty not to exceed ten thousand dollars ($10,000.00) per day of such violation.

Pending receipt of a satisfactory response, no further enforcement action will be taken at this time. However, a copy of this letter will be placed in your file and will be used in determining appropriate action to be taken in case of future permit violations. Failure to respond in a timely and satisfactory manner will result in further enforcement action.

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DEC 20 1985
RECEIVED

Sincerely,

Stephen C. Thomas

Sandra L. Hursey for
Environmental Quality Manager
Enforcement Section
Water Quality Assessment and
Enforcement Division

SLH/jbl
cc: Steve Thomas
District Director

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

July 12, 1985

RGB ✓
DGN ✓
CJK ✓
MEW ✓
FILE

Mr. John M. Meeks
General Manager
Venture Chemicals, Inc.
P.O. Box 815
Lobeco, SC 29931

Re: NPDES Permit #SC0000914
Beaufort County

Dear Mr. Meeks:

This letter is in response to a number of your recent submittals concerning your discharge. These include oyster toxicity of your effluent, PCB data on your wastewater system, and shrimp toxicity testing scheduled for June, 1985.

Glenda Swearingen, in our Biological Services Section, had a number of comments on your oyster toxicity testing, and her memo stating those is enclosed. These comments have previously been discussed with Rick Shealy of Aquatic Analysts.

The PCB data, which you have submitted thus far, is somewhat ambiguous. The residue from the manhole upstream of Morgan Road was contaminanted with PCB's, but PCB's were not found in the holding basin at the detection limit used. To be clear about what may have occurred, three changes are indicated:

1. Analyses of sludge should have a detection limit no higher than 0.1 mg/kg, and 0.010 mg/kg, if possible;

2. Analysis of a residue sample from the second manhole upstream of Morgan Road would be helpful; and,

3. Effluent analyses, having a detection limit of 1 ug/l or less, are needed.

The South Carolina Department of Health and Environmental Control data from May 1, 1985 sampling, confirms the above comments. A copy of the data is enclosed.

The procedures you described in your letter of June 18, 1985 concerning shrimp toxicity testing, are suitable. However, it may be necessary to ask for an additional test if the dilutions used are not low enough to establish a 96-hour LC_{50}.

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JUL 17 1985

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. BOX 12559
217 FORT JOHNSON ROAD
CHARLESTON, SOUTH CAROLINA 29412

April 15, 1985

Mr. Robert G. Gross
Chief, Bureau of Wastewater
and Stream Quality
S.C. Department of Health and
Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Re: Venture Chemical Company, Permit No. SC0000914 (current revision)

Dear Mr. Gross:

The U.S. Fish and Wildlife Service (USFWS) has just reviewed the subject draft permit describing the new effluent limitations and monitoring requirements for Venture Chemical Company. We commend the S.C. Department of Health and Environmental Control (SCDHEC) for development of more stringent environmental safeguards, especially the biomonitoring tests and studies proposed for oysters, the study plan to reduce discharge toxicity, and the macroinvertebrate assessments. We feel that these improvements are a direct result of our cooperative interagency efforts (i.e., USFWS, S.C. Wildlife and Marine Resources Department (SCWMRD), S.C. Coastal Council (SCCC), and SCDHEC). These new requirements represent the first step in resolving serious water quality problems.

Obviously the efficacy of the new effluent restrictions are dependent on follow up. In order to assure continued improvements of Venture discharge, the Service would like to continue our joint cooperative approach. We understand, through conversations with SCWMRD biologists, that SCDHEC will furnish copies of monitoring reports as they become available. We would like to be included on this distribution. This will help keep us informed of Venture's progress. We would also like to be informed of any "upset" that SCDHEC monitoring or Venture self-monitoring might reveal. If problems arise, we will be glad to meet and discuss them, even on short notice.

We appreciate the opportunity to coordinate with SCDHEC in resolving these problems of mutual concern and we look forward to continued coordination with your agency on this and other serious water quality problems.

Sincerely yours,

Catherine D. Duncan

Catherine D. Duncan
Acting Field Supervisor

CDD/HG/lm

Gary

Venture Chemicals, Inc.

September 6, 1984

South Carolina Department of
Health and Environmental Control
Bureau of Solid and Hazardous Waste
2600 Bull Street
Columbia, South Carolina 29201

attn: Ms. Debbie Browning

re: Priority Pollutant Analysis, December, 1983

Dear Debbie:

This letter is in response to your telephone request of September 5, 1984, regarding information related to Priority Pollutant Analysis as reported in Davis & Floyd, Inc.'s report for samples analyzed in December, 1983, for Venture Chemicals, Inc.

Below listed are those compounds questioned and opinions of Davis & Floyd, Inc. and Venture Chemicals, Inc. personnel as to source of the minute quantities found.

1. Di-Ethyl Phthalate - Bis(2-Ethylhexyl)Phthalate and Di-N-Butyl Phthalate

   Phthalate compounds were found in all samples; raw water, influent and effluent and are commonly found in priority pollutant analysis. EPA protocol is followed in selection of equipment and supplies used in sampling for priority pollutant analysis, but a possible source of contamination comes from tubing used in sampling of liquid materials.

2. Methylene Chloride

   Methylene Chloride has been described by many professional technical personnel as being one of the most difficult of listed compounds for analysis in small quantities due to potential for contamination. Sources for contamination include the laboratory in which analysis are conducted since this is primary solvent used in extractions for priority pollutant analysis.

SEP 12 1984

3. Toluene

Toluene was not found in raw water nor influent samples, but at 16 ug/L in effluent. This small quantity is assumed to be ample contamination or lab error. This is another compound that is used in substantial quantities in laboratories conducting analysis. August 10, 1984 analysis was reported at 7 ug/L in effluent analysis.

4. Penachlorophenol

This compound found in effluent only at 428 ug/L was resampled and reanalyzed for two (2) consecutive months following this analysis and again in August, 1984. Below listed:

January, 1984	Below detectable limit of instrument.
February, 1984	Below detectable limit of instrument.
August, 1984	Below detectable limit of instrument.

At this point of analysis, it became obvious that original reported analysis was in error.

5. Chlorobenzene

It is believed that this compound found in influent sample, at 23 ug/L, could possibly have originated in side reaction during synthesis of Quinizarine, a dyestuff intermediate manufactured during that time. As of April 1, 1984, Quinizarine was removed from Venture Chemicals, Inc. product line and is not intended for manufacture at this location in the future. August 10, 1984, priority pollutant analysis on effluent, chlorobenzene was below detectable limits of instrument.

Should you have questions concerning any of this information, please feel feel free to call me.

Sincerely,

John M. Meeks

John M. Meeks
General Manager

cc: R. S. Andrews, VCI - Lafayette, LA
J. M. Huckabee, VCI - Lobeco, SC
R. S. Powell, Davis & Floyd, Inc., Greenwood, SC
W. G. Dukes, SCDHEC - Beaufort, SC
B. Harvey, Harvey & Battey, P.A. - Beaufort, S.C.

Venture Chemicals, Inc.

RECEIVED

APR 23 1984

BUREAU OF WATER
POLLUTION CONTROL

April 20, 1984

Mr. Andy Yasinsac
South Carolina Department of
Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

re: Coliform Analysis

Dear Andy:

Below listed are coliform analysis on Venture Chemicals, Inc., Lobeco's effluent per your telephone request of March 30, 1984.

DATE	Total Coliform (MPN)	Fecal Coliform (MPN)
4-4-84	1,400	0
4-5-84	800	0
4-6-84	800	0
4-7-84	17,500	0
4-8-84	<2	0
4-9-84	1,300	0
4-10-84	3,300	0
4-11-84	27,800	0
4-12-84	400	0
4-13-84	500	0
4-14-84	<2	0
4-15-84	<2	0
4-16-84	500	0
4-17-84	4,900	0

Mr. Andy Yasinsac
Coliform Analysis
April 20, 1984
Page Two

Per our telephone conversation, daily additions of HTH to treated waste began on March 30, 1984. On April 17, 1984, continuous chlorination of treated effluent began via chlorine gas. Coliform analysis are continuing, and additional analysis will be forwarded to you on April 30, 1984.

If you should need any additional information, please feel free to let me know.

Sincerely,

VENTURE CHEMICALS, INC.
LOBECO DIVISION

John M. Meeks

John M. Meeks
General Manager

JMM:nk

cc: R. Andrews, Venture Chemicals, Inc. - Lafayette
R. Gross, SCDHEC, Wastewater Division - Columbia
B. Harvey, Harvey & Battey, P.A. - Beaufort
R. Powell, Davis & Floyd, Inc. - Greenwood

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

April 10, 1984

TO: Luke Hause
Director of Shellfish & Recreational Waters

FROM: Russell E. Berry REB
Shellfish Manager
Low Country District

THRU: Marshall Dixon
District Director
Low Country District

Shellfish growing water samples in area 14, in Whale Branch and the Huspah Creek area, have been sporadically unacceptable for areas open to shellfish harvesting. The source of contamination has not been conclusively identified.

There are two permitted discharges into tributaries of the waters of this area. These discharges are James J. Davis Elementary School and Venture Chemical Company. In trying to determine the source of contamination, I have increased sampling frequency in this area and sampled the discharges.

Sampling results of both waste treatment plants indicate that bacteria are being discharged in great enough numbers to be a possible cause of bacterial water quality problems. Both waste treatment systems provide chlorination. James J. Davis Elementary School provides a flow thru tablet type chlorination. Venture Chemical Company periodically adds HTH to the final polishing pond. The chlorination at Venture is used whenever high fecal coliform levels are detected thru self-monitoring.

Because of the chemical nature of the waste discharge at Venture Chemical, I am concerned that chlorination may result in the production of THMs or chlorinated hydrocarbons. However, some type of disinfection is necessary. There are no established limits for bacteria on the second phase of Venture Chemicals permit. The limits on James J. Davis Elementary are for fecal coliform only.

Upon further investigation at Venture Chemical it appears that two plant upsets have occurred in the Waste treatment system since January 1, 1984. On March 29, 1984, I accompanied Jay Kook on an inspection at Venture Chemical. We met with Pat Garrett, the treatment plant operator. Pat Garrett stated that it takes 10 days to three weeks for the treatment system to get back into efficient operation and provide adequate treatment. To rejuvenate the system after the "plant upsets", waste sludge from domestic plants and acclimated "super bugs" are used to seed the plant.

Pat Garrett stated that the flows at the Venture plant have increased from 0.150 MGD to a maximum of 0.350 MGD. Before 12/15/83, flows ranged from 0.125 MGD to 0.150 MGD. As of 1/1/84, flows ranged from 0.300 MGD to 0.350 MGD. The DMRs of James J. Davis School indicate that their flow is approximately 0.003 MGD.

At the Venture site they are producing one type of pesticide and a component of another pesticide. This waste is being discharged into Campbell Creek then to Whale Branch and Huspah Creek (see EPA Dye Study). This waste discharge at the time of plant "up-sets" is not being sufficiently treated. The two materials being produced are "Krenite" and "intermediate 1292." The "intermediate 1292" is produced for Pittsburgh Paint and Glass. I am concerned that the waste from this production of these products may possibly be concentrated in the food chain.

I have consulted with Marshall Dixon on this matter. Until we can isolate and eliminate the source of bacterial contamination and address some of the concerns about possible chemical contamination we concur with the FDA's recommended closure zone as a preventative health measure.

Thank you for your help in this matter.

cc: Marshall Dixon
Jay Kook
Area 14 File
Venture File
Jim Joy
Russ Sherer

South Carolina Department of Health and Environmental Control

May 9, 1984

TO: Venture File

FROM: Marshall Dixon
District Director
Low Country District

RE: Venture Chemical
Wastewater
Beaufort County

The following information was obtained from S. C. Water Resources Commission.

VENTURE CHEMICAL WELL FLOWS

	TOTAL-MONTHLY	DAILY (MONTHLY/30)
October, 1983	6,420,000 gpd	214,000 gpd
November, 1983	6,000,000 gpd	200,000 gpd
December, 1983	8,180,000 gpd	2,726,000 gpd

cc: Jim Joy

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

April 13, 1984

MEMO TO FILE

RE: Venture Chemical Company, Beaufort County
Campbell Creek - Whale Branch

JLHause

Approximately 2 years ago, the subject company applied for an NPDES permit to increase their discharge of treated industrial waste into Campbell Creek. Campbell Creek has been closed to shellfish harvest for at least 8 years, according to our files, and therefore, no shellfish should have been harvested from that area. Actually, the closure zone includes all of Campbell Creek and the nearside of Whale Branch at its confluence with Campbell Creek and 500 feet to the left and 500 feet to the right on the same bank side that Campbell Creek is on.

The notice for application for the increased discharge by Venture went to various agencies for review and the S.C. Wildlife and Marine Resources site inspected Campbell Creek and took an oyster meat sample from there. This oyster meat sample was analyzed by their laboratory and the results were brought to the attention of EPA and FDA shellfish personnel. The levels of chromium and cadmium found in the oysters were as shown on the attached memorandums. Since that episode, the Department of Health & Environmental Control has re-sampled and reaffirmed the sanitary quality of shellfish in the adjacent open waters of Whale Branch. Water samples and meat samples were taken and analyzed for heavy metals and pesticides. Further, an increased sample activity was recommended to the Low Country District. (See copy of attached memorandum.)

When FDA came into our state in February to get a performance review of their own inhouse capabilities, they focused in on Area 14, which contains the Venture Chemical/Whale Branch/Campbell Creek complex. Having had the prior knowledge that something was happening there, like an increased discharge, etc., they, of course, made some recommendations for our staff to implement with regards to increasing the buffer zone, if necessary, and closing off certain other areas that are not now closed.

Accordingly, DHEC shellfish staff proceeded to establish 4 or 5 new stations around the Campbell Creek confluence with Whale Branch. These results have been tabulated, and decisions have not been made, as yet, to increase the closure area around Campbell Creek. But, it appears that because Venture Chemical has tripled their effluent, the impacted area has correspondingly increased.

Recently, several news agencies have asked what DHEC is doing about it, and some individual medical doctor in Beaufort has asked for an injunction to cease the discharge of Venture Chemical into Campbell Creek. The status of this injunctive relief is not known.

The DHEC shellfish staff have a good collection of sample data from around the area. A determination will be made soon regarding the necessity of an increased buffer zone or closure area around Campbell Creek as it confluences with Whale Branch. Mr. Warren Hardy of the Commissioner's office has been advised of the details of a recent conversation between the Charleston News and Courier reporter and the shellfish office.

Please find attached all recent data pertinent to this particular project.

/ms

Attachments

cc: Bob Gross, Chief, Bureau of Water Pollution Control
George Nelson, Chief, Bureau of Water Supply & Special Programs
Marshall Dixon, District Director, Low Country District

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

March 27, 1984

TO: Jim Joy
Industrial Wastewater Division

FROM: Marshall Dixon
Low Country District

RE: Venture Chemicals
Wastewater
Beaufort County

For the past few months we have been collecting unsatisfactory water samples in Whale Branch and we suspect that Venture Chemical's discharge could be causing some or most of the problem.

A recent sample of Venture Chemical's effluent showed >240,000 total coliforms per 100 ml. As you probably know, the total coliform standard for SA waters is 70 coliform per 100 ml and no more than 10% of the samples can exceed 230 coliform per 100 ml. Any discharge into SA waters should be required to meet a 70/100 ml total coliform limit.

If chlorination is used as a disinfectant, chlorinated organic compounds may be worse than the coliform bacteria. Other types of disinfection could be used but these methods are normally not as reliable as chlorine for disinfection.

Venture has been seeding its treatment plant with digestor sludge from Fripp Island STP and the City of Beaufort STP. We believe the chemicals in the wastewater kill off most of the bacteria in the treatment plant and the treatment plant has to be reseeded. Seeding the treatment plant with a large volume of digester sludge periodically could be causing the excessive amounts of total coliform bacteria in Venture's discharge.

Your comments or suggestions concerning this matter would be greatly appreciated.

cc: Luke Hause
cc: Jay Kook
cc: Russell Berry

American Color & Chemical Corporation

P.O. Box 88
Mt Vernon Street
Lock Haven, Pa. 17745
Telephone (717) 748-6747

January 28, 1981

Mr. Robert G. Gross, P.E.
Director, Industrial Wastewater Division
Bureau of Wastewater Control
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Re: NPDES SC0000914
Lobeco, Beaufort County

Dear Mr. Gross:

I am enclosing for your information and file the analysis on our final effluent for priority pollutants.

For reference, we are also including sample locations, collection field data sheets and analysis on raw water and mixed effluent.

Note that no pesticides have been found. The reports are self-explanatory.

Should you have any questions, please call.

Very truly yours,

J. F. Jacobetz

J. F. Jacobetz, Director
Safety & Environmental Services

JFJ/hew

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

E. KENNETH AYCOCK, M.D., M.P.H., COMMISSIONER
J. MARION SIMS BUILDING — 2600 BULL STREET
COLUMBIA, SOUTH CAROLINA 29201

October 1, 1976

MEMORANDUM

TO: Wayne Fanning

THRU: Tom Kurimcak

FROM: Ronald W. Kinney R.W.K.

REFERENCE: Special PCB Sampling

Please sample the following dischargers for PCB's during the appropriate week:

1. American Color and Chemical - October 4-8, 1976
2. North Charleston-Elgin Street - October 4-8, 1976
3. Veron Corporation - October 11-15, 1976
4. Westinghouse Electric - October 11-15, 1976

The sampling should be a one day grab sample from the effluent.

RWK:aa
cc: Organic Chemistry
Marshall Dixon

LOBECO PRODUCTS, INC. Penny - info & file

P.O. BOX 815
LOBECO, SOUTH CAROLINA 29931

(803) 846-8171

SC HWY. 38
LOBECO, SOUTH CAROLINA 29931

July 27, 1989

Ms. Sandra Hursey
Environmental Quality Manager
Water Quality Assessment
and Enforcement Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Re: 1989 Oyster Spat Recruitment, NPDES Permit No. SC0000914

Dear Ms. Hursey:

The attached reports present the results of the required oyster spat recruitment study at Lobeco Products, Inc. for 1989.

Please note that there were no differences in spat numbers attributable to the permitted discharge.

Sincerely,

Victor M. Granquist
Environmental Manager

VMG:lkf

cc: George Nelson
Bob Gross
LPI circulation

LOBECO PRODUCTS, INC. Jenny - Bill's Comment & Sandra

P.O. BOX 815
LOBECO, SOUTH CAROLINA 29931

(803) 846-8171

Sent to Andy SC HWY. 38
LOBECO, SOUTH CAROLINA 29931

THIS STUDY SHOWS THAT OYSTERS WILL GROW IN THIS AREA (AROUND CAMPBELL CREEK), IT DOES NOT ~~AD~~ ADRESS THE ISSUE OF WHAT THESE OYSTER MAY CONTAIN, MANY MARINE ANIMALS HAVE A TOLERANCE FOR CHEMICALS WHICH ARE HARMFUL TO PEOPLE, AS FAR AS STATION 3 CATCHING THE MOST SPAT, IT WAS IN A BIGGER BODY OF WATER WITH GREATER FLOWS, THUS WAS EXPOSED TO A GREATER NUMBER OF ~~the~~ OYSTER ~~[illegible]~~ LARVAE
WRS

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JUL 1 4 1988
S.C. Dept. of Health & Environmental Control - Industrial - Agricultural Wastewater Division

July 11, 1988

Henry Gibson, Manager
NPDES Administration Section
South Carolina Department of
Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

re: NPDES Permit No. SC0000914, Beaufort County

Dear Mr. Gibson:

Attached please find two copies of the report concerning the annual oyster spat recruitment study for 1988, as required by the NPDES permit for this facility.

As shown in the report, the number of spat collected in Campbell's Creek as compared to the control stations indicates that there is no adverse effect on oyster spat settlement due to Lobeco Product's, Inc.'s discharge. In fact, the greatest number of spat was collected at the mouth of Campbell's Creek, and the station nearest the discharge point yielded more spat than one of the controls, Station No. 1.

The reduced overall number of spat collected at all stations in 1988 versus 1987 is quite probably due to early spawning during abnormally hot temperatures of early May.

As you may recall, the 1987 in-stream macroinvertebrate assessment showed there was no significant difference in total number of oysters between Campbell's Creek and the control stations. This combined with the oyster spat recruitment study and oyster tissue analyses indicates that the referenced discharge is not currently having an adverse effect on the oyster population in Campbell's Creek, nor has it had an adverse effect on the oyster population in the recent past.

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Thus, the level of toxicity (as measured by the Mysid shrimp acute flow-through bioassays) exhibited by Lobeco Products, Inc.'s discharge is less than the toxicity level that would be required to result in an adverse effect on the oyster population.

If you have any questions concerning the above information, please don't hesitate to call.

Sincerely,

Victor M. Granquist
Environmental Manager

VMG:nls

cc: Andy Yasinsac
R. S. Andrews
J. M. Meeks
Ed Barnhart

AN ASSESSMENT OF OYSTER SPAT RECRUITMENT IN CAMPBELL CREEK NEAR LOBECO PRODUCTS, INC., BEAUFORT COUNTY SOUTH CAROLINA

May - June, 1988

Report To

LOBECO PRODUCTS, INC.

Lobeco, South Carolina

Prepared By

SHEALY ENVIRONMENTAL SERVICES, INC.
400 Graymont Avenue
Columbia, South Carolina 29205
(803) 254-9915

SCDHEC Laboratory Certification No. 26103

Reported By: Glenda R Swearingen
Glenda R. Swearingen, Project Manager

RECEIVE

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I. SUMMARY

An oyster spat recruitment study conducted May 12 - June 11, 1988 in the Campbell Creek area, Beaufort County, South Carolina, near LOBECO PRODUCTS, INC., demonstrated that settlement of oysters was occurring at all stations sampled. A total of 773 oysters were collected from four stations during the sampling period. There was considerable variation in the settlement between the four stations (72% mean difference between control stations) with no significant difference in oyster settlement being observed downstream from the LOBECO PRODUCTS, INC. discharge (Station 2) and Station 1, one of the controls. The greatest number of oysters was collected at Station 3, at the mouth of Campbell Creek.

II. INTRODUCTION

An assessment of oyster spat recruitment in Campbell Creek, Beaufort County, South Carolina, was conducted May 12 - June 11, 1988 by SHEALY ENVIRONMENTAL SERVICES, INC. to determine the recruitment of oysters into Campbell Creek near LOBECO PRODUCTS, INC.

III. DESCRIPTION OF STUDY AREA

The general characteristics of the saltmarsh environment under study have been described previously (Marcus and Swearingen, 1984). Specific station locations are given in Table 1 and Figure 1.

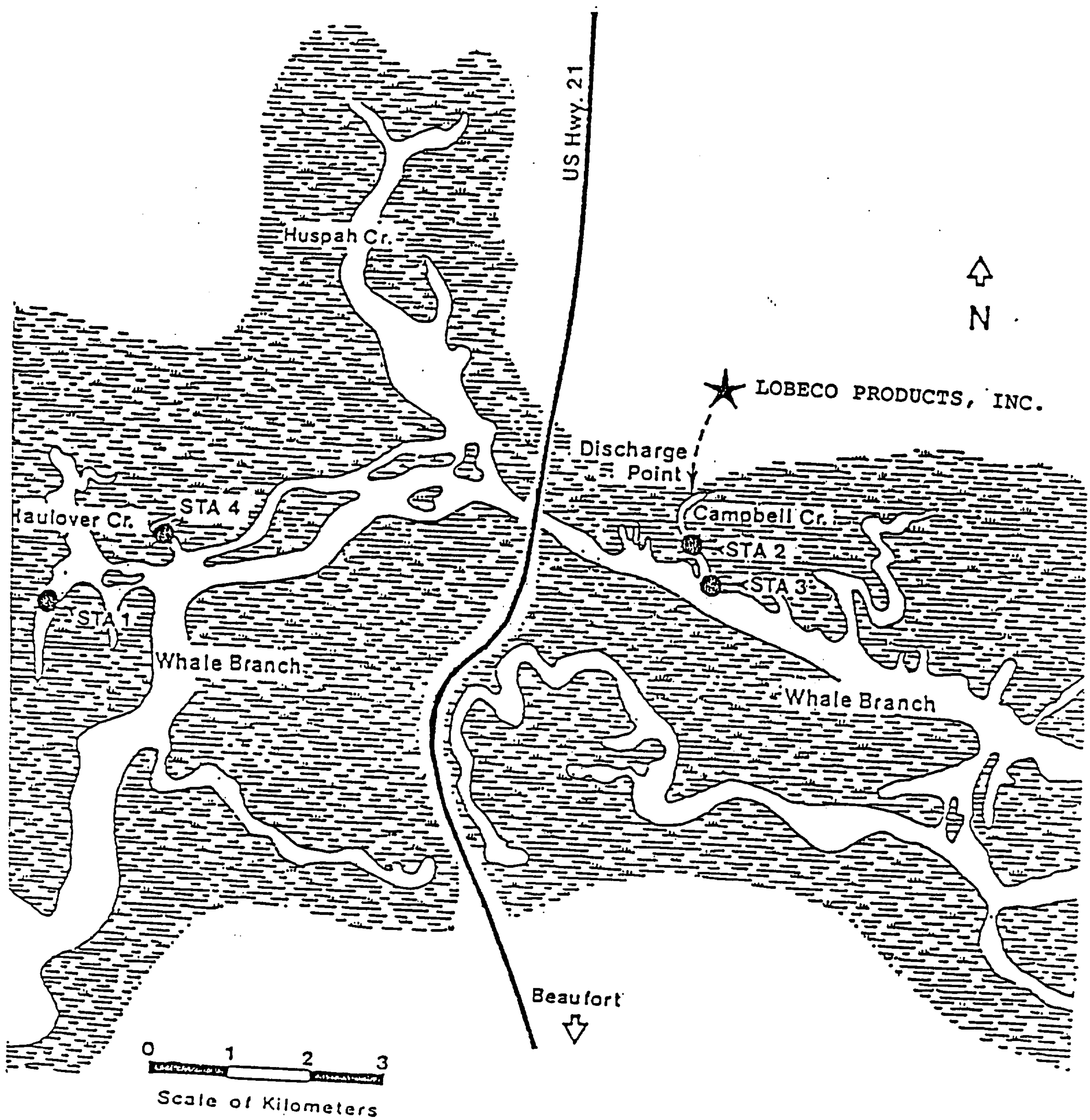
Table 1. Station Location Descriptions at Campbell Creek, Beaufort County, South Carolina, May 12 - June 11, 1988.

Station 1:	Unnamed tributary to Haulover Creek, approximately 25 meters south of confluence with Haulover Creek (at SCDHEC's Station MD-631)
Station 2:	Campbell Creek, approximately 300 meters south of LOBECO PRODUCTS, INC.'s final effluent discharge point (at SCDHEC's Station MD-630)
Station 3:	Campbell Creek at confluence with Whale Branch (at SCDHEC's Station MD-538)
Station 4:	Unnamed tribuary to Whale Branch, approximately 400 meters northwest of confluence with Whale Branch, north of Haulover Creek (not sampled by SCDHEC)

IV. METHODS AND MATERIALS

Differences in settlement of oysters, <u>Crassostrea virginia</u> (Gmelin), on artifical substrates were determined after a four week exposure period (May 12 - June 11, 1988).

Figure 1: Station locations for oyster spat recruitment study May 12 - June 11, 1988, LOBECO PRODUCTS, INC., Beaufort County, South Carolina.



Unglazed ceramic tiles (19 x 9 centimeters each) which were grooved on one side were used as artifical substrates. Each sampler was composed of four tiles attached on alternating sides of a wooden crossbar (2.5 centimeters wide x 0.5 meters long). Three samplers were deployed approximately one meter apart in the mid-intertidal zone of each station by attaching each end of the sampler to a wooden stake embedded in the substrate. The tiles were parallel to and approximately 5 centimeters off the bottom.

Upon recovery, each tile was placed in a separate plastic bag and returned to the laboratory. The tiles were rinsed over a U.S. Standard No. 30 sieve. All oyster spat attached to the tiles and any that were dislodged during rinsing were counted.

Significant differences in total numbers of oysters attached to the artifical substrates between stations were determined by a one-way analysis of variance. Where the F statistic was significant at p=.05, Tukey's Multiple Comparison Test was used to delineate which stations differed from one another (Ott, 1977).

V. RESULTS

Results of the oyster settlement data collected May 12 - June 11, 1988 demonstrated that recruitment and settlement of oysters was occurring at all stations (Table 2). Although there were a few oysters about 2-3 millimeters (mm) in size at all stations, almost all the spat were less than 1 mm with 95% of the settlement occurring

Table 2: Number of oysters collected from artificial substrates, May 12 - June 11, 1988, LOBECO PRODUCTS, INC., Beaufort County, South Carolina.

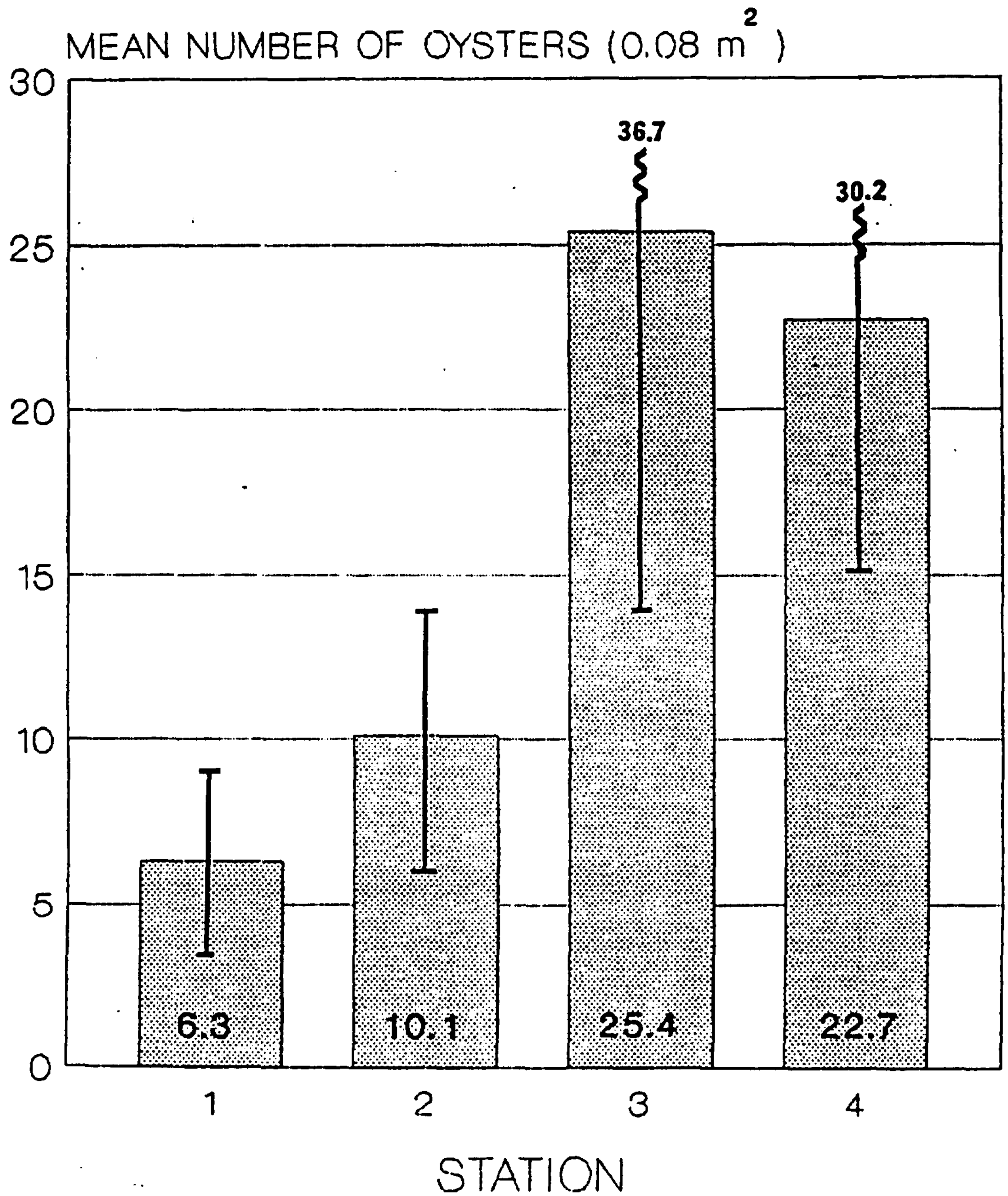
	Number of Oysters			
	Station			
Replicate	1	2	3	4
	5	8	17	25
A	4	10	15	43
	5	14	23	29
	4	15	13	13
	4	8	24	19
B	10	15	26	14
	6	16	47	19
	12	8	27	22
	7	8	28	25
C	2	4	28	22
	9	7	10	22
	7	8	47	19
Total	75	121	305	272
Mean	6.3	10.1	25.4	22.7
Std. Dev.	2.8	3.7	11.3	7.5

on the tile surface facing the bottom substrate. A total of 773 oysters were collected during the sampling period with the greatest settlement occurring at Station 3, at the mouth of Campbell Creek (Figure 2). There was considerable variation between the four sampling stations (72% mean difference between control stations). There were no significant differences between Stations 1 and 2 and between Stations 3 and 4. However, Stations 3 and 4 had significantly more ($p < 0.05$) oysters than Stations 1 and 2. There was 38% more oysters collected from Station 2 (the station nearest to the discharge) than Station 1, one of the controls and 11% more oysters collected from Station 3 than the other control, Station 4.

VI. CONCLUSIONS

No adverse effect on settlement of oysters was observed at Station 2 or Station 3 in Campbell Creek downstream from LOBECO PRODUCTS, INC.'s final discharge based on statistical comparisons with the control stations. The differences seen between stations reflect the natural variability that exists in oyster settlement (Buroker, 1983) and does not suggest any correlation to the LOBECO PRODUCTS, INC. wastewater discharge.

Figure 2: Comparison of mean number of oyster spst collected May 12 - June 11, 1988, LOBECO PRODUCTS, INC., Beaufort County, South Carolina.



Bars represent plus/minus one standard deviation
Numbers inside of columns represent mean values

VII. REFERENCES

Buroker, N.E. 1983. Genetic differentiation and population structure of the American oyster *Crassostrea virginica* (Gmelin) in Chesapeake Bay. Journal of Shellfish Research Vol. 3, No. 2, 153-167.

Marcus, J.M. and G.R. Swearingen. 1984. A summary of water quality sampling activities at Campbell Creek, Beaufort County, South Carolina, November, 14-15, 1983 through December 5, 1984. South Carolina Department of Health and Environmental Control, Bureau of Water Pollution Control, Tech. Rep. No. 037-83. Columbia, South Carolina. 47pp.

Ott, L. 1977. An introduction to statistical methods and data analysis. Wadsworth Publishing Co., Belmont, CA. 730 pp.

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

June 12, 1989

Mr. R.D. Pruessner
Manager of Environmental Affairs
Tenneco, Inc.
Post Office Box 2511
Houston, Texas 77001

RE: Proposed Amendment to Consent Order 87-65-W
Tenneco Resins, Inc.
American Color and Chemical Corporation
Lobeco Products, Inc.
Beaufort County

Dear Mr. Pruessner:

Enclosed is the proposed Amendment to Consent Order 87-65-W which we discussed at our meeting in April. Read it carefully and, if acceptable, coordinate with the other parties in obtaining the appropriate signatures. When the Amendment has been fully executed, a copy will be returned to you for your records.

If you have any questions concerning the order, please call me at 734-5304. I will be glad to assist you.

Sincerely,

Sandra L. Hursey

Sandra L. Hursey
Environmental Quality Manager
Water Quality Assessment and
Enforcement Division

SLH/sh
cc: George Nelson
Andy Yasinsac
Tom Knight
Miles Coleman
Rick Renfrow
Russ Sherer
Steve Thomas
James P. Fields, Jr.
Primo Marchesi
John Meeks
Brantley Harvey Jr.
Bob Gross
Ann Pizzorusso
Sam Lane
Roger D. Towe
Ralph Mellom
Jack Kelly

STATE OF SOUTH CAROLINA

BEFORE THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

IN RE: Tenneco Resins, Inc.
American Color & Chemical Corporation
Lobeco Products, Inc.
Beaufort County

AMENDMENT TO CONSENT ORDER 87-65-W

WHEREAS, the South Carolina Department of Health and Environmental Control (Department) issued Consent Order 87-65-W to Tenneco Resins, Inc., American Color and Chemical Corporation, and Lobeco Products, Inc. (referred to collectively as the Respondents) on July 25, 1987; and,

WHEREAS, On October 19, 1988, the Respondents submitted to the Department a Remedial Action Plan (Plan) including an implementation schedule, in accordance with Order requirements; and,

WHEREAS, by letter of February 27, 1989, the Department approved the Plan, including the implementation schedule, for the removal of high level contamination at the abandoned lagoon and the abandoned burn site; and,

WHEREAS, due to discussions at a meeting on April 13, 1989, the parties have decided to amend the Consent Order.

NOW, THEREFORE, IT IS ORDERED, CONSENTED TO AND AGREED that the Respondent shall:

1. Implement the Plan in accordance with the approved schedule. The final remediation design/work plan, to be completed in accordance with the National Contingency Plan (NCP), shall be submitted to the Department no later than July 17, 1989. The Safety plan, to be completed by the Respondent's contractor, shall be completed in accordance with OSHA standards and approved by the Department before work at the site(s) begins.

Perform analysis of oysters for organics (volatiles and acid and base/ neutral extractables) and metals (arsenic, cadmium, chromium, copper, lead and nickel) and report the results to the Department within forty-five (45) days after sampling. The analysis shall be performed before the pretreatment system for the ground-water dewatering process is placed into service and, within sixty (60) days after the pretreatment system is no longer in use. Samples shall be taken from the mouth of Campbell Creek, near the confluence of Huspah Creek and Whale Branch, and from the mouth of Haulover Creek. If either of the required sampling dates falls between the period July - November, it may be substituted for the NPDES permit requirement.

3. While the pretreatment system for the contaminated ground-water is in use:

   (a) The flow limit of the NPDES permit (average) shall be increased to .45 MGD. All other NPDES permit effluent parameters shall remain unchanged.

   (b) The PCB level in the discharge from the pretreatment system shall not exceed 0.5 ug/l. The discharge shall be monitored for PCBs twice per week and the results submitted to the Department as an attachment to the monthly discharge monitoring report.

4. Within sixty (60) days of issuance of this amendment, submit to the Department an approvable plan to include an implementation schedule, to completely define the horizontal and vertical extent of ground-water contamination. The schedule will include a final report which will include a plan for remediation of contaminated ground-water. The proposed plan shall include the drum storage area and areas outside the slurry walls at the abandoned lagoon site and the burn site. Upon Department approval of the plan, including the implementation schedule,

it shall become an enforceable part of this Order, and the Respondents shall carry out the approved plan in accordance with the approved schedule.

IT IS FURTHER ORDERED AND AGREED that the Respondent shall be responsible for obtaining all Department permits to construct and to operate. This shall include, but not be limited to, permits for ground-water monitoring wells and the pretreatment system.

IT IS FURTHER ORDERED AND AGREED that this Amendment shall be incorporated into Consent Order 87-65-W.

IT IS FURTHER ORDERED AND AGREED that failure to comply with any provision of this Order shall be grounds for appropriate sanctions and further enforcement action.

THE SOUTH CAROLINA DEPARTMENT OF
HEALTH AND ENVIRONMENTAL CONTROL

BY: ______________________________
Michael D. Jarrett
Commissioner

BY: ______________________________
James A. Joy, III, P.E., Chief
Bureau of Water Pollution Control

Date: ________________, 1989
Columbia, South Carolina

South Carolina Department of Health and Environmental Control

received
MAY 11 1989

2600 Bull Street
Columbia, S.C. 29201

May 9, 1989

Mr. Brian Holaway
EPA Region IV
345 Courtland Street
Atlanta, GA 30365

Dear Mr. Holaway:

Please find enclosed a copy of the Update Preliminary Assessment for the American Color and Chemical/Venture Chemical Company Site which you requested. The PAR was completed by Charles Strange on December 2, 1988 with a rating of a High Priority for an SSI.

Please contact me if I can be of further assistance.

Sincerely,

David W. Nix
Site Screening Screening
Bureau of Solid and Hazardous Waste Management

DWN/njw

Enclosure

Ref 3-4 are missing

UPDATED PRELIMINARY ASSESSMENT REPORT
American Color and Chemical/Venture Chemical
SCD 046 507 018
Beaufort County

Completed by: Charles Strange
Date completed: December 2, 1988

I. INTRODUCTION/EXECUTIVE SUMMARY

The American Color and Chemical/Venture Chemical site is now owned by Lobeco Products, Inc. The Lobeco Products, Inc. facility is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Coosaw River.

The plant was built by Tenneco Chemical Company (later Tenneco Resins, Inc.) in 1967, but was purchased by American Color and Chemical Company in January, 1974. American Color and Chemical Company subsequently sold the facility to Venture Chemical Company (now Lobeco Products) in October, 1982. Lobeco has operated the facility since that time (Ref. No. 6, pg. 2).

The plant primarily manufactures agric-products, dye intermediates and drilling fluid chemicals for the oil industry. Chemicals used and produced on-site consist primarily of organic compounds. Acidic industrial wastewater from the plant is treated and neutralized on-site, prior to discharge to Campbell's Creek. Elevated chlorides and volatile organics have been detected in the groundwater on site. PCBs and Hg have also been detected in the groundwater. An area of stressed vegetation was found to have elevated levels of chromium and lead. A high priority for a screening site inspection is assigned.

II. SITE BACKGROUND AND HISTORY

A. Ownership History

The plant was originally owned by Tenneco Chemical Company (later Tenneco Resins, Inc.) but was later purchased by American Color and Chemical Company in January, 1974. American Color and Chemical subsequently sold the facility to Venture Chemical Company (now Lobeco Products) in October, 1982. Lobeco Products, Inc. has operated the facility since that time.

B. Site Description

The facility is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Coosaw River. No schools or Day Care Centers were noted in the vicinity of the

site by reviewing topographic quadrangle maps. The geographical coordinates of the site are latitude 32 degrees, 33 minutes, 03.0 seconds and longitude 80 degrees, 43 minutes, 46.0 seconds (Ref. No. 8).

C. Regulatory History/RCRA Summary

The Lobeco site is under a Consent Order dated August 8, 1988 for violation of its NPDES permit (Permit #SC 0000914) by discharging waste into the environment in violation of the discharge permit, specifically in violation of the toxicity, biochemical oxygen demand, total coliform and ultimate oxygen demand limits. Lobeco was ordered to immediately begin and continue to properly operate and maintain its waste treatment facilities so as to maximize treatment.

Lobeco Products, Inc. were protective filers under RCRA. Lobeco Products, Inc. submitted their part A application under RCRA because of treatment in tanks and surface impoundments. It was later determined that the tank treatment was not under RCRA as it was a Waste Water Treatment Unit. Additionally the waste in the surface impoundment was determined to be non-hazardous. Lobeco requested withdrawal of their RCRA notification/application. The withdrawal was approved on October 18, 1984.

D. Process and Waste Disposal History

Active waste management facilities at the site are part of the NPDES water treatment system (extended aeration and activated sludge) and consists of the following:

- Equalization basin
- Aeration basin
- Digester basin
- Clarifiers (two)
- Drying beds
- Holding ponds (east and west ponds)

Inactive or abandoned waste sites on the property include the following: (Ref. No. 5, pp. 12,13,14 & 15).

1. Abandoned Lagoon Site - Soil samples have shown contamination of 6750 ppm of Pb and 54 ppm of TCB (Ref. No. 7, p. 37).

2. Burn Site - Soil samples have shown 250 ppm of PCB's and 19 ppm of Hg and groundwater monitoring wells have shown 114 ppm PCB's and 180 ppm of Trichloroethene (Ref. No. 7, p. 47).

3. Drum Storage Area - Carbon Tetrachloride found at 89 ppm in monitoring well (Ref. No. 7, p. 47).

4. Stressed Vegative Area - Elevated chromium and lead found in soil (Ref. No. 3).

On November 14-15, 1983, the department conducted an assessment of the ambient water quality of Campbell Creek, into which the Lobeco plant effluent discharges. Analysis of water samples for dissolved oxygen, pH, temperature, salinity and specific conductance indicated satisfactory water quality within the context of the parameters examined. However, a total of sixty-six (66) organic chemical compounds were detected in oyster tissue samples, sediment samples and the Lobeco plant effluent. The community structure of hard substrate and soft substrate fauna in Campbell Creek was found to have been moderately to severely impacted, and significantly fewer oysters were observed, relative to the control station. Also, a department study done December 5, 1984 detected PCB's in sediment at the Lobeco outfall and downstream of the outfall (Ref. No. 6, p. 2).

E. Remedial and Removal Actions

To the department's knowledge no removal/remedial actions have taken place to date at the site.

F. Demography/Regional Setting

The Lobeco Products, Inc. site is located in a moderately populated rural area. The area is characterized by mostly flat land (Ref. No. 8).

III. GROUNDWATER PATHWAY

A. Regional Hydrogeology

The results of the hydrogeologic review are as follows:

1. The depth to the water table is five to ten feet based on elevations of nearby streams determined from topographic maps.

2. The aquifer of concern is the (1) Hawthorne - Recent and (2) Tertiary Limestone which is composed of sandy limey clays and light colored fossiliferous clayey limestone. The depth to the aquifer of concern is the same as the depth to the ground water (Ref. No. 2).

3. The composition of the unsaturated zone is Chisolm loamy fine sands containing ten to twenty-five percent clay according to the 1980 Soil Survey of Beaufort County. Soils of this type have an approximate hudraulic conductivity of > 10^{-3} cm/s.

4. A well inventory within a radius of four miles of the site reveals that ground water is used for drinking purposes in the aquifer of concern, with no other source presently available.

5. The nearest domestic well developed within the aquifer of concern is 0.3 mile to the south of the site, whereas the nearest community well is on the site.

B. Ground Water Use

The use made of ground water in the area is drinking water with no other source presently available.

The number of homes within a four mile radius of the site with domestic wells, as identified from topographic quadrangles, are as follows:

Radius	Number of Houses
0-1 Mile	35
1-2 Miles	122
2-3 Miles	176
3-4 Miles	236
	569

C. Ground-Water Impact

Sample analyses from monitoring wells on site indicate contamination of the aquifer of concern with PCB's and volatile organic compounds (Ref. No. 4).

IV. SURFACE WATER PATHWAY/SURFACE WATER CONCERNS

The surface water has been contaminated with PCB's which have been detected in sediment at the Lobeco outfall and downstream from it.

There are no surface water intakes located downstream from the facility, however, recreational use is made of the surface water including fishing and swimming. Additionally, the possibility exists for the contamination of the human food chain due to contamination of hard substrate and soft substrate fauna in Campbell Creek which receives plant effluent discharges from Lobeco (Ref. No's 1 & 3).

VII. CONCLUSIONS AND RECOMMENDATIONS

A high priority for a screening site inspection is recommended due to the potential for contamination of area domestic drinking water wells. Further sampling of the stressed vegetation area is recommended to determine if the dead vegetation was caused by elevated levels of heavy metals or other contaminants. Further conductivity studies are recommended for mapping contaminant plumes that may affect nearby domestic wells. Sampling of off-site wells that may be endangered is also recommended. Additionally, a magnetometer survey of the "Burn Site" should be done to identify any waste burial sites that may exist. Any other suspected burial sites should also be surveyed.

VIII. REFERENCES

1. Map of Water Intakes for S.C. (Copy attached).

2. Memo from Judy Canova to John Cresswell, dated September 14, 1988 (Copy attached).

3. SCDHEC Industrial Wastewater Files.

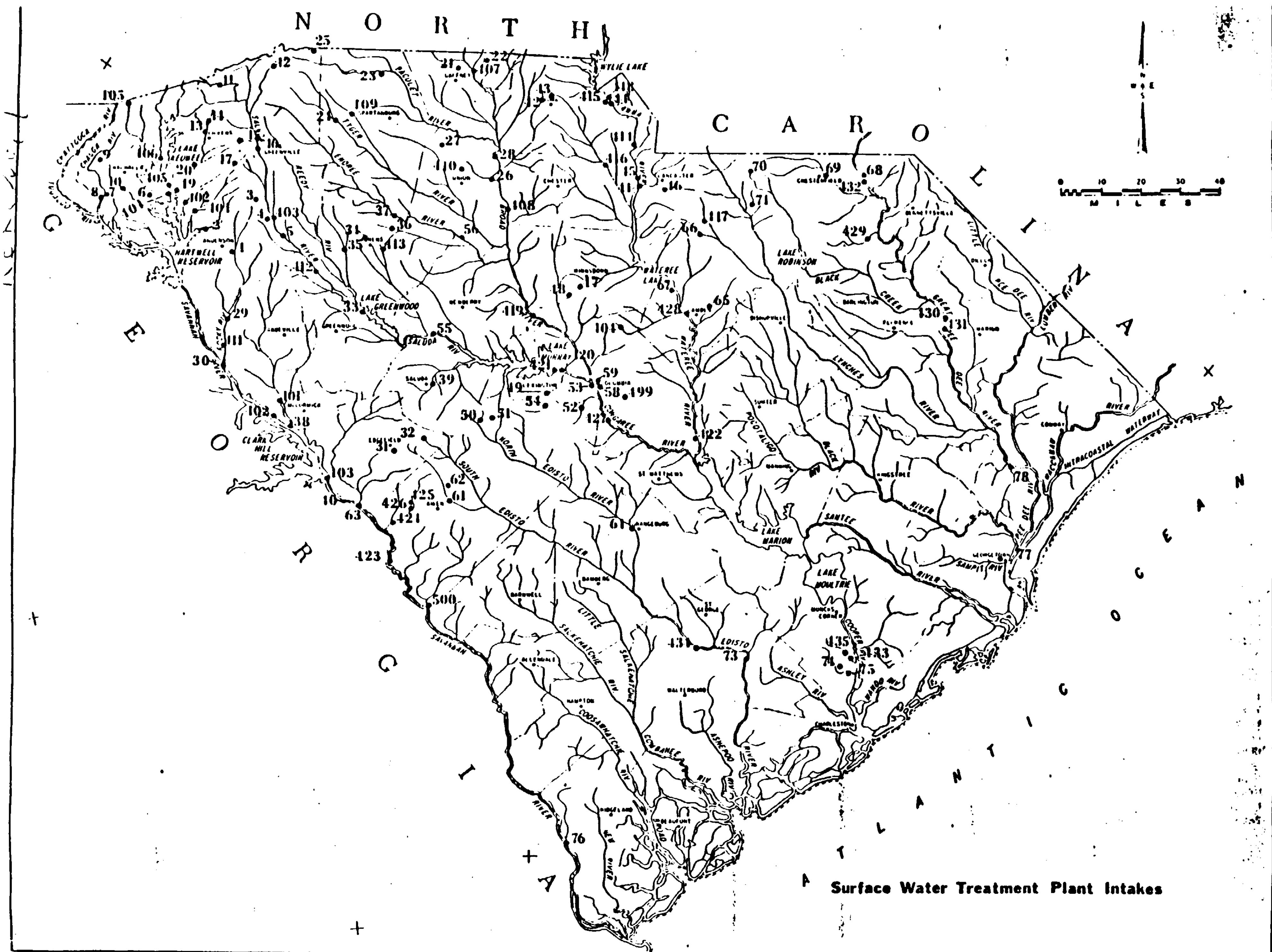
4. SCDHEC Groundwater Protection Division Files.

5. Historical Operational Survey of the Lobeco Products, Incorporated, Lobeco, South Carolina plant, February, 1988 (referenced pages attached).

6. Plan of Study, Lobeco Products, Inc. Manufacturing site, January 20, 1987 (referenced material attached).

7. Ongoing Soil and Groundwater Study and Conceptualized Cleanup Plan, Venture Chemicals, Inc., April 1986 (referenced pages attached).

8. Four mile radius map compiled from topographic quadrangle maps.


NORTH CAROLINA
GEORGIA
ATLANTIC OCEAN
Surface Water Treatment Plant Intakes
MILES
LAKE ROBINSON
LAKE GREENWOOD
LAKE MARION
LAKE MOULTRIE
HARTWELL RESERVOIR
CLARK HILL RESERVOIR
WYLIE LAKE
SAVANNAH RIVER
EDISTO RIVER
SANTEE RIVER
INTRACOASTAL WATERWAY

South Carolina Department of Health and Environmental Control

Ref. No. 2

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

MEMORANDUM

TO: John Cresswell, Manager
Site Screening Section
Bureau of Solid and Hazardous Waste Management

FROM: Judy Canova, Hydrologist JC
Superfund and Solid Waste Section
Division of Hydrogeology
Bureau of Solid and Hazardous Waste Management

DATE: September 14, 1988

RE: American Color/Chem Venture
SCD Ø46 5Ø7 Ø18
Preliminary Update - Hydrogeologic Review
Beaufort County

A hydrogeologic review of the referenced site has been conducted to assist in completing a preliminary assessment update for the Superfund program. A preliminary assessment update is a reassessment of existing preliminary assessments in an attempt to standardize preliminary assessment scope, products, and decisions, and to foster improved preliminary assessment quality. The purpose of the hydrogeologic review is to provide information regarding the ground-water migration route of potential contaminants. It includes information obtained from South Carolina Water Resources Commission well tabulations, available site specific information from state files, a target survey using United States Geological Survey topographic quadrangles, and a literature review.

The results of the hydrogeologic review are as follows:

1) The depth to the water table is five to ten feet based on elevations of nearby streams determined from topographic maps.

2) The aquifer of concern is the 1) the Hawthorne - Recent and 2) the Tertiary Limestone which is composed of 1) sandy limey clays and sands and 2) light colored fossiliferous, clayey limestone (Spigner and Ransom, 1979). The depth to the aquifer of concern is equivalent to the depth to ground water.

3) The composition of the unsaturated zone is Chisolm loamy fine sands containing ten to twenty-five percent clay according to the 1980 Soil Survey of Beaufort County. Soils of this type have an approximate hydraulic conductivity of $> 10^{-3}$ cm/s.

4) A well inventory within a radius of four miles of the site reveals the following uses of ground-water from the aquifer of concern: domestic, irrigation, and community water supply.

5) The nearest domestic well developed within the aquifer of concern is 0.3 miles to the south of the site, whereas the nearest community well is on site.

6) The number of homes within a four mile radius of the site with domestic wells, as identified from topographic quadrangles, are as follows:

Radius	Number of Houses
1 Mile	35
2 Miles	122
3 Miles	176
4 Miles	236
Total	569

References Cited:

Spigner, B. C. and Ransom, C., Report on ground-water conditions in the Low Country area, South Carolina: South Carolina Water Resources Commission Report # 132, 144 p.

Ref. No. 5

HISTORICAL OPERATIONAL SURVEY

of the

LOBECO PRODUCTS, INCORPORATED

LOBECO, SOUTH CAROLINA PLANT

February, 1988

LANE
ENVIRONMENTAL SERVICES CORPORATION

5.1 Abandoned Lagoon Area

Subsection 4.1 and 4.3 describe the Lobeco effluent handling system and potential chemical constituents. During the active life of the lagoon the process effluent may have contained product and raw material residues extracted in the aqueous wash cycles, and, on occasion, PCBs from in-plant spill incidents.

In addition to providing the holding time necessary to allow the prescribed ebb-tide discharge, the lagoon also served as a settling basin to permit any undissolved particles to settle out. This "settling out" formed a sediment layer on the lagoon bottom which was clearly visible (by color) in the core samples obtained during the G&E Engineering preliminary investigation. It is probable that this sediment layer, which will be defined during the current study, may contain PCB residues.

5.2 Burn Site Area

A list of materials possibly associated with the Burn Site Area (e.g., burned, stored, etc.) has been compiled. These materials are:

Material(*)	Chemical Name
Amino G	7-amino-1,3-napthalene disulfonic acid
Gamma Acid	2-amino-8-naphthol-6-sulfonic acid
G-Salt	2-naphthol-6,8-disulfonic acid
PNTS	4-nitrotoluene-2-sulfonic acid
R-Salt	2-amino-8-naphthol-6-sulfonic acid
Anthrarufin	1,5-dihydroxy anthraquinone

Cassella Acid	2-naphthylamine-4,8-disulfonic acid
J Acid	2-amino-5-naphthol-7-sulfonic acid
Peri Acid	1-naphthylamine-8-sulfonic acid
CUP	Copper phthalocyanine
DMS	4,4'-dinitrostilbene disulfonic acid
Heat Transfer Oil/Residue	Arochlor 1248 PCB
Iron Filings	———
Recovered Aniline	Aniline Oil
Chloral	Trichloroacetaldehyde

*It should be noted that the source of information linking these materials to the Burn Area is employee recollection except for Chloral (which information was found during records search).

5.3 Old Drum Storage Area

As discussed in Subsection 4.2, off-grade products and other process wastes were drummed and temporarily stored in this area. Any chemicals which may be contained in the soil or groundwater at this site would be due to spills or drum leaks and are not likely to be present in any major quantity.

No specific list of such chemicals can be developed, but would likely be similar to the list in 5.2.

5.4 Campbell Creek/Marsh Area

Prior SCDHEC and Venture Chemical studies of the Campbell Creek

sediment and oyster and crab tissue samples have shown the presence of PCB and other chemicals possibly related to the Lobeco plant operations. While no analyses were above FDA tolerance levels or EPA action levels, DHEC has requested further analyses of the creek and marsh sediment to extend their chronological data base.

6.0 POTENTIAL HAZARDS

6.1 Burn Area

The chemicals that might be encountered at the burn site represent little hazard to investigators in the condition in which they are likely to exist. The organic components are potentially flammable, but would not be classed as "ignitable". Chloral, probably the most combustible, could possibly be rated as a Class 3 combustible material.

All except the Arochlor 1248 and aniline oil are solids, thus limiting potential exposure routes.

Regulatory-driven procedures for working around PCB contamination are well known, and again, the possible exposure routes are limited. At the low temperature expected of materials which may be present at the burn area, the vapor inhalation potential is minimal. Also, if appropriate caution is taken during the investigation, there is little chance of an aerosol being created.

Aniline Oil is listed as having an OSHA TLV (8 hr.TWA) of 5ppm or 19 mg/cu. meter. Again, potential exposure routes are limited.

The acute local irritation rating for Chloral is 1 and the acute ingestion toxicity is 3.

Inasmuch as Level D or modified Level D protection is being specified for workers at the site, there should be no skin contact. If, however, skin contact with any of the above chemicals should occur, thorough washing with soap and water should be performed to minimize skin irritation.

6.2 Abandoned Lagoon Area

The potential constituent of greatest concern at the lagoon area is Arochlor 1248. There is little likelihood of any exposure except possibly by surface contact. Appropriate protective apparel and sound sanitary/hygienic practices will prevent exposure to PCB-containing soil and/or groundwater.

6.3 Old Drum Storage Area

Prior chemical analyses of soil and groundwater samples from the Drum Storage Area have not indicated concentrations which would represent an acute hazard to site investigation workers.

6.4 Campbell Creek and Marsh Area

Chemicals contained in the creek and marsh sediment, if any will be at such low concentrations and in such a form as to represent no acute hazard.

Ref. No. 6

PLAN OF STUDY

LOBECO PRODUCTS, INC. MANUFACTURING SITE

Lobeco, S. C.

DISCUSSION DRAFT

January 20, 1987

LANE ENVIRONMENTAL SERVICES CORPORATION
9314 LAWNDELL ROAD
RICHMOND, VIRGINIA 23229
(804) 282-7122

2.0 BACKGROUND INFORMATION

2.1 Site History

The Lobeco Products, Inc. facility is located in Beaufort County, South Carolina, approximately 12 miles northwest of the town of Beaufort, near the Coosaw River.

The plant was originally owned by Tenneco Chemical Company (later Tenneco Resins, Inc.), but was purchased by American Color and Chemical Company in January, 1974. American Color subsequently sold the facility to Venture Chemical Company (now Lobeco Products) in October, 1982.

Lobeco has operated the facility since that time.

2.2 Prior Environmental Studies

On November 14-15, 1983, the South Carolina Department of Health and Environmental Control (DHEC) conducted an assessment of the ambient water quality of Campbell Creek, into which the Lobeco plant effluent discharges. Analysis of water samples for dissolved oxygen, pH, temperature, salinity and specific conductance "indicated satisfactory water quality within the context of the parameters examined" (1). However, a total of sixty-six (66) organic chemical compounds were detected in oyster tissue samples, sediment samples and the Lobeco plant effluent. The community structure of hard substrate and soft substrate fauna in Campbell Creek was found to have been moderately to severely impacted, and significantly fewer oysters were observed, relative to the control station.

Subsequent to the findings above, Venture Chemical Company

Ref. No. 7

REPORT OF

ONGOING SOIL AND GROUNDWATER STUDY AND CONCEPTUALIZED CLEANUP PLAN VENTURE CHEMICALS, INC.

LOBECO, SOUTH CAROLINA

PREPARED FOR

VENTURE CHEMICALS, INC.

LOBECO, SOUTH CAROLINA

APRIL 1986

PREPARED BY

G & E

ENGINEERING, INC.

ENVIRONMENTAL & GEOTECHNICAL CONSULTANTS

COLUMBIA, SOUTH CAROLINA

related to past activities (prior to the closing of the lagoon). PCB concentrations in the old lagoon as high as 6,750 mg/kg (ppm), and the fact that discharge of untreated wastes directly from the lagoon to the marsh occurred, support this argument.

Another consideration in site/waste interaction is that of food chain uptake. Again the PCBs would be the components of greatest concern. Fortunately the PCBs are restricted to the old lagoon, which has been covered, and a small area of shallow soil and groundwater contamination at the burn site. There is little, if any, connection to surface waters.

Perhaps the most mobile components at the site are the chlorides (and other salts) which move with relative ease in the unconfined aquifer. The high conductivity values and the vegetation stress in the burn site and, particularly, downgradient from the abandoned lagoon reflect salt stress. In fact, the salt deposits are visible on the surface on the southern edge of the old lagoon levee. Salts (chlorides) do move faster than most organics in groundwater and are normally easily traced with conductivity instruments.

There does not appear to be significant lateral migration.

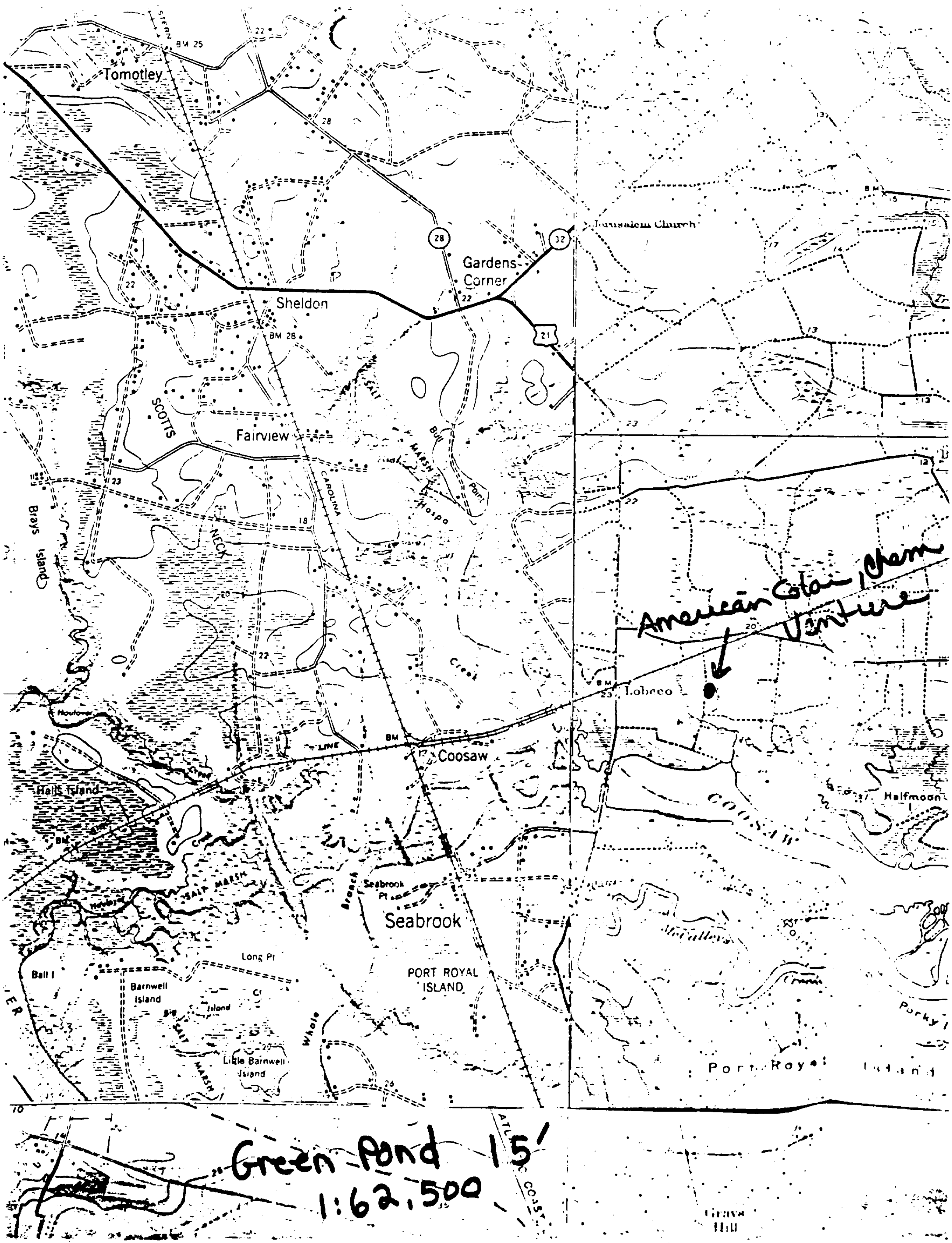
e. The presence of PCBs in the groundwater in the area of the burn site is likely due to the elevated concentrations of solvents (TCE) detected in the area, which enable the relatively insoluble PCBs to move into solution. The concentration of TCE in W-9, located in the burn pit area, is 180 mg/l (ppm). There were no such solvent concentrations detected in the abandoned lagoon groundwater samples.

f. The PCBs associated with the abandoned lagoon appear to be contained in the general area of the lagoon. Extensive auger boring and monitor well sampling hydraulically downstream of the lagoon show no PCBs. A deep boring (to the Hawthorn formation) immediately adjacent to the lagoon showed no soil contamination.

g. The groundwater beneath the old drum storage area is contaminated with carbon tetrachloride at concentrations up to 89 mg/l. The southern extent and the depth of contamination in this zone has not been determined.

h. For cleanup and closure purposes it appears that some degree of source removal of the PCB contaminated soils in the abandoned lagoon and burn site will be required. Aroclor 1248 is stable, persistent and not readily amenable to in-situ biodegradation techniques. Contaminated liquids for the two areas can be treated in-situ.

i. There does not appear to be any imminent threats to man or the environment at the site (if proper


Tomotley
Sheldon
Gardens Corner
Jerusalem Church
Fairview
SCOTTS NECK
Brays Island
CAROLINA
Bull Point
Hospa Creek
Creek
Lobeco
Coosaw
Halls Island
Seabrook
Seabrook Pt
Branch
Long Pt
Barnwell Island
Big Island
SALT MARSH
Little Barnwell Island
Whale
PORT ROYAL ISLAND
Halfmoon
Port Royal Island
Porky I
ATLANTIC COAST LINE
American Cotton Chem Venture
Green Pond 15'
1:62,500

SSI HAZARD RANKING SYSTEM SCORING SUMMARY

FOR

Site Name:	American Color and Chemical/Venture Chemical
EPA ID Number:	SCD 046 507 018
Address:	Lobeco Plant Site
City, State:	Lobeco, S.C.

EPA REGION IV

SCORE STATUS: IN PREPARATION

SCORED BY: Charles Strange

DATE OF THIS REPORT: 12/6/88
DATE OF LAST MODIFICATION:

GROUND WATER ROUTE SCORE :	43.25
SURFACE WATER ROUTE SCORE:	15.94
AIR ROUTE SCORE :	0
MIGRATION SCORE :	26.64
FIRE AND EXPLOSION SCORE :	Not scored
DIRECT CONTACT SCORE :	Not scored

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

HRS GROUND WATER ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
I. OBSERVED RELEASE Comments:	____	45	45
II. ROUTE CHARACTERISTICS - N/A			
A. Depth to Aquifer of Concern			
1. Depth to Water Table Comments:	______feet		
2. Depth to Bottom of Waste Comments:	______feet		
3. Depth to Aquifer of Concern	______feet	____(x2)	____
B. Net Precipitation			
1. Precipitation	______inches		
2. Evaporation (Score 1-2=3)	______inches		
3. Net Precipitation	______inches	____	____
C. Permeability Comments:	______cm/sec	____	____
D. Physical State Comments:		____	____
TOTAL ROUTE CHARACTERISTICS SCORE:			____
III. CONTAINMENT - N/A Comments:		____	____

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
IV. WASTE CHARACTERISTICS			
A. Toxicity/Persistence Matrix Value:		18	18
Comments: PCB's			
Trichlorethene			
B. Waste Quantity			
1. Cubic Yds	1		
2. Drums	---		
3. Gallons	---		
4. Tons	---		
(Convert Drums, Gallons, Tons to Cubic Yards)			
(1 + 2 + 3 + 4 = Total)			
5. Total	1 Cu.yds.	1	1
TOTAL WASTE CHARACTERISTICS SCORE:			19
V. TARGETS			
A. Ground Water Use (three mile radius)		3 (x3)	9
Comments:			
B. Distance to Nearest Well/Population Served			
1. Distance to Nearest Well	1584 feet		
2. Population Served	669 Targets (3 mile radius)		
a. No. of Houses	176		
b. No. of Persons	669		
c. No. of Connections	176		
d. No. of Irrigated Acres	0		
3. Matrix Value:		20	20
TOTAL TARGETS SCORE:			29

VI. SCORING

A. If line 1 is 45, multiply 1 x 4 x 5. 24795
If line 1 is 0, multiply 2 x 3 x 4 x 5.

B. Divide A by 57,330 and multiply by 100 = Sgw.

GROUND WATER ROUTE SCORE (Sgw) = 43.25

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

HRS SURFACE WATER ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
I. OBSERVED RELEASE	____	45	45
Comments:			
II. ROUTE CHARACTERISTICS			
A. Facility Slope/Intervening Terrain			
1. Site Located in Surface Water	____		
2. Site Within Closed Basin	____		
3. Facility Slope	____%		
4. Intervening Slope	____%		
5. Matrix Value for 3 and 4		____	____
B. 24-Hour Rainfall	____inches	____	____
C. Distance to Down-Slope Water	____feet	____(x2)	____
D. Physical State		____	____
Comments:			
TOTAL ROUTE CHARACTERISTICS SCORE:			____
III. CONTAINMENT		____	____
Comments:			
IV. WASTE CHARACTERISTICS			
A. Toxicity/Persistence Matrix Value:		18	18
Comments: PCB's			
B. Waste Quantity			
1. Cubic Yds	1		
2. Drums	---		
3. Gallons	---		
4. Tons	---		
(Convert Drums, Gallons, Tons to Cubic Yards) (1 + 2 + 3 + 4 = Total)			
5. Total	1 Cu.Yds	1	1
TOTAL WASTE CHARACTERICS SCORE:			19

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
V. TARGETS			
A. Surface Water Use (within 3 miles downstream) Comments:		2 (x3)	6
B. Distance to Sensitive Environments		3 (x2)	6
1. Coastal Wetlands	300 feet		
2. Fresh-water Wetlands	N/A feet		
3. Critical Habitat	N/A feet		
C. Distance to Water Supply Intake/Population Served			
1. Distance to Water Supply Intake	N/A miles		
2. Total Population Served	" persons (3 mile radius)		
a. No. of Houses	"		
b. No. of Persons	"		
c. No. of Connections	"		
d. No. of Irrigated Acres	"		
3. Distance to Intake/Population Served Matrix		0	0
TOTAL TARGETS SCORE:			12

VI. SCORING

A. If line 1 i 45, multiply 1 x 4 x 5. 10260
If line 1 is 0, multiply 2 x 3 x 4 x 5.

B. Divide A by 64,350 and multiply by 100 = Ssw.

SURFACE WATER ROUTE SCORE (Ssw) = 15.94

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

HRS AIR ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
I. OBSERVED RELEASE Comments:	____	____	0
II. WASTE CHARACTERISTICS			
A. Reactivity Comments:			
B. Incompatibility Comments:			
C. Reactivity/Incompatibility Matrix Value		____	____
D. Toxicity: Comments:		____(x3)	____
E. Waste Quantity			
1. Cubic Yds	____		
2. Drums	____		
3. Gallons	____		
4. Tons	____		
(Convert Drums, Gallons, Tons to Cubic Yards) (1 + 2 + 3 + 4 = Total)			
5. Total	____ Cu. yds.	____	____
TOTAL WASTE CHARACTERISTICS SCORE:			____
III. TARGETS			
A. Population			
1. 0 to 0.25 mile	____		
2. 0 to 0.50 mile	____		
3. 0 to 1.0 mile	____		
4. 0 to 4.0 miles	____		
5. Total Population within 4 miles score		____	____
B. Distance to Sensitive Environments:		____(x2)	____
1. Coastal Wetlands	____feet		
2. Fresh-Water Wetlands	____feet		
3. Critical Habitat	____feet		
C. Distance to Land Uses:		____	____
1. Commercial/Industrial	____feet		
2. Park/Forest/Residential	____feet		
3. Agricultural Land	____feet		
4. Prime Farmland	____feet		
5. Historic Site Within View?			
TOTAL TARGETS SCORE:			0

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

HRS AIR ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE

IV. SCORING

A. Multiply 1 x 2 x 3.

b. Divide A by 35,100 and multiply by 100 = Sa.

AIR ROUTE SCORE (Sa) = 0

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

HAZARDOUS RANKING SYSTEM SCORING CALCULATIONS

Ground Water Route Score

Observed Release	45
Route Characteristics	N/A
Containment	N/A
Waste Characteristics	19
Targets	29

= 29 /57,330 x 100 = 43.25 Sgw

Surface Water Route Score

Observed Release	45
Route Characteristics	N/A
Containment	N/A
Waste Characteristics	19
Targets	12

= 12 /64,350 x 100 = 15.94 Ssw

Air Route Score

Observed Release	0
Waste Characteristics	---
Targets	

= --- /35,100 x 100 = 0 Sa

Summary of Migration Score Calculations

	S	S^2
Groundwater Route Score (S_{gw})	43.25	1870.56
Surface Water Route Score (S_{sw})	15.94	254.08
Air Route Score (S_a)	0	0
$S^2_{gw} + S^2_{sw} + S^2_a$		2124.64
$S^2_{gw} + S^2_{sw} + S^2_a$		46.09
$S^2_{gw} + S^2_{sw} + S^2_a$ /1.73 = S_m		26.64

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

FIRE AND EXPLOSION SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
I. CONTAINMENT			
A. Hazardous substances present:			
B. Type of containment, if applicable:			
C. Score:		____	____
II. WASTE CHARACTERISTICS			
A. Direct evidence		____	____
1. Type of instrument and measurements:			
B. Ignitability		____	____
1. Compound used:			
C. Reactivity		____	____
1. Most reactive compound:			
D. Incompatibility		____	____
1. Most incompatible pair of compounds:			
E. Hazardous Waste Quantity		____	____
1. Total quantity of hazardous substances at the facility:			
2. Basis of estimating and/or computing waste quantity:			
TOTAL WASTE CHARACTERISTICS SCORE			____
III. TARGETS			
A. Distance to Nearest Population		____	____
B. Distance to Nearest Building		____	____
C. Distance to Sensitive Environment		____	____
1. Distance to wetlands: ________			
2. Distance to critical habitat: ________			

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
D. Land Use		____	____
1. Distance to commercial/industrial area, if 1 mile or less: _____			
2. Distance to national or state park, forest, or wildlife reserve, if 2 miles or less: _____			
3. Distance to residential area, if 2 miles or less: _____			
4. Distance to agricultural land in production within past 5 years, if 2 miles or less: _____			
5. Distance to prime agricultural land in production within past 5 years, if 2 miles or less: _____			
6. Historic or Landmark site within view of the site: _____			
E. Population within 2-mile radius	_______	____	____
F. Buildings within 2-mile radius	_______	____	____
TOTAL TARGETS SCORE:			____

IV. SCORING

A. Multiply I x II x III.

B. Divide line IV-A by 1,440 and multiply by 100 = S_{FE}.

FIRE AND EXPLOSION HAZARD SCORE (S_{FE}) = _________

SITE NAME: American Color and Chemical/Venture Chemical
EPA ID NUMBER: SCD 046 507 018

DIRECT CONTACT SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
I. OBSERVED INCIDENT	____	____	____

A. Date, location, and pertinent details or incident:

NOTE

If line I is 45, proceed to line IV.
If line I is 0, proceed to line II.

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
II. ACCESSIBILITY		____	____

A. Describe type of barrier(s):

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
III. CONTAINMENT		____	____

A. Type of containment, if applicable:

IV. WASTE CHARACTERISTICS

A. Toxicity		____ (x5)	____

1. Compounds evaluated:

2. Compound with highest score:

V. TARGETS

A. Population within a 1-mile radius:	____	____ (x4)	____
B. Distance to a critical habitat:	____	____ (x4)	____
TOTAL TARGETS SCORE			____

VI. SCORING

A. If line I is 45, multiply I x IV x V
If line I is 0, multiply II x III x IV x V

B. Divide line VA-A by 21,600 and multiply by 100 = S_{DC}

DIRECT CONTACT HAZARD SCORE (S_{DC}) = ________

Perry

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

MEMORANDUM

TO: Sandra Hursey
Enforcement Section

FROM: Rick Renfrow *Rick Renfrow*
Water Quality Monitoring Section

THROUGH: Edward M. Younginer, Manager *Edward Younginer*
Water Quality Monitoring Section

SUBJECT: Acute 96-Hour Toxicity Test, October 10-14, 1988
Lobeco Products, Incorporated
NPDES Permit No. SC0000914
Beaufort County, S.C.

DATE: February 7, 1989

The above referenced test was conducted in accordance with Lobeco's permit. The test was conducted on behalf of Lobeco by Shealy Environmental Services, Incorporated, Columbia, S.C., using mysid shrimp (Mysidopsis bahia) consistent with required methodology.

The result (96-hour LC_{50} = 53%) is essentially consistent with the result obtained in June 1988, (96-hour LC_{50} = 51%).

If you have any questions, please call me at 734-5398.

RR/EY/al

cc: Russ Sherer
Steve Thomas
Andy Yasinsac
George Nelson
NPDES Files

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FEB 14 1989
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Gen W/W file

South Carolina Department of Health and Environmental Control

00 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

M E M O R A N D U M

TO: Sandra L. Hursey, EQM
Enforcement Section

FROM: Rick Renfrow Rick Renfrow
Water Quality Monitoring Section

THRU: Mike Marcus, Manager Rick Renfrow for Mike Marcus
Water Quality Monitoring Section

SUBJECT: Toxicity Test
Venture Chemicals, Incorporated
NPDES Permit #SC0000914
Beaufort County, South Carolina

DATE: April 14, 1986

This office has reviewed the report on the 96-hour flow-through acute toxicity test conducted February 23-27, 1986 on treated wastewater being discharged by Venture Chemicals, Incorporated into Campbell Creek. The test was conducted by Aquatic Analysts, Columbia, South Carolina using the mysid shrimp (Mysidopsis bahia) in accordance with recommended testing methodology and approved reporting procedures.

The reported 96-hour LC_{50} of 32% does not comply with the permitted toxicity limit of 66% (Part III.A.14.). This confirms previous toxicity testing efforts indicating the potential for toxic impact to Campbell Creek due to the Venture Chemical discharge.

If you have any questions, please call me at 758-3499.

RR/sl

cc: Russ Sherer
Andy Yasinsac
Jim Joy
Steve Thomas
Alton Boozer
File

RECEIVED
APR 18 1986

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A 96-HOUR FLOW-THROUGH BIOASSAY ON LOBECO PRODUCTS, INC.'S EFFLUENT

Report To

LOBECO PRODUCTS, INC.

Lobeco, South Carolina

June 1989

SHEALY ENVIRONMENTAL SERVICES, INC.

BIOLOGISTS, TOXICOLOGISTS & CHEMISTS

A 96-HOUR FLOW-THROUGH BIOASSAY ON LOBECO PRODUCTS, INC.'S EFFLUENT

Report To

LOBECO PRODUCTS, INC.

Lobeco, South Carolina

June 1989

Submitted By:

SHEALY ENVIRONMENTAL SERVICES, INC.
Columbia, South Carolina
(803) 254-9915

SCDHEC Laboratory Certification No. 26103

Richard L. Shealy, President

I. INTRODUCTION

A 96-hour flow-through bioassay was conducted June 12 - 16, 1989, at LOBECO PRODUCTS, INC., Lobeco, South Carolina, to evaluate the acute toxicity of the plant's final effluent to mysid shrimp, Mysidopsis bahia. The bioassay was conducted by Richard L. Shealy

II. METHODS

The 96-hour test was conducted with a solenoid-activated, proportional, flow-through dilutor system as described by the United States Environmental Protection Agency (USEPA, 1985). The dilutor system delivered 75%, 42%, 24%, 13.5%, 7.5% and 4.2% effluent concentrations and 100% dilution water control. All test concentrations and the control were tested in duplicate 15.0 liter test chambers. The dilutor system and test chambers were cleaned and prepared for the test according to the procedures outlined in USEPA (1985).

The dilutor system was adjusted to an average cycle time of 7.9 minutes/cycle resulting in 5.3 volume changes/day in every test chamber during the bioassay. Water temperature in the test chambers was maintained at 20^{o} C ± 2^{o} C during the testing period. Dilution water was collected on a flood tide from the Broad River at the South Carolina Highway 170 bridge crossing.

The mysid shrimp used in the tests were five days old at the strt of the test. They were obtained from Aquatic BioSystems, Ft. Collins, CO. Ten mysids were placed in each test chamber and fed live brine shrimp nauplii, Artemia sp., twice daily during the acclimation and test.

The test organisms were acclimated to dilution water for two days prior to the start of the flow-through bioassay. As in previous bioassays, the mysid shrimp in the two highest effluent concentrations, 75% and 42%, were acclimated to 15 ppt dilution water. This was done to prevent physiological stress to the mysid shrimp once they were exposed to the low salinity effluent (<2.0 ppt). This process was accomplished by gradually adding distilled water to these test chambers during the acclimation period until the desired salinities were achieved. Less than 5% mortality was observed during the 48 hour acclimation period.

Test chambers were checked daily for dead mysid shrimp. A mysid was considered dead if no appendage activity could be observed. Dead mysids were removed from test chambers when found.

Water temperature, pH, salinity and dissolved oxygen were determined in the effluent concentrations and controls at the start and at 24-hour intervals during the testing period.

III. RESULTS

The results of the 96-hour flow-through bioassay are given in Table 1. Mortality occurred in the 75% (100% mortality), 42% (60% mortality), 24% (10% mortality), and 13.5% (5% mortality) effluent concentrations. No mortality occurred in the control. Mortality data from this test was used to determine LC50 values by the Log-Concentration Versus Percent-Survival Method as given in USEPA (1985). The 24, 48, 72 and 96-hour LC50 calculations are given below:

24-Hour LC50 = 51%

48-Hour LC50 = 48%

72-Hour LC50 = 44%

96-Hour LC50 = 38%

Water quality data are given in Table 2. The daily effluent discharge flows and ammonia determinations made by LOBECO PRODUCTS, INC. personnel during the testing period are given in Table 3.

IV. REFERENCES

United States Environmental Protection Agency. 1985. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. EPA 600/4-85/013. 216 pp.

Table 1. Mortality recorded during the 96-hour flow-through bioassay to determine the acute toxicity of LOBECO PRODUCTS, INC.'s effluent to mysid shrimp, June 12 - 16, 1989.

Test Concentration	Replicate	Mortality 24 Hrs.	48 Hrs.	72 Hrs.	96 Hrs.	Total Number Dead	Number Tested	Percent Dead
Control	A	0	0	0	0	0	10	0%
	B	0	0	0	0	0	10	
4.2%	A	0	0	0	0	0	10	0%
	B	0	0	0	0	0	10	
7.5%	A	0	0	0	0	0	10	0%
	B	0	0	0	0	0	10	
13.5%	A	1	1	1	1	1	10	5%
	B	0	0	0	0	0	10	
24%	A	0	0	1	2	2	10	10%
	B	0	0	0	0	0	10	
42%	A	2	4	5	5	7	10	60%
	B	3	3	4	4	5	10	
75%	A	10	10	10	10	10	10	100%
	B	10	10	10	10	10	10	

Table 2. Water quality data recorded in conjunction with the 96-hour flow-through bioassay to determine the acute toxicity of LOBECO PRODUCTS, INC.'s effluent to mysid shrimp, June 12 - 16, 1989.

Exposure Period	Parameter	Test Concentrations						
		Control	4.2%	7.5%	13.5%	24%	42%	75%
4 Hours	D.O. (mg/l)	7.3	7.4	7.4	7.1	7.0	6.7	6.3
	Temp. (^{O}C)	20.8	21.0	21.0	21.1	21.1	21.0	21.0
	pH (SU)	8.14	8.03	7.99	7.96	7.91	7.85	7.79
	Salinity (ppt)	29.5	28.0	26.5	24.0	22.0	18.0	16.5
24 Hours	D.O. (mg/l)	7.4	7.7	7.5	7.4	7.2	7.0	6.3
	Temp. (^{O}C)	19.7	19.7	19.7	19.5	19.5	19.5	19.3
	pH (SU)	7.99	8.03	7.92	7.95	7.89	7.85	7.80
	Salinity (ppt)	30.0	28.5	27.5	26.0	21.5	18.5	16.5
48 Hours	D.O. (mg/l)	7.4	7.3	7.3	7.1	6.7	6.3	-*
	Temp. (^{O}C)	22.0	21.5	21.5	21.5	21.5	21.5	-
	pH (SU)	8.09	7.97	7.93	7.86	7.85	7.79	-
	Salinity (ppt)	30.0	28.5	27.5	25.5	21.5	19.0	-
72 Hours	D.O. (mg/l)	7.5	7.3	7.2	7.4	7.0	6.4	-
	Temp. (^{O}C)	21.0	21.1	21.2	21.2	21.5	21.5	-
	pH (SU)	7.96	7.97	7.90	7.89	7.84	7.80	-
	Salinity (ppt)	29.5	28.0	27.0	25.0	21.0	18.0	-
96 Hours	D.O. (mg/l)	7.5	7.2	7.1	7.2	6.9	6.3	-
	Temp. (^{O}C)	21.7	21.8	21.7	21.7	21.7	22.0	-
	pH (SU)	8.11	7.98	7.89	7.85	7.87	7.80	-
	Salinity (ppt)	29.5	28.0	27.0	25.0	21.0	18.0	-

* All test organisms expired at this concentrations at least 24 hours prior to this time.

Table 3. Effluent discharge flows and ammonia levels recorded by LOBECO PRODUCTS, INC. during the flow-through bioassay conducted June 12 -16, 1989.

Date	Flow (gallons/day)	Ammonia (mg/l)
June 12	378,800	Not Measured
June 13	383,200	26.8
June 14	252,700	25.5
June 15	319,200	25.8
June 16	372,200	23.8

A SEVEN DAY LARVAL SURVIVAL, GROWTH AND FECUNDITY TEST ON LOBECO PRODUCTS, INC.'s FINAL EFFLUENT WITH MYSID SHRIMP

JUNE 1989

Report To:

LOBECO PRODUCTS, INC.

Lobeco, South Carolina

SHEALY ENVIRONMENTAL SERVICES, INC.

BIOLOGISTS, TOXICOLOGISTS & CHEMISTS

A SEVEN DAY LARVAL SURVIVAL, GROWTH AND FECUNDITY TEST ON LOBECO PRODUCTS, INC.'s FINAL EFFLUENT WITH MYSID SHRIMP

JUNE 1989

Report To:

LOBECO PRODUCTS, INC.

Lobeco, South Carolina

Reported By:

SHEALY ENVIRONMENTAL SERVICES, INC.
400 Graymont Avenue
Columbia, South Carolina 19205
(803) 254-9915

SCDHEC Laboratory Certification No. 26103
NCDEM Biological Laboratory Certification No. 001

Richard L. Shealy, President

I. INTRODUCTION

A survival, growth and fecundity test was conducted on the final effluent from LOBECO PRODUCTS, INC. to determine the chronic toxicity of the effluent to mysid shrimp (Mysidopsis bahia), June 13 - 20, 1989.

II. METHODS

Effluent samples were collected daily during the test. During transport to the laboratory and once in the laboratory, samples were maintained at or below 4°C until used in the test.

Test methodology conformed to USEPA 600/4-87/028, "Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms." A summary of test conditions is given in Table 1.

III. RESULTS

The mysid shrimp test showed significantly reduced survival, growth and fecundity in the 2%, 4%, 8%, and 16% effluent concentrations (Tables 2 and 3). A summary of the statistical data is provided below.

I. Fecundity Data:
   Dunnett's Test = Significantly Lower at 2%, 4%, 8%, and 16% Effluent Concentrations.
   NOEC = 1% Effluent Concentration
   LOEC = 2% Effluent Concentration
   ChV =1.4% Effluent Concentration

II. Growth Data:

Dunnett's Test = Significantly Lower at 2%, 4%, 8%, and 16% Effluent Concentrations.

NOEC = 1% Effluent Concentration
LOEC = 2% Effluent Concentration
ChV =1.4% Effluent Concentration

III. Survival Data:

Dunnett's Test = Significantly Lower at 2%, 4%, 8%, and 16% Effluent Concentrations.

Chi-Square Goodness of Fit = 4.38
Critical Value = 11.07
Bartlett's Test p Value = 0.410
p = 0.01

<u>Calculated Dunnett's T Values</u>
(Critical Value = 2.25)
1% = 1.05
2% = 2.38
4% = 6.15
5% = 9.02

Test and water chemistry results are given in Table 4. All water quality parameters monitored were within acceptable ranges for bioassay purposes.

TABLE 1. SUMMARY OF RECOMMENDED TEST CONDITIONS FOR MYSIDOPSIS BAHIA SEVEN DAY SURVIVAL, GROWTH, AND FECUNDITY TEST

1.	Test type:	Static renewal
2.	Salinity:	25 ppt (±2 ppt)
3.	Temperature (C):	26 - 27^{o}C
4.	Photoperiod:	16 h light 8 h dark
5.	Test chamber:	8 oz. plastic disposable cups
6.	Test solution volume:	150 mL per replicate cup
7.	Renewal of test solutions:	Daily
8.	Source of test organisms:	Aquatic Biosystems, Ft. Wayne, CO
9.	Age of test animals:	7 days
10.	Number of treatments per study:	5 treatments and a control
11.	Number of organisms per test chamber:	5
12.	Number of replicate chambers per treatment:	8
13.	Source of food:	Artemia nauplii
14.	Feeding regime:	Fed approximately 150 24-h old nauplii per mysid daily, half after test solution renewal and half after 8-12 h.
15.	Aeration:	None needed.
16.	Dilution water:	Artificial seawater mixed with deionized water.
17.	Test duration:	7 days
18.	Effects measured:	Survival, growth, and egg development
19.	Cleaning:	Pipetted excess food from cups daily

Table 2. Summary of test data from Mysid Shrimp survival, growth and fecundity test conducted on Lobeco Products, Inc.'s effluent June 13 - 20, 1989.

Treatment	Control	1%	2%	4%	8%	16%	
# Live Shrimp	37	34	30	18	9	0	
Survival (%)	93%	85%	75%	45%	23%	0%	
Survival Signif. Diff. From Control	-	No	Yes	Yes	Yes	Yes	NOEC = 1% LOEC = 2%
Mean Dry Wt./ Larvae (mg) ± S.D.	0.385 ±0.03	0.389 ±0.07	0.288 ±0.06	0.271 ±0.26	0.106 ±0.04	- -	
Growth Signif. Diff. From Control	-	No	Yes	Yes	Yes	Yes	NOEC = 1% LOEC = 2%
% of Females with Eggs	71.4%	75%	35.7%	0%	0%	0%	
Fecundity Signif. Diff. From Control	-	No	Yes	Yes	Yes	Yes	NOEC = 1% LOEC = 2%
Mean Temperature (C) ± S.D.	26.4 ±0.48	26.4 ±0.48	26.4 ±0.48	26.4 ±0.48	26.4 ±0.48	26.3 ±0.52	
Mean Salinity (ppt) ± S.D.	24.9 ±0.19	24.9 ±0.19	24.9 ±0.19	24.9 ±0.38	24.9 ±0.35	24.9 ±0.38	
Average Dissolved Oxygen (mg/l) ± S.D.	7.1 ±0.46	7.1 ±0.35	7.1 ±0.50	7.1 ±0.39	7.0 ±0.25	6.7 ±0.45	
Mean pH (SU) ± S.D.	7.96 ±0.39	8.00 ±0.36	8.03 ±0.38	8.03 ±0.36	8.02 ±0.31	7.48 ±0.27	

Probit LC50 = 4.08%

95% Confidence Limits = 3.04% - 5.09%

Table 3. Survival and fecundity recorded during the mysid shrimp test on effluent from Lobeco Products, Inc., June 13 - 20, 1989.

Treatment	Replicate Chamber	Total Mysids	No. Alive	Total Females	Females w/Eggs
Control	1	5	5	3	3
	2	5	4	1	0
	3	5	5	5	4
	4	5	4	2	2
	5	5	5	2	1
	6	5	5	4	3
	7	5	5	2	2
	8	5	4	2	1
1%	1	5	4	2	2
	2	5	4	3	3
	3	5	4	3	1
	4	5	5	3	3
	5	5	4	2	1
	6	5	5	4	3
	7	5	4	1	0
	8	5	4	2	2
2%	1	5	4	3	1
	2	5	3	1	0
	3	5	4	2	1
	4	5	4	1	0
	5	5	5	3	1
	6	5	3	2	1
	7	5	3	1	1
	8	5	4	1	0
4%	1	5	2	1	0
	2	5	3	1	0
	3	5	1	0	0
	4	5	1	0	0
	5	5	2	1	0
	6	5	2	0	0
	7	5	3	2	0
	8	5	4	3	0
8%	1	5	1	0	0
	2	5	1	1	0
	3	5	0	0	0
	4	5	2	1	0
	5	5	1	0	0
	6	5	1	0	0
	7	5	2	0	0
	8	5	1	1	0
16%	1	5	0	0	0
	2	5	0	0	0
	3	5	0	0	0
	4	5	0	0	0
	5	5	0	0	0
	6	5	0	0	0
	7	5	0	0	0
	8	5	0	0	0

Table 4. Water quality measurements taken during the mysid shrimp survival, growth and fecundity test conducted on effluent from Lobeco Products, Inc., June 13 - 20, 1989.

		DAY						
Concentration	Parameter	1	2	3	4	5	6	7
Control	Temp. (C)	26.0	26.0	27.0	27.0	26.5	26.0	26.0
	Salinity (ppt)	24.5	25.0	25.0	25.0	25.0	25.0	25.0
	D.O. (mg/l)	7.6	6.5	6.4	7.3	7.3	7.4	7.0
	pH (SU)	8.79	7.93	7.53	7.74	7.90	7.89	7.96
1%	Temp. (C)	26.0	26.0	27.0	27.0	26.5	26.0	26.0
	Salinity (ppt)	24.5	25.0	25.0	25.0	25.0	25.0	25.0
	D.O. (mg/l)	7.8	6.8	6.8	7.0	7.1	6.9	7.0
	pH (SU)	8.76	8.01	7.62	7.82	7.91	7.87	8.00
2%	Temp. (C)	26.0	26.0	27.0	27.0	26.5	26.0	26.0
	Salinity (ppt)	24.5	25.0	25.0	25.0	25.0	25.0	25.0
	D.O. (mg/l)	7.4	6.7	6.4	7.7	7.3	7.4	6.6
	pH (SU)	8.85	8.00	7.65	7.87	7.91	7.99	7.93
4%	Temp. (C)	26.0	26.0	27.0	27.0	26.5	26.0	26.0
	Salinity (ppt)	24.0	25.0	25.0	25.0	25.0	25.0	25.0
	D.O. (mg/l)	7.8	6.9	6.6	7.2	7.1	7.3	6.8
	pH (SU)	8.78	8.04	7.71	7.82	7.81	8.03	8.05
8%	Temp. (C)	26.0	26.0	27.0	27.0	26.0	26.5	26.0
	Salinity (ppt)	24.5	25.0	25.0	24.5	25.5	25.0	25.0
	D.O. (mg/l)	7.0	6.9	6.6	7.4	7.2	7.1	6.9
	pH (SU)	8.67	8.03	7.72	7.85	7.90	7.87	8.07
16%	Temp. (C)	26.0	26.0	27.0	27.0	26.0	26.0	-
	Salinity (ppt)	24.5	25.0	25.0	24.5	25.5	25.0	-
	D.O. (mg/l)	6.5	6.0	6.7	7.3	7.0	6.8	-
	pH (SU)	8.51	7.96	7.76	7.87	7.93	7.85	-

PUBLIC NOTICE

State of South Carolina
Department of Health & Environmental Control
Bureau of Wastewater & Stream Quality Control
2600 Bull Street
Columbia, South Carolina 29201
803/758-3877

Public Notice No.: 76-8 September 25, 1975

NOTICE OF PROPOSED ISSUANCE OF
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

The following list of applicants have applied for National Pollutant Discharge Elimination System (NPDES) permits to discharge treated wastewater into waters of the State of South Carolina. The proposed NPDES permits contain limitations on the amounts of pollutants allowed to be discharged based upon preliminary staff review and application of the Pollution Control Act of South Carolina, as amended; the 1972 Amendments to the Federal Water Pollution Control Act, (PL92-500); and other lawful standards and regulations. The pollutant limitations and other permit conditions are tentative and open to comment from the public.

Persons wishing to comment upon or object to permit issuance or to the proposed permit limitations and conditions are invited to submit same in writing within thirty (30) days of the date of this notice to the South Carolina Department of Health and Environmental Control, 2600 Bull Street, Columbia, South Carolina 29201, Attn: Mr. John Yeager. The NPDES permit number should be placed at the top of the first page of comments. Where there is a significant degree of public interest in a proposed permit or group of permits, the Department of Health and Environmental Control Commissioner will hold a public hearing.

All comments received within the 30 day period will be considered in the formulation of final determinations regarding the permit. If the determinations are substantially unchanged from those announced by this notice, all persons submitting written comments will be so notified. If the determinations are substantially changed, a public notice will be issued indicating the revised determinations. Requests for adjudicatory hearings may be filed after the above described determinations have been made. Additional information regarding adjudicatory hearings is available from the Assistant Attorney General at the above department address or by calling him at 803/758-5409.

Additional information on proposed permit determinations and on hearing procedures is available by writing, or calling, the above department address. Copies of draft permits are also available. All information pertaining to NPDES applications and draft permits is available for review and copying at Room 402, 2600 Bull Street, Columbia, South Carolina, between the hours of 8:30 a.m. and 5:00 p.m., Monday through Friday. A copying machine is available for public use at a charge of $.20 per page.

Please bring the foregoing to the attention of persons who you know will be interested in this matter.

<u>APPLICANTS</u>:

1. TRAVELEZE MOTEL (Greenville County) - NPDES Permit #SC0025593 - 2800 Laurens Rd., Greenville, SC 29607. The company has one discharge from the operation of a motor inn, Standard Industrial Classification (SIC) Code 7011. Discharge is into Laurel Creek in front of plant at the intersection of I-85 & US 276. The receiving stream is classified as suitable for domestic use after complete treatment.

2. GAINES W. HARRISON & SON (Richland County) - NPDES Permit #SC0029131 - 724 Pulaski St., Columbia, SC 29201. The company has one discharge from the cleaning of tractor engines, Standard Industrial Classification (SIC) Code 7538. The discharge enters the City of Columbia storm sewer adjacent to the plant & thence to the Congaree River. The receiving stream is classified as suitable for domestic use after complete treatment.

3. HOLLY HILL LUMBER CO. (Orangeburg County) - NPDES Permit #SC0026034 - Fiberboard Div., P.O. Box 128, Holly Hill, SC 29059. The company has one discharge from the manufacture of fiberboard, Standard Industrial Classification (SIC) Code 2661. The discharge enters a ditch adjacent to the plant which empties into Four Hole Swamp approximately 2,000 ft. from the plant & 2,650 ft. upstream from the northern most bridge on SC Hwy. #453 crossing Four Hole Swamp. The receiving stream is classified as suitable for domestic use after complete treatment.

4. 3M CORP. (Greenville County) - NPDES Permit #SC0003869 - Fine Paper & Film Group, P.O. Box 220, Pisgah Forest, NC 28768, for their facility located at Donaldson Ctr., SC - This company is engaged in the manufacture of polyester film, Standard Industrial Classification (SIC) Code 2824. This discharge enters an unnamed tributary of the Reedy River at Donaldson Ctr. The receiving stream is classified as suitable for domestic use after complete treatment.

5. HOWARD COURT APARTMENTS (Greenville County) - NPDES Permit #SC0027006 - %Howard's Metal Works, Rt. 5, Greenville, SC 29609. The company has one discharge from the operation of an apartment complex, Standard Industrial Classification (SIC) Code 6513. Discharge is into an unnamed creek 1/4 mile east of plant at the intersection of SC 253 & 46, which is a tributary to Mountain Creek. The receiving stream is classified as suitable for domestic use after complete treatment.

6. GATEWOOD SUBDIVISION (Greenwood County) - NPDES Permit #SC0023191 - %Town & Country Real Estate, P.O.Box 187, Greenwood, SC 29646. Subdivision has one discharge of sanitary waste, Standard Industrial Classification (SIC) Code 4952. Discharge point is to Curltail Creek approximately 7000 ft. downstream from secondary road 178 bridge. The receiving stream is classified as suitable for domestic use after complete treatment.

7. BAKER CREEK STATE PARK STP #1 (McCormick County) - NPDES Permit #SC0025071 - Pavilion Area - Rt. 1 Box 219, McCormick, SC 29835. The one discharge of sanitary waste is from the operation of a recreational facility, Standard Industrial Classification (SIC) Code 7033. Discharge is into Clark Hill Reservoir approximately 250 ft. east of pavilion. The receiving stream is classified as suitable for swimming.

8. BAKER CREEK STATE PARTK STP #2 (McCormick County) - NPDES Permit #SC0025089 - Camping Area - Rt. 1 Box 219, McCormick, SC 29835. The one discharge of sanitary waste is from the operation of a recreational facility, Standard Industrial Classification (SIC) Code 7033. Discharge is into Clark Hill Reservoir directly behind plant. The receiving stream is classified as suitable for swimming.

9. ALTAMONT MOBILE HOME PARK (Greenville County) NPDES Permit #SC0028533 - Rt. 7, Buncombe Rd., Greenville, SC 29609. The mobile home park has one discharge of sanitary waste, Standard Industrial Classification (SIC) Code 6515. Discharge is into Hawkins Creek approximately 500 ft. above confluence with Brock Creek. The receiving stream is classified as suitable for domestic use after complete treatment.

10. KIMBRELL'S TRAILER PARK (York County) - NPDES Permit #SC0022985 - 3308 India Hook Rd., Rock Hill, SC 29730. The mobile home park has one discharge of sanitary waste, Standard Industrial Classification (SIC) Code 6515. Discharge is into Jackson Branch approximately 650 ft. behind plant which is located approximately 1½ miles from intersection of I-77 & Hwy. 160. The receiving stream is classified as suitable for swimming.

11. HICKORY KNOB STATE PARK (McCormick County) - NPDES Permit #SC0025879 - Rt.1,Box 199B, McCormick, SC. The one discharge of sanitary waste is from the operation of a recreational facility, Standard Industrial Classification (SIC) Code 7033. Discharge is located south of camping area into Clark Hill Reservoir. The receiving stream is classified as suitable for swimming.

12. HICKORY KNOB STATE PARK (McCormick County) - NPDES Permit #SC0025887 - Rt.1,Box 199B, McCormick, SC. The one discharge of sanitary waste is from the operation of a recreational facility, Standard Industrial Classification (SIC) Code 7033. Discharge is into Clark Hill Reservoir approximately 750 ft. east of lodge. The receiving stream is classified as suitable for swimming.

13. HINKLE MOBILE HOME PARK (Oconee County) - NPDES Permit #SC0026794 - Rt.2, Box 13, Salem, SC 29676. The mobile home park has one discharge of sanitary waste, Standard Industrial Classification (SIC) Code 6515. Discharge is approximately 900 ft. inside city limits west of plant on Hwy. S37-24 into Stamp Creek, thence to Keowee Lake. The receiving stream is classified as suitable for swimming.

14. NEWBERRY INN (Newberry County) - NPDES Permit #SC0026921 - %Winnsboro Petroleum Co., P.O. Drawer 449, Winnsboro, SC 29180. The company has one discharge of sanitary waste from the operation of a motel, restaurant & service station, Standard Industrial Classification (SIC) Code 7011. Discharge is into Cannon Creek approximately 400 ft. west of plant parallel to I-26 & SC 34 in Newberry, SC. The receiving stream is classified as suitable for domestic use after complete treatment.

15. ARROWOOD ESTATES, INC. (Lancaster County) - NPDES Permit #SC0026905 - P.O.Box 37, Lancaster, SC 29720. The subdivision has one discharge of sanitary waste, Standard Industrial Classification (SIC) Code 4952. Discharge is located 1230 ft. upstream on Camp Creek from where it intersects with SC Hwy. S-29-56. The receiving stream is classified as suitable for domestic use after complete treatment.

16. INGERSOLL RAND CO. (Laurens County) - NPDES Permit #SC0000973 - Torrington Div., Clinton Bearing Plant, P.O.Box 667, Clinton, SC 29325. The company has one discharge from the manufacture of ball & roller bearings, Standard Industrial Classification (SIC) Code 3562. The discharge enters North Creek at the headwaters. The receiving stream is classified as suitable for domestic use after complete treatment.

17. LONE STAR INDUSTRIES, INC. (Fairfield County) - NPDES Permit #SC0030074 - Blair Quarry, Rt.1, Blair, SC 29015. The company has one discharge from mining of crushed granite, Standard Industrial Classification (SIC) Code 1423. Discharge is from vicinity of quarry into Crane Creek & thence into Broad River. The receiving streams are classified as suitable for domestic use after complete treatment.

18. BLUE CHANNEL CO. (Beaufort County) - NPDES Permit #SC0001988 - P.O.Box 128, Port Royal, SC 29935. The company has 4 existing discharges from the processing of canned & frozen crabmeat & crabmeat products, Standard Industrial Classification (SIC) Codes 2091 & 2092. Discharge 001 enters Battery Creek approximately 3700 ft. downstream of SC Hwy. 281; 002 enters approximately 3390 ft. downstream of the highway; 003 enters the creek approximately 3290 ft. downstream of the highway; 004 enters Battery Creek approximately 3080 ft. downstream of the highway. The creek is classified as suitable for bathing & any other usages except shellfishing for market purposes.

19. VILLAGE SUBDIVISION (Greenville County) - NPDES Permit #SC0028959 - Fork Shoals Rd., Simpsonville, SC 29681. The residential subdivision has one discharge of sanitary waste, Standard Industrial Classification (SIC) Code 6552. Discharge is from an oxidation pond at the intersection of Georgia Rd. The receiving streams are classified as suitable for domestic use after complete treatment.

20. H.B. SWOFFORD VOCATIONAL SCHOOL (Spartanburg County) - NPDES Permit #SC0028031 - Districts 1 & 2, Rt.2, P.O.Box 6, Inman, SC 29349. The school has one discharge of sanitary waste, Standard Industrial Classification (SIC) Code 8249. The discharge is into Obed Creek approximately 1032 ft. directly behind & north of plant which is located on Hwy. 11, 1.2 miles east of New Prospect, SC. The receiving stream is classified as suitable for domestic use after complete treatment.

21. GREENWOOD STATE PARK (Greenwood County) - NPDES Permit #SC0025038 - Ninety Six, SC 29666. The park has one discharge of sanitary waste from the operation of a recreational facility, Standard Industrial Classification (SIC) Code 7033. Discharge is from holding pond at camping area approximately 1500 ft. from Lake Greenwood. The receiving stream is classified as suitable for swimming.

22. AMERICAN COLOR & CHEMICAL CORP. (Beaufort County) - NPDES Permit #SC0000931 - P.O.Box 815, Lobeco, SC 29931. The company has one discharge from the manufacture of cyclic intermediate organic chemicals, Standard Industrial Classification (SIC) Code 2865. Discharge is into an unnamed tributary of Whale Branch approximately 1734 yards east of intersection of Rt.21 & Rd. 301. The receiving stream is classified as suitable for shellfishing for market purposes.

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

RECEIVED
FEB 1 1989
BUREAU OF WATER POLLUTION CONTROL

MEMORANDUM

To: Sandra Hursey, EQM
Division of Water Quality Assessment and Enforcement

From: Tom Knight, Hydrogeologist TK
Assessment and Development Section
Ground-Water Protection Division (GWPD)

Re: Lobeco Products, Incorporated
September 1988 Site Environmental Assessment
Beaufort County

Date: January 31, 1989

The Ground-Water Protection Division has reviewed the referenced submittal and offers the following comments:

1) The GWPD requests that driller's logs referred to in the report for the two production wells and any relevant data on the "deep observation well" be submitted.

2) The investigation has been generally completed per the study plan which was agreed upon, thus meeting the applicable conditions of the consent order. The only exception is that "library scans" were not completed in analyses.

3) At the abandoned lagoon site various metals (for example up to 33 milligrams per liter mg/l of arsenic, and up to .11 mg/l cadmium), organics (up to .018 mg/l benzene and up to .390 mg/l trichloroethylene), and PCB's (up to .258 mg/l) have been detected in ground water above Class GB standards (.05 mg/l for arsenic and .01 mg/l for cadmium), federal drinking water standards (.005 mg/l for benzene and trichloroethylene) or levels of concern (zero for PCB's). Due to the levels of compounds present, ground water remediation as well as additional assessment to define the horizontal and vertical extent of ground water contamination, should be conducted. Please note that this is contrary to the recommendations of the report.

4) At the old burn site, mercury at .002 mg/l, trichloroethylene at .210 mg/l, methylene chloride at .081 mg/l and PCB's (up to .0123 mg/l) have been detected in ground water at levels of concern or above federal drinking water standards in the new

monitoring wells. Additionally significant levels of organics have been detected in well W-11 and to a lesser extent well W-10 in the past (12 mg/l of 1,1,1 trichloroethylene in a April 4, 1986 analysis from W-11). Ground water remediation and further assessment to determine th horizontal/vertical extent of contamination (especially plume evidenced by analytical results from W-11, ETW-3, ETW-5 and L-3) should be conducted. Please note that this is contrary to the recommendations of the report.

5) At the old drum storage area, there are significant levels of organics detected in current analyses (1,4 dichlorobenzene detected at .280 mg/l). Also significant levels of metals (chromium, arsenic, lead, and cadmium) and organics (trichloroethylene, benzene, toluene, and carbon tetrachloride) have been detected in wells W-6, W-7 and/or V-3 in past analyses. Further assessment to determine the horizontal and vertical extent of groundwater contamination and ground water remediation is necessary in this area. This is also contrary to the recommendations of the report.

6) Elevated TOC values from soil samples from the old burn area may be due to the presence of 'lighter than water' organics (note elevations of water table fluctuations). Also some of the TOC values from deeper elevations may be from "heavier than water" organics (note depths at which PCB's were identified).

7) Elevated TOC values were detected in ground water monitoring wells from the old drum storage site (up to 400 mg/l) and from the abandoned lagoon (up to 260 mg/l). In a 3/17/86 analyses, elevated TOC was also detected at the old drum storage site. The approved plan of study included a "library scan" for compounds during the GC/MS analyses. This scan was not performed. The compounds contributing to and the cause of the elevated TOC values needs to be determined. Additional analyses of all onsite monitoring wells/piezometers for appropriate compounds including TOC and a "library scan", from selected wells is advisable. This should include analyses for all chemical compounds and degradation products identified as being manufactured or used at this site. The cause of the elevated specific conductance at several wells need to be determined by analyses for appropriate compounds.

8) Well L-4, down gradient from the old burn site, may not be indicating the true presence or absence of ground water contamination since this well is screened across a perched zone. A deeper monitoring well is recommended at this location.

9) Well pairs at the appropriate places in zones of contamination to determine vertical gradients in the upper unit and to determine if the zone immediately above the Hawthorn formation has been impacted by heavier than water constituents needs to be established.

10) No consideration has been given to how drainage ditches (shown on site maps to have continuous flow) affect contaminant migration/discharge and the ground water flow directions. This needs to be considered and appropriate sampling of the ditches needs to be established if contaminated ground water discharges to the ditches.

11) The proposal for long term monitoring is moot due to the need for furhter assessment and ground water remediation.

12) The proposal for soils remediation needs to be given further consideration. How are the slurry walls going to affect ground water remediation mandated for the entire area? PCB's are not the only parameters of concern, how is the proposed soil remediation going to address metals and other organics contamination of soils. Any contaminated soils which are not removed will be a continuing source for groundwater contamination. Justification is necessary to show that removed contaminated soils of less than 50 mg/kg PCB's which would be placed back into the excavation, will not act as a source to further contaminate ground water. Also please note that in an August 28, 1986 letter to Mr. John Meeks, Mr. Andy Yasinsac noted that "treatment and disposal of material containing PCB's at a concentration greater than 50 parts per million must receive approval from the TOSCA office of USEPA, Region IV". It should be assumed that this is still a valid comment.

13) The relatively low water level in W-13 may be due to the well being screened in a partially confined aquifer or may be due to a significant vertical gradient. Further investigation to determine vertical gradients would be appropriate in this area.

14) In submitting a report proposing recovery, consideration should have been given to the results of all past investigations. A compilation summary of all past analytical results and well logs for all onsite wells is appropriate and should be included in future reports.

15) Isoconcentration maps for individual or appropriate groups of compounds in ground water and soils would have been helpful in interpreting the large amounts of data collected. Appropriate isoconcentration maps should be included in future reports.

16) Piezometers should be upgraded, as appropriate, to monitoring wells suitable for obtaining ground water samples.

17) PCB's and other organics have been identified in the past in soils in an area not assessed by the current investigation as reported on page 10 of G&E Engineerings February, 1987 report. PCB's were detected at 21.4 and 113 milligrams per kilogram in soil samples V5S and V6S respectively. This area and possibly the nearby ditch draining this area needs to be assessed for soils and groundwater contamination.

It is recommended that the appropriate facilities be required to submit a proposal containing appropriate information, including justification, for further investigation and ground water recovery (where appropriate). This proposal should address the above concerns (including appropriate diagrams). If you have any questions, please feel free to contact me at 734-5485 (temporarily at 734-5357).

ETK/lr
A:ZPROD.TXT

cc: George Nelson, Director
Low Country District EQC

Andy Yasinsac, Engineer
Division of Industrial and Agricultural Wastewater

Christine Sanford, Hydrogeologist
Trident District EQC

Coleman Miles, Engineer
Division of Site Engineering and Screening

South Carolina Department of Health and Environmental Control

RECEIVED
JAN 31 1989
BUREAU OF WATER POLLUTION CONTROL

2600 Bull Street
Columbia, S.C. 29201

MEMORANDUM

To: Sandra Hursey, EQM
Division of Water Quality Assessment and Enforcement

From: Tom Knight, Hydrogeologist T.K.
Assessment and Development Section
Ground-Water Protection Division

Re: Lobeco Products Incorporated
October 21, 1988 Ground Water Monitoring Report
Beaufort County

Date: January 30, 1989

The Ground Water Protection Division has reviewed the referenced submittal and other information regarding the wastewater treatment system and offers the following comments:

1) The elevated specific conductivity in wells V-4 and V-5 needs to be explained.

2) In the March 8, 1988 sampling, cadmium was detected at .011 milligrams per liter mg/l in well V-5 which is above the Class GB standards (.01 mg/l). Mercury was also detected above GB Standards (.002 mg/l) in wells V-4 and V-5 at .007 and .006 mg/l respectively. In the second quarter, 1987 analytical results, chromium was detected above GB Standards at .023 mg/l in well V-5. Cadmium and chromium were detected at levels of concern in well V-4. Further assessment needs to be conducted to determine the source and vertical/horizontal extent of ground water contamination detected in these wells. Please note that the elevated chloride and TOC in some past analyses may also be indicating that ground water contamination from other compounds is occurring. The source of any ground water contaminants should be remediated if located (including the lining of any unlined lagoons which may be allowing the seepage of effluent into ground water supplies).

3) It may be advisable to add a third monitoring well around the wastewater treatment lagoons due to their aerial extent and due to some lagoons reportedly being unlined.

4) Analyses for chloride needs to be conducted and the relatively elevated TOC in well V-5 needs to be explained (conduct a "library scan" in the next analyses?).

5) Please note that chromium has not been analyzed for in groundwater from wells V-4 and V-5 as specified in construction permit number 13,068, issued March 17, 1987 in the 1988 analyses. This should be conducted.

It is requested that a proposal addressing these issues be submitted. If you have any questions, please feel free to contact me at 734-5357 (734-5485 permanent number).

BTK/lr
LPROD.TXT

cc: George Nelson, Director
Low Country District EQC

Andy Yasinsac, Engineer
Divison of Industrial and Agricultural Wastewater

Christine Sanford, Hydrogeologist
Trident District EQC

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

January 25, 1989

RECEIVED
JAN 26 1989
BUREAU OF WATER POLLUTION CONTROL

MEMORANDUM

TO: Sandra Hursey
File

Andy Yasinsac

FROM: Andrew Yasinsac, Jr., P.E., Manager
Industrial Wastewater Section

Subject: Lobeco Products, Inc., Beaufort County
Environmental Assessment, September, 1988

1. Section 2.1, page 2-1 states there is "Little potential for impact to domestic water supplies." While this may be true for existing water supplies, potential uses will be seriously endangered. Appendix E, page 4 shows arsenic 5 1/2 times the drinking water standard, cadmium 8.7 times the drinking water standard, and benzene exceeding the U.S. EPA human health criterion by an even greater ratio. Adequate site remediation to prevent these contaminants from flowing off-site must be designed and installed.

2. PCB analyses for boring ATW-5, stated in Appendix C, do not reach a depth into the ground where results approach background. The sample at 12.5'-14' (the deepest shown) is 18.3 mg/kg. This does not accomplish a complete definition of the contamination, which was to have been submitted.

3. At least 4 locations have PCB's greater than 100 mg/kg at a depth of less than 2 feet. It is particularly important that care be taken to clean any equipment working in that area.

4. Appendix E, page 4. Data includes an arsenic concentration 5 1/2 times the drinking water standard; cadmium, 8.7 times the drinking water standard; and benzene exceeding the U.S. EPA human health criterion by an even greater ratio. Such contaminated groundwater should not be allowed to migrate off-site. Remediation for the groundwater is therefore required.

5. The report states that removal of groundwater (dewatering to allow soil removal) will involve discharge "to the Campbell Creek/Marsh area ...." Such a discharge must be permitted under NPDES, including public notice requirements.

cc: George Nelson-DHEC, Beaufort
Tom Knight-DHEC, Groundwater Protection Div.
W. Coleman Miles-DHEC, BSHWM

PC

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

January 25, 1989

MEMORANDUM

RECEIVED
JAN 2 7 1989

TO: Sandra Hursey
File

Andy Yasinsac

FROM: Andrew Yasinsac, Jr., P.E., Manager
Industrial Wastewater Section

Subject: Lobeco Products, Inc., Beaufort County
Environmental Assessment, September, 1988

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3. At least 4 locations have PCB's greater than 100 mg/kg at a depth of less than 2 feet. It is particularly important that care be taken to clean any equipment working in that area.

Lenny - for

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

August 16, 1988

Mr. John M. Meeks
Vice President-General Manager
Lobeco Products, Inc.
Post Office Box 815
Lobeco, SC 29931

RE: Consent Order 88-37-W
Lobeco Products, Inc.
Beaufort County

Dear Mr. Meeks:

Enclosed, for your records, is a completely executed copy of Consent Order 88-37-W for the above referenced facility.

This letter will also serve to acknowledge your check in the amount of twenty thousand dollars ($20,000) in satisfaction of requirement #6 of the order.

Sincerely,

Sandra L. Hursey

Sandra L. Hursey
Environmental Quality Manager
Water Quality Assessment
and Enforcement Division

SLH\sh

cc: George Nelson
Andy Yasinsac
Russ Sherer
Steve Thomas
Brantley Harvey, Jr.

RECEIVED
AUG 18 1988

THE STATE OF SOUTH CAROLINA
BEFORE THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

IN RE: Lobeco Products, Inc.
Beaufort County

CONSENT ORDER
88-37-W

Lobeco Products, Inc. (Respondent), a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its waste treatment facility.

Section 48-1-50 of the South Carolina Code of Laws, 1976, as amended (Code), authorizes the South Carolina Department of Health and Environmental Control (Department) to issue Orders and assess civil penalties for violation of the Pollution Control Act (Act).

In accordance with approved procedures, Department staff have determined that an Order should be issued, to include the following Findings of Fact and Conclusions of Law.

Findings of Fact

1. The Respondent, a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its wastewater treatment facility.
2. The Department has issued NPDES Permit #SC0000914 effective July 1, 1985, to Venture Chemicals, Inc., (now Lobeco Products, Inc.) for its wastewater treatment facility. The permit requires, in part:
    a. The effluent from the wastewater treatment facility meet specified effluent limits;
    b. Additional quarterly monitoring for toxic pollutants with results reported with the Discharge Monitoring Reports;

c. Additional weekly monitoring of PCBs until questions about sources are resolved, then quarterly; results to be submitted with the Discharge Monitoring Reports;

d. 96-hour flow-through toxicity testing using shrimp (Mysidopsis bahia) in February, June, and October each year to meet a LC50 limit of 66%;

e. Submittal of a program to improve effluent quality in Campbell Creek to include monthly 48-hour static toxicity tests on oyster larvae; a yearly survey of oyster spat recruitment in Campbell Creek; a plan to reduce discharge toxicity, including chlorine related toxicity; and an annual macroinvertebrate assessment of Campbell Creek; and

f. Analysis of instream oysters for organics and metals each year in September.

3. The Department issued Consent Order 86-94-W to the Respondent on September 29, 1986 for violations of the NPDES Permit and Code Sections 48-1-90 and 48-1-110 of the Act. The order requires, in part, that the Respondent submit a plan of study to the Department within thirty (30) days of issuance of the order. The plan was to contain a proposal for a wastewater treatment system upgrade including ammonia removal and disinfection along with other appropriate functions.

4. The Respondent submitted its Toxicity Status Report to the Department on October 29, 1986. The Department reviewed the report and sent its comments to the Respondent on June 11, 1987. A meeting between the Respondent and the Department was held on July 14, 1987 to discuss the report and the Department's comments.

5. A July 31, 1987 the Respondent submitted preliminary information on the toxicity/treatability testing ongoing at its wastewater treatment facility which the Department had requested at the July 14 meeting. The Respondent

also stated that an independent biologist was preparing the assessment of instream conditions and an analysis of historical macroinvertebrate data which the Department had also requested at the July meeting. The review of existing macroinvertebrate assessments conducted between 1983 and 1986 in the waters of Campbell's Creek and Whale Branch was submitted to the Department on August 7, 1987.

6. By letter of September 4, 1987 the Department responded to the Respondent's letter and report of July 31, 1987. Permission was granted to begin in-plant hydrogen peroxide pretreatment testing. The final report on the pretreatment was to also address the Department's comments on the July 31st report. In addition, the Department requested a more definitive schedule of all toxicity/treatability studies the Respondent planned to conduct, including scheduled report submittals. The Respondent was also told that the improvements it suggested in the study might not meet the requirements of the NPDES Permit and the Order for toxicity. The schedule provided to the Department should include testing to evaluate the success of corrective action with emphasis on final effluent testing to determine that sufficient toxicity reduction had occurred.

7. By letter of September 15, 1987 Respondent replied to the Department letter of September 4, 1987. I set forth the following schedule:

   a) Microtox and respirometer screening would be completed by December 15, 1987 and the report submitted to the Department by December 30, 1987.

   b) PAC, peroxide and permanganate tests would be completed by April 30, 1988 and the report submitted to the Department by May 31, 1988.

   On December 30, 1987 the Respondent submitted a status report for the treatability/toxicity testing. The Respondent stated that work was incomplete and would continue on selected waste streams.

8. By letter of November 18, 1987 the Respondent requested a modification to the NPDES Permit LC50 effluent toxicity. It based the request on its consultant's flow study to provide accurate tidal cycle discharge values and a review of its 1986-87 flow data to provide a realistic presentation of discharge values. Copies of the flow study and the Respondent's calculations were enclosed. By letter of November 23, 1987, the Respondent confirmed a telephone conversation with the Department in which it was agreed to delay modification of the LC50 toxicity effluent limit of the NPDES Permit until the "Toxicity Reduction Report" was submitted to and reviewed by the Department.

9. On February 1, 1988 the Respondent submitted to the Department a report entitled "An Assessment of the Biological Waste Treatment System and Discharge Environment". On February 22, 1988 the Department met with the Respondent to discuss the report. At the meeting the Respondent promised to submit a detailed study plan describing its proposed activities along with a proposed implementation schedule by April 1, 1988. The Department told the Respondent that it would not delay enforcement action concerning the order required plan submittal beyond April 1, 1988.

10. By letter of April 12, 1988 the Department notified the Respondent that since the study plan had not been received as agreed in the February meeting, it planned to proceed with further enforcement action, i.e., an order containing a civil penalty. By letter of April 13, 1988 to the Department, the Respondent confirmed a telephone conversation between the parties on that date. It stated that it was unable to complete the large volume of work required in time to meet the submission deadline which the Respondent had proposed at the February 22, 1988 and the Department had concurred with.

11. The report, "Plan of Study for Pre-Treatment of Aqueous Waste Streams," was submitted to the Department on April 15, 1988. The Department reviewed the study plan and met with the Respondent on June 2, 1988 to discuss it and the

proposed implementation schedule.

12. Since the issuance of Consent Order 86-94-W, the 96-hour flow-through toxicity tests conducted by the Respondent have continued to violate the NPDES Permit LC50 limit if 66%. The 96-hour flow-through and 48-hour static toxicity tests as well as the annual oyster spat recruitment test conducted May 25-June 20, 1987 continue to show an adverse impact on Campbell's Creek due to the Respondent's discharge. In addition, the Respondent has had chronic violations of the NPDES Permit effluent limits for biochemical oxygen demand, total coliform and ultimate oxygen demand.

Conclusions of Law

1. Section 48-1-50 of the Code authorizes the Department to issue orders, assess civil penalties, and require the owner or operator of a disposal system to establish and maintain records; make reports; install monitoring equipment and methods; analyze discharges; and provide such other information as the Department may reasonably require.

2. The Respondent has violated its NPDES Permit and Code Section 48-1-90 of the Act in that it has discharged waste into the environment in violation of the discharge permit, i.e., NPDES permit, issued by the Department, specifically, in violation of the toxicity, biochemical oxygen demand, total coliform and ultimate oxygen demand limits.

3. The Respondent has violated Code Section 48-1-110 of the Act in that it has operated a wastewater treatment facility in violation of the discharge permit issued by the Department.

4. The Respondent has violated Consent Order 86-94-W in that an approvable report on the discharge toxicity was not submitted in a timely manner.

5. The Respondent's violations of the NPDES permit, the Consent Order and the Code subject it to the assessment of civil penalties as set forth in Code

Section 48-1-330 of the Act of up to ten thousand dollars ($10,000.00) per day of violation.

NOW THEREFORE IT IS ORDERED, CONSENTED TO AND AGREED that the Respondent shall:

1. Immediately begin and continue to properly operate and maintain its waste treatment facility so as to maximize treatment.
2. On or before May 31, 1989 - Submit plans and specifications for treatment plant modifications.
3. On or before September 1, 1989 - Begin construction of the treatment plant modifications.
4. On or before May 31, 1990 - Complete construction of the treatment plant modifications and meet the final effluent limits of the NPDES Permit.
5. On or before December 31, 1990 - Complete construction of the sludge handling facilities associated with the treatment plant.
6. Within thirty (30) days of issuance of this Order - Pay to the Department a civil penalty of twenty thousand dollars ($20,000.00).

IT IS FURTHER ORDERED AND AGREED that from issuance of this Order until May 31, 1990 the following changes in the NPDES Permit shall be in effect:

a) a LC50 limit of 20% for the 96-hour flow-through shrimp toxicity test; and
b) elimination of the in-stream macroinvertebrate assessment in Campbell's Creek.

IT IS FURTHER ORDERED AND AGREED that failure to comply with any provision of this Order shall be grounds for appropriate sanctions and further enforcement action.

THE SOUTH CAROLINA DEPARTMENT OF
HEALTH AND ENVIRONMENTAL CONTROL

BY: ______________________
Michael D. Jarrett
Commissioner

BY: ______________________
James A. Joy, III, P.E., Chief
Bureau of Water Pollution Control

Date: August 8, 1988
Columbia, South Carolina

WE CONSENT:

______________________ Date: August 8, 1988
Lobeco Products, Inc.

______________________ Date: 10 August 1988
Water Quality Assessment and
Enforcement Division

______________________ Date: Aug. 16, 1988
Attorney for the Department

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

MEMORANDUM

TO: Andy Yasinsac, Manager
Industrial Wastewater Section

FROM: Mike Marcus, Manager Mike Marcus
Water Quality Monitoring Section

SUBJECT: Toxicity Reduction Report
Lobeco Products, Incorporated - Beaufort County
NPDES Permit No. SC0000914

DATE: December 17, 1986

The following comments relative to the referenced report are offered for your consideration:

1. Section 2.1, p.4

   The statement that "acute toxicity tests.... are of no value if viewed without in-stream data" is speculative and unsupportable in the absolute. This concept is completely counter to prevailing current toxicity concepts and guidance being provided by USEPA. While acute toxicity tests are, like any end-of-pipe toxicity test, predictive in nature, they most certainly have inherent value on their own basis.

2. Section 2.3., pp.5-7

   It should also be noted (as presented in Appendix B of report) that PCBs were detected at several points in the existing wastewater treatment facility (ref. my memorandum of April 28, 1986, to you). Concentrations ranged from 2,740 ug/kg to 5,780 ug/kg from six points within the facility. Arclor 1248 was the identified PCB product. Thus, attribution of PCB contamination sources solely to abandoned lagoons and similar areas could be erroneous.

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3. Section 2.4., pp.7-8

As has been discussed with you and Lobeco Products personnel, interpretative differences in the existing macroinvertebrate assessments between this Section and the toxicity reduction report are apparent for the March 1986 assessment. In fact, the March 1986 assessment indicated not that everything was satisfactory, but that some increased impact (over November 1985) was apparent at Station 2 in Campbell Creek. Please reference this Section's memorandum of June 13, 1986, to you concerning this point.

The undesirable adverse conditions at Station 2 are attributed, in part, to the "contamination in the marsh associated with sediments that contain PCB, trichlorobenzene, napthalene, lead and other contaminants which were discharged directly to the marsh prior to 1978." To my knowledge, other than analyses presented by SCDHEC, there has been no quantitative or qualitative description of sediment contamination in the marsh proper. While Lobeco Products has investigated the abandoned lagoon and other sites around the existing plant, existence/extent of contamination off-site in the marsh itself has not been presented. Thus, it seems as if a leap in inductive assessment has occurred here with no analytical data to support the contentions that: the off-site marsh is widely contaminated; is contaminated already to the extent that this would essentially "drive" the ecosystem; and, that all of this was due to pre-1978 discharges.

4. Section 2.5, p.8

Oyster recruitment was impaired at Station 2 in 1986, relative to 1985. While this is attributed to natural variables, etc., these results were not surprising based on the declining effluent toxicity testing performance prior to this recruitment study. Furthermore, this diminution in recruitment/settlement and increased toxicity potential was followed by increased stress in the benthos at Station 2 as documented in March 1986.

5. Section 2.6, pp.9-12

   Oyster tissue analyses since 1984 have shown qualitative improvements in the numbers and types of organic compounds detected in oyster tissue in the area. This has been attributed by this Section to active management of and attention to the Lobeco Products wastewater effluent by plant personnel. Obviously, if pre-1978 contaminated sediments are driving the system as suggested by the toxicity reduction report, then any active attention/management of the discharge has resulted in minimal improvements observed since 1984. This pre-1978 dominant sediment hypothesis doesn't seem to be the panacea for which it is proposed when all data are considered.

   The reference to 20,000 mg/kg of copper in oyster tissue (p.12) should be 20,000 ug/kg. That level (20 ppm) is truly within normal ranges seen along the coast.

6. Section 4.1, p.15

   Again, there is a contradictory message here. Improving conditions in oyster tissue analyses (agreed) and in the macroinvertebrate communities (arguable) are suggested to have been occurring over the past year. This infers improved management and quality of the effluent has allowed this progress. However, when deleterious effects are noted in oyster recruitment and benthics at Station 2, this is assigned to pre-1978 contamination of sediments. The documented improvements in all aspects of Campbell Creek observed between 1984 and 1985 suggest that, in fact, management of the effluent quality is a more plausible approach than the sediment hypothesis.

7. Section 4.3, pp.17-18

   I'm not really sure how much information is actually gained from toxicity information on freshwater organisms such as rainbow trout and water fleas in this particular situation of estuarine receiving waters.

   Briefly, as most everyone is aware, toxicity of individual compounds, influent wastestreams, etc., may not equate directly with effluent toxicity due to additivism, antagonism and synergism.

8. Section 6.1, pp.23-27

   Should Lobeco Products continue with chlorination, they should be aware of this Bureau's policy on maximum allowable total residual chlorine.

9. Section 7.2, pp.28-30

   The statement that "the data also show that there is no apparent impact to receiving waters that can be tied to Lobeco's current discharge" doesn't seem to be plausible given the review of all data in a comprehensive, time-sequence manner, e.g., tissue residue levels, oyster recruitment/settlement, benthic assessments, end-of-pipe toxicity tests. If, in fact, there are no impacts tied to Lobeco Products current discharge, then why are all of the engineering/treatability/unit process changes being made?

   One important point must be made here. End-of-pipe tests are predictive in nature. This seems to be accepted by the author of the report for acute toxicity risks.... p.29). Likewise, it seems to be understood that there is not always correlation between toxicity test results and in-stream assessment results (the laboratory vs. field scenario). Chronic toxicity of stream water or whole waste is also predictive only. As with acute tests, chronic tests can be and are verified and clarified by in-stream assessment. The diminution of oyster recruitment/settlement at Station 2 and the increased stress in the benthos there is a real time, field-verified indication of chronic impact in Campbell Creek.

   Additional comments on the risk assessment presentation will be withheld until the quantitative risk assessment report is reviewed.

I hope these comments may be useful. If I can answer any questions or provide additional information, please contact me.

MM/al
cc: Russ Sherer — Jim Joy
George Nelson — Sandra Hursey
Lobeco Products
NPDES File

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

October 3, 1986

Mr. J. M. Meeks
Plant Manager
Lobeco Products, Inc.
P. O. Box 815
Lobeco, S. C. 29031

RE: Consent Order #86-94-W
Lobeco Products, Inc.
Beaufort County

Dear Mr. Meeks:

Enclosed, for your records, is a completely executed copy of Consent Order #86-94-W for Lobeco Products, Inc.

Sincerely,

Sandra L. Hursey

Sandra L. Hursey
Environmental Quality Manager
Water Quality Assessment
& Enforcement Division

SLH/sl

Enclosure

cc: George Nelson
Mike Marcus
Andy Yasinsac
Steve Thomas

OCT 06 1986

STATE OF SOUTH CAROLINA
BEFORE THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

IN RE: Lobeco Products, Inc.
Beaufort County

CONSENT ORDER
86-94-W

Lobeco Products, Inc. (Respondent), a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its wastewater treatment facility.

Section 48-1-50 of the South Carolina Code of Laws, 1976, as amended (Code), authorizes the South Carolina Department of Health and Environmental Control (Department) to issue orders and assess civil penalties for violation of the Pollution Control Act (Act).

In accordance with approved procedures, Department staff has determined that an order should be issued, to include the following Findings of Fact and Conclusions of Law.

Findings of Fact

1. The Respondent, a manufacturer of specialty chemicals located in Beaufort County, South Carolina, owns and is responsible for the operation of its wastewater treatment facility.

2. The Department has issued NPDES Permit #SC0000914 effective July 1, 1985, to Venture Chemicals, Inc., (now Lobeco Products, Inc.) for its wastewater treatment facility. The permit requires, in part:

   a. The effluent from the wastewater treatment facility meet specified effluent limits;

   b. Additional quarterly monitoring for toxic pollutants with results reported with the Discharge Monitoring Reports;

   c. Additional weekly monitoring of PCBs until questions about sources are resolved, then quarterly; results to be submitted with the Discharge Monitoring Reports;

d. 96-hour flow-through toxicity testing using shrimp (Mysidopsis bahia) in February, June, and October each year to meet a LC50 limit of 66%;

e. Submittal of a program to improve effluent quality in Campbell Creek to include monthly 48-hour static toxicity tests on oyster larvae; a yearly survey of oyster spat recruitment in Campbell Creek; a plan to reduce discharge toxicity, including chlorine related toxicity; and an annual macroinvertebrate assessment of Campbell Creek; and

f. Analysis of instream oysters for organics and metals each year in September.

3. Discharge Monitoring Reports submitted to the Department by the Respondent indicate the discharge from the facility usually meets the effluent limits contained in Part I.A. of the NPDES Permit. However, the results of the October 1985, February 1986, and June 1986, 96-hour flow-through toxicity tests indicate violations of the LC50 of 66% limit which is contained in Part III.A. of the NPDES Permit. The results of the November 1985 and January 1986, 48-hour static toxicity tests also indicate there is a severe toxicity problem. The results of the March 1986 and April 1986, 48-hour static toxicity tests and Oyster Recruitment/Settlement Study conducted by the Respondent in June and July 1986, indicate the potential for toxic impact in Campbell Creek is increasing.

4. The in-stream assessment of Campbell Creek conducted by the Respondent in March 1986, produced data which indicate that at least portions of the hard-substrate communities at station #2, the station most closely associated with the facility's outfall, have been subjected to increased stresses and increased water quality impairment in recent months.

The Report submitted by the Respondent on the discharge toxicity reduction study is inadequate in that it contained numerous generalities without data to support them. In addition, the report did not include a proposal for a wastewater treatment system upgrade.

Conclusions of Law

1. Section 48-1-50 of the Code authorizes the Department to issue orders, assess civil penalties, and require the owner or operator of a disposal system to establish and maintain records; make reports; install monitoring equipment and methods; analyze discharges; and provide such other information as the Department reasonably may require.
2. The Respondent has violated its NPDES permit and Code Section 48-1-90 of the Act in that it has discharged waste into the environment in violation of the discharge permit, i.e., NPDES permit, issued by the Department, specifically, in violation of the toxicity limit.
3. The Respondent has violated Code Section 48-1-110 of the Act in that it has operated a wastewater treatment facility in violation of the discharge permit issued by the Department.
4. The Respondent's violations of the NPDES permit and the Code subject it to the assessment of civil penalties as set forth in Code Section 48-1-330 of the Act of up to ten thousand dollars ($10,000) per day of violation.

NOW, THEREFORE, IT IS ORDERED, CONSENTED TO AND AGREED that the Respondent shall:

1. Within thirty (30) days from the issuance of this Order - Pay a civil penalty of ten thousand dollars ($10,000) to the Department.

Within thirty (30) days from the issuance of this Order - Resubmit a plan of study on the discharge toxicity to include a proposal for a wastewater treatment system upgrade, including ammonia removal and disinfection along with other appropriate functions.

IT IS FURTHER ORDERED AND AGREED that failure to comply with any provision of this Order shall be grounds for appropriate sanctions and further enforcement action.

THE SOUTH CAROLINA DEPARTMENT OF
HEALTH AND ENVIRONMENTAL CONTROL

BY: Michael D. Jarrett
Michael D. Jarrett
Acting Commissioner

BY: Robert G. Gross
Robert G. Gross, Chief
Bureau of Water Pollution Control

DATE: September 29, 1986

WE CONSENT:

Lobeco Products, Inc. — Date: September 29, 1986

Water Quality Assessment and Enforcement Division — Date: 30 September 1986

Attorney for the Department — Date: 10/1/86

M.2 - SITE MAINTENANCE FORM

* ACTION: _ *

EPA ID : SCD046507018

SITE NAME: AMERICAN COLOR & CHEMICAL SOURCE: R * ______ _ *

STREET : SC HWY 38/P O BOX 815 CONG DIST: 01 * ______ __ *

CITY : LOBECO ZIP: 29931 * ______ _____-____ *

CNTY NAME: BEAUFORT CNTY CODE : 013 * ______ ___ *

LATITUDE : 32/33/12.0 LONGITUDE : 080/44/42.0 * __/__/__._ ___/__/__._ *

LL-SOURCE: R LL-ACCURACY: * _ _ *

SMSA : HYDRO UNIT: 03050208 * ____ ________ *

INVENTORY IND: Y REMEDIAL IND: Y REMOVAL IND: N FED FAC IND: N * _ _ _ _ *

NPL IND: N NPL LISTING DATE: NPL DELISTING DATE: * _ __/__ __/__ *

SITE/SPILL IDS: * __ __ __ __ __ *

RPM NAME: RPM PHONE: - - * ______ ___-___-___ *

SITE CLASSIFICATION: SITE APPROACH: * __ ___ *

DIOXIN TIER: REG FLD1: REG FLD2: 6 * ____ ______ _ *

RESP TERM: PENDING ( ) NO FURTHER ACTION ( ) * PENDING (_) NO FURTHER ACTION (_) *

ENF DISP: NO VIABLE RESP PARTY ( ) VOLUNTARY RESPONSE ( ) * _ _ *
ENFORCED RESPONSE ( ) COST RECOVERY ( ) * _ _ *

SITE DESCRIPTION:

* ______ *

* ______ *

* ______ *

* ______ *

M.2 - ALIAS/ALIAS LOCATION MAINTENANCE FORM

* ACTION: _ *

SITE: AMERICAN COLOR & CHEMICAL

EPA ID: SCD046507018 ALIAS SEQ NO: 01

ALIAS NAME: VENTURE CHEMICAL SOURCE: R * ________________________________ _ *

ALIAS LOCATION * ACTION: _ *

CONTIGUOUS PORTION OF SITE? C FED FAC IND: N * _ _ *

STREET : SC HWY 38/P. O. BOX 815 CONG DIST : 01 * ________________________ __ *

CITY : ST: SC ZIP: 29931 * ____________________ __ _____-____ *

CNTY NAME: BEAUFORT CNTY CODE: 013 * ____________________ ___ *

LATITUDE : 32/33/12.0 LONGITUDE : 080/44/42.0 * __/__/__._ ___/__/__._ *

LL-SOURCE: G LL-ACCURACY: * _ _ *

SMSA : HYDRO UNIT: 03050208 * ____ ________ *

ALIAS DESCRIPTION:

* ____ *

* ____ *

* ____ *

* ____ *

M.2 - PROGRAM MAINTENANCE FORM

* ACTION: _ *

SITE: AMERICAN COLOR & CHEMICAL

EPA ID: SCD046507018 PROGRAM CODE: H01 PROGRAM TYPE: * _ *

PROGRAM QUALIFIER: ALIAS LINK : * ___ __ *

PROGRAM NAME: SITE EVALUATION * ______________________________ *

DESCRIPTION:

* ____ *

* ____ *

* ____ *

* ____ *

M.2 - EVENT MAINTENANCE FORM

* ACTION: _ *

SITE: AMERICAN COLOR & CHEMICAL
PROGRAM: SITE EVALUATION

EPA ID: SCD046507018 PROGRAM CODE: H01 EVENT TYPE: DS1

FMS CODE: EVENT QUALIFIER : EVENT LEAD: E * _ ___ _ *

EVENT NAME: DISCOVERY STATUS: * ______________________________ _ *

DESCRIPTION:

* ____ *
* ____ *
* ____ *
* ____ *

ORIGINAL	CURRENT	ACTUAL			
START:	START:	START:	* __/__/__	__/__/__	__/__/__ *
COMP :	COMP :	COMP : 04/01/81	* __/__/__	__/__/__	__/__/__ *

HQ COMMENT:

* ____ *

RG COMMENT:

* ____ *

COOP AGR #	AMENDMENT #	STATUS	STATE %
			0

* ________ ________ __ ___ *

M.2 - EVENT MAINTENANCE FORM

* ACTION: _ *

SITE: AMERICAN COLOR & CHEMICAL
PROGRAM: SITE EVALUATION

EPA ID: SCD046507018 PROGRAM CODE: H01 EVENT TYPE: PA1

FMS CODE: EVENT QUALIFIER : EVENT LEAD: S * _ ___ _ *

EVENT NAME: PRELIMINARY ASSESSMENT STATUS: * ______________________________ _ *

DESCRIPTION:

* ____ *
* ____ *
* ____ *
* ____ *

ORIGINAL	CURRENT	ACTUAL
START:	START:	START: 08/05/85
COMP :	COMP :	COMP : 08/12/85

* __/__/__ __/__/__ __/__/__ *
* __/__/__ __/__/__ __/__/__ *

HQ COMMENT:

* ____ *

RG COMMENT:

* ____ *

COOP AGR #	AMENDMENT #	STATUS	STATE %
			0

* __________ __________ __ ___ *

Venture Chemicals, Inc.

MAR 0 3 1986

S.
E
IND
WASTEWATER DIVISION

February 25, 1986

South Carolina Department of
Health and Environmental Control
Industrial Wastewater Division
Bureau of Water Pollution Control
2600 Bull Street
Columbia, South Carolina 29201

attn: Mr. Andrew Yasinsac, Jr; P.E., Section Manager

re: Oyster Analyses

Dear Andy:

Attached is the metal analyses to be included with the November, 1985 oyster tissue data.

We do not understand why Davis & Floyd waited until after the first of the year to run the metals nor do we believe some of the data are possible. In any event, Venture requested the metal analyses and the organic analyses at the same time. We regret the delay and the questionable nature of the data, however, we are sometimes at the mercy of outside laboratories.

Future sampling and analyses will be more carefully monitored by our people. Considering the interest in the data, it is absolutely crucial to receive valid results.

If you have any questions concerning the attached data, please feel free to call me.

Sincerely,

James M. Huckabee
Assistant Plant Manager

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JMM:nls
cc: Mr. R. S. Andrews, Venture Chemicals, Inc., Lafayette, LA
Mr. J. M. Meeks, Venture Chemicals, Inc., Lobeco, SC
attachment

Davis & Floyd, Inc.

CONSULTING ENGINEERS
POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29648
803-229-5211

LABORATORY ANALYSIS REPORT

FOR: VENTURE CHEMICALS INC.
LOCATION: LOBECO SC
JOB NUMBER: 3916

SAMPLE DATE: 09-19-85
DATE RECEIVED: 09-20-85
REPORT DATE: 01-22-86

PARAMETER	852288	852289	852290
CADMIUM	2.20	1.25	1.50
CHROMIUM (TOTAL)	6.58	22.5	19.8
NICKEL	2.44	10.8	9.26
ARSENIC	0.16	0.50	0.35
LEAD	0.36	0.27	0.18

SAMPLE 852288 IS HAULOVER CREEK OYSTERS
SAMPLE 852289 IS HUSPAH CREEK OYSTERS
SAMPLE 852290 IS CAMPBELL CREEK OYSTERS

NOTES
1. RESULTS IN MG/KG.

RECEIVED JAN 2 4 1986

SAMPLED BY __DAVID TUCK__________

ANALYSIS BY __MPM________________

CHECKED BY __John H McCord, Jr.__
JOHN H. McCORD, JR.

APPROVED BY __E Carl Burrell Jr.__
E. CARL BURRELL, JR.

OYSTER TISSUE ANALYSES
FROM CAMPBELL, HUSPAH AND HAULOVER CREEKS,
BEAUFORT COUNTY, SOUTH CAROLINA
September 1986

Report To

LOBECO PRODUCTS, INC.
Lobeco, South Carolina

SHEALY ENVIRONMENTAL SERVICES, INC.

BIOLOGISTS, TOXICOLOGISTS & CHEMISTS

OYSTER TISSUE ANALYSES
FROM CAMPBELL, HUSPAH AND HAULOVER CREEKS, BEAUFORT COUNTY, SOUTH CAROLINA

September 1986

Report To

LOBECO PRODUCTS, INC.
Lobeco, South Carolina

SHEALY ENVIRONMENTAL SERVICES, INC.
400 Graymont Avenue
Columbia, South Carolina 29205
(803) 254-9915

SCDHEC Laboratory Certification No. 26103

Reported By: Glenda R Swearingen
Glenda R. Swearingen, Project Manager

I. STUDY OBJECTIVE

This study was conducted to fulfill Part III;16 of LOBECO PRODUCTS, INC.'s NPDES #SC0000914 discharge permit in which oysters were collected for tissue analyses for organics and metals.

II. STUDY AREA

Oysters (Crassostrea virginica) were collected from three locations as follows (Figure 1; station numbers assigned based on previous sampling by SHEALY ENVIRONMENAL SERVICES, INC.):

Station 1: Haulover Creek at SCDHEC's station MD-631.

Station 3: Mouth of Campbell Creek at SCDHEC station MD-538.

Station 5: Huspah Creek near the confluence with Whale Branch at SCDHEC's station MD-535.

III.METHODS AND MATERIALS

III.A. Sample Collection

Oysters of 75 millimeters or greater in height were collected from the mid-intertidal zone on September 2, 1986 and transported live via Trailways on September 3, 1986 to J.L. Rogers and Callicott Engineers, Inc. laboratory (SCDHEC Certification No. 23105) in Greenville, South Carolina for analyses. At the laboratory, the oysters were cleaned, shucked and dispensed into appropriate containers. Each sample consisted of a 15 oyster composite.

III.B. Analytical Procedure

Oyster tissues were prepared for analysis by blending each oyster sample with dry ice to a powdery consistency. The blended oyster samples were transferred to glass vials and placed in a freezer to allow the dry ice (CO_2) to sublime.

For volatile organic analysis, 1 gram aliquots of oyster tissue were weighed and suspended in 5 millimeters of organic-free deionized water. These aliquots were analyzed by GC/MS using the purge and trap technique.

Twenty gram aliquots of oyster tissue were weighed and extracted with acetonitrile using a tissue miser for non-volatile organic analyses. The acetonitrile extracts were mixed with a aqueous sodium sulfate solution and then extracted in accordance with EPA Method 625, substituting hexane in place of methylene chloride. The extracts were analyzed by GC/MS.

For metals analysis, 5 gram aliquots of oyster tissue were weighed and digested with concentrated nitric acid to a light colored residue. The digested material was then diluted to 50 milliliters with a 5% nitric acid solution. These solutions were analyzed by atomic absorption, utilizing graphite furnace techniques. The above procedures were performed in accordance with the United States Environmental Protection Agency publication, "Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue".

III.C. Parameters Analyzed

EPA Priority Pollutants Volatile Organics

EPA Priority Pollutants Base Neutral Extractables

EPA Priority Pollutants Acid Extractables

PCBs

Arsenic

Cadmium

Chromium

Copper

Lead

Nickel

In addition, any major peak(s) seen during GC/MS analyses of the oyster tissue were identified.

IV. Results

Results of the oyster tissue analyses are provided in Table 1. No other major peaks were observed during GC/MS analyses.

Table 1.

J. L. ROGERS & CALLCOTT ENGINEERS, INC.
718 Lowndes Hill Road – Greenville, South Carolina 29607 – (803) 232-1556

Rogers, P.E.
Callcott, P.E.

Diplomate, American Academy of Environmental Engineers

CLIENT: Lobeco Products
Lobeco, S.C.

DATE RECEIVED: 9/3/1986 DATE REPORTED: 10/3/1986

PROJECT: LOBECO PRODUCTS OYSTER TISSUE STUDY

SAMPLE NO.	Station [illegible]-131	DESCRIPTION
41455	1 [illegible]	86-178, 9/2/86, 15 Oyster Composite
41456	3 [illegible]	86-179, 9/2/86, 15 Oyster Composite
41457	5 535 [illegible]	86-180, 9/2/86, 15 Oyster Composite

VOLATILE ORGANICS	RESULTS 41455	41456	41457
ACROLEIN	<50	<50	<50
ACRYLONITRILE	<50	<50	<50
BENZENE	<50	<50	<50
BIS (CHLOROMETHYL) ETHER	<50	<50	<50
BROMOFORM	<50	<50	<50
CARBON TETRACHLORIDE	<50	<50	<50
CHLOROBENZENE	<50	<50	<50
CHLORODIBROMOMETHANE	<50	<50	<50
CHLOROETHANE	<50	<50	<50
2 CHLOROETHYLVINYL ETHER	<50	<50	<50
CHLOROFORM	866	287	172
CHLOROMETHANE	<50	<50	<50
DICHLOROBROMOMETHANE	<50	<50	<50
1,1 DICHLOROETHANE	<50	<50	<50
1,2 DICHLOROETHANE	<50	<50	<50
1,1 DICHLOROETHYLENE	<50	<50	<50
1,2 DICHLOROPROPANE	<50	<50	<50
TRANS 1,3 DICHLOROPROPENE	<50	<50	<50
ETHYLBENZENE	<50	<50	<50
METHYL BROMIDE	<50	<50	<50
METHYL CHLORIDE	<50	<50	<50
METHYLENE CHLORIDE	153	238	77
1,1,2,2 TETRACHLOROETHANE	<50	<50	<50
TETRACHLOROETHYLENE	<50	<50	<50
TOLUENE	<50	<50	<50
1,2 TRANS-DICHLOROETHYLENE	<50	<50	<50
1,1,1 TRICHLOROETHANE	<50	<50	<50
1,1,2 TRICHLOROETHANE	<50	<50	<50
TRICHLOROTRIFLUOROMETHANE	<50	<50	<50
TRICHLOROETHYLENE	<50	<50	<50
VINYL CHLORIDE	<50	<50	<50

Results in micrograms per kilograms (ug/kg) unless otherwise noted.

J. L. ROGERS & CALLCOTT ENGINEERS, INC.
718 Lowndes Hill Road – Greenville, South Carolina 29607 – (803) 232-1556

J.L. Rogers, P.E.
F.D. Callcott, P.E.

Diplomate, American Academy of Environmental Engineers

CLIENT: Lobeco Products
Lobeco, S.C.

PROJECT: LOBECO PRODUCTS OYSTER TISSUE STUDY

Page 2

ACID EXTRACTABLES	RESULTS		
	41455	41456	41457
1A. PHENOL	<250	<250	<250
2A. 2-CHLOROPHENOL	<250	<250	<250
3A. 2-NITROPHENOL	<250	<250	<250
4A. 2,4-DIMETHYLPHENOL	<250	<250	<250
5A. 2,4-DICHLOROPHENOL	<250	<250	<250
6A. P-CHLORO-M-CRESOL	<250	<250	<250
7A. 2,4,6-TRICHLOROPHENOL	<250	<250	<250
8A. 2,4-DINITROPHENOL	<250	<250	<250
9A. 4-NITROPHENOL	<250	<250	<250
10A. 4,6-DINITRO-O-CRESOL	<250	<250	<250
11A. PENTACHLOROPHENOL	<250	<250	<250

BASE NEUTRAL EXTRACTABLES	RESULTS		
	41455	41456	41457
1B. N-NITROSODIMETHYLAMINE	<250	<250	<250
2B. BIS (2-CHLOROETHYL) ETHER	<250	<250	<250
3B. 1,3-DICHLOROBENZENE	<250	<250	<250
4B. 1,4-DICHLOROBENZENE	<250	<250	<250
5B. 1,2-DICHLOROBENZENE	<250	<250	<250
6B. BIS (2-CHLOROISOPROPYL) ETHER	<250	<250	<250
7B. HEXACHLOROETHANE	<250	<250	<250
8B. N-NITROSODI-N-PROPYLAMINE	<250	<250	<250
9B. NITROBENZENE	<250	<250	<250
10B. ISOPHORONE	<250	<250	<250
11B. BIS (2-CHLOROETHOXY) METHANE	<250	<250	<250
12B. 1,2,4-TRICHLOROBENZENE	<250	<250	<250
13B. NAPHTHALENE	<250	<250	<250
14B. HEXACHLOROBUTADIENE	<250	<250	<250
15B. HEXACHLOROCYCLOPENTADIENE	<250	<250	<250
16B. 2-CHLORONAPHTHALENE	<250	<250	<250
17B. DIMETHYLPHTHALATE	<250	<250	<250
18B. ACENAPHYLENE	<250	<250	<250
19B. 2,6-DINITROTOLUENE	<250	<250	<250

Results in micrograms per kilograms (ug/kg) unless otherwise noted.

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Diplomate, American Academy of Environmental Engineers

CLIENT: Lobeco Products
Lobeco, S.C.

PROJECT: LOBECO PRODUCTS OYSTER TISSUE STUDY

Page 3

BASE NEUTRAL EXTRACTABLES	RESULTS 41455	41456	41457
20B. ACENAPHTHENE	<250	<250	<250
21B. 2,4-DINITROTOLUENE	<250	<250	<250
22B. DIETHYLPHTHALATE	<250	<250	<250
23B. FLUORENE	<250	<250	<250
24B. 4-CHLOROPHENYL PHENYL ETHER	<250	<250	<250
25B. DIPHENYLAMINE (N-NITROSO)	<250	<250	<250
26B. 1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	<250	<250	<250
27B. 4-BROMOPHENYL PHENYL ETHER	<250	<250	<250
28B. HEXACHLOROBENZENE	<250	<250	<250
29B. PHENANTHRENE	<250	<250	<250
30B. ANTHRACENE	<250	<250	<250
31B. DI-N-BUTYLPHTHALATE	7320	22500	5490
32B. FLUORANTHENE	<250	<250	<250
33B. BENZIDINE	1068	1050	1050
34B. PYRENE	<250	<250	<250
35B. BUTYLBENZYLPHTHALATE	<250	<250	<250
36B. BENZO(A)ANTHRACENE	<250	<250	<250
37B. 3,3'-DICHLOROBENZIDINE	<250	<250	<250
38B. CHRYSENE	<250	<250	<250
39B. BIS(2-ETHYLHEXYL)PHTHALATE	<250	<250	5600
40B. DI-N-OCTYLPHTHALATE	<250	<250	289
41B. BENZO(B)FLUORANTHENE	<250	<250	<250
42B. BENZO(K)FLUORANTHENE	<250	<250	<250
43B. BENZO(A)PYRENE	<250	<250	<250
44B. INDENO(1,2,3-CD)PYRENE	<250	<250	<250
45B. DIBENZO(A,H)ANTHRACENE	<250	<250	<250
46B. BENZO(G,H,I)PERYLENE	<250	<250	<250
PCB's	<100	<100	<100

METALS	RESULTS		
ARSENIC	<100	<100	<100
CADMIUM	1100	1200	800
CHROMIUM	<500	<500	<500
COPPER	20000	14000	11000
LEAD	<100	<100	<100
NICKEL	900	900	900

Results in micrograms per kilograms (ug/kg) unless otherwise noted.

REPORTED BY: Sam W. Avery
Sam W. Avery, Laboratory Manager

South Carolina Department of Health
and Environmental Control

FILE - VENTURE
WW

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

MEMORANDUM

TO: Russell W. Sherer, Director
Division of Water Quality Assessment and Enforcement

THRU: Harry L. Gaymon, Manager Harry L. Gaymon
Biological Services Section

FROM: Glenda R. Swearingen Glenda R Swearingen
Biological Services Section

SUBJECT: Crab Tissue Analyses for PCBs at Venture Chemicals, Incorporated, Beaufort County, NPDES #SC0000914

DATE: October 28, 1985

On September 27, 1985, the Biological Services Section with assistance from the South Carolina Wildlife and Marine Resources collected legally harvestable ($\geq$12.7 cm/5 inches) blue crabs, Callinectes sapidus, from seven locations (Table 1, Figure 1) in the vicinity of Venture Chemicals, Incorporated, Beaufort County for the purpose of polychlorinated biphenyl (PCBs) analyses of edible meat. The crab pots in Campbell Creek and Huspah Creek were not recovered, therefore, on October 10, 1985, the Biological Services Section collected crabs from MD-664, the station lost earlier in Campbell Creek and two additional stations in Campbell Creek.

Immediately after collection, crabs were placed on ice and transported live to the Biological Services Section for meat extraction. Individual samples consisted of composited backfin tissue from three crabs with three replicates per station. All sampling procedures and chain-of-custody of samples conformed to all applicable sections in The Standard Operating Procedures Manual and Quality Assurance Procedures Plan (SCDHEC) and Procedures and Quality Control Manual for Chemistry Laboratories.

Results of the analyses showed detectable levels of PCBs in nearly all samples (Table 2) which is not unexpected due to the ubiquitous nature of PCBs in the environment (National Academy of Sciences, 1979). However, PCBs in crab tissue from MD-664, at Venture Chemicals, Incorporated, outfall were elevated above values reported elsewhere for crab tissue (Table 3). The mean level of .949 ppm PCBs in crab muscle from MD-664 was significantly higher ($p<.05$, Kruskal-Wallis H test) than Stations MD-665 ($\bar{x}$ = .061) and MD-634 ($\bar{x}$ = .036). Although the other stations sampled were not significantly less than MD-664, all the values except for the 1.479 ppm level at MD-631 were comparable to levels seen elsewhere in crab muscle (Table 3). The one high PCB level at MD-631, a control station, indicates that contamination of the sample may have occurred during meat extraction. The heptaopancreas of the crab concentrates PCBs, frequently to levels of 20 ppm, and contamination of muscle tissue during dissection for meat extraction is quite possible and probably

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occurred in this case (personal communication, Dr. Ron Sloan, New York Toxics Monitoring Program, New York Department of Environmental Conservation).

However, all levels of PCBs in the crab tissue analyzed are below the 2.0 ppm tolerance level recommended by the Food and Drug Administration (Federal Register 21 CFR Part 109, Volume 49, No 100).

HLG/GRS/al

cc: Bob Gross
Jim Joy
George Nelson
Luke Hause
Lewis Shaw
Bob King
Tom Berry

attachments

Table 1: Sampling locations and Station descriptions for crab tissue sampling, September 27, 1985, and October 10, 1985.

Station	Location
MD-535	Whale Branch approximately 15 meters west of US 21 bridge
MD-538	Campbell Creek at confluence with Whale Branch
MD-664	Campbell Creek immediately at the Venture Chemicals, Incorporated, wastewater treatment facility discharge
MD-629	Campbell Creek approximately 50 meters upstream from Venture Chemicals, Incorporated, wastewater outfall
MD-630	Campbell Creek approximately 300 meters downstream of Venture Chemicals, Incorporated, wastewater outfall.
MD-631	Unnamed tributary to Haulover Creek, approximately 25 meters upstream from confluence with Haulover Creek
MD-634	Cossaw River at western point of Morgan Island where Bull River and Parrot Creek enter the Coosaw
MD-653	Huspah Creek at mouth of Field Creek
MD-665	North bank of Whale Branch at Stuarts Point

Figure 1: Sampling locations for crab tissue analysis for PCBs, September 27, 1985 and October 10, 1985, Beaufort County, S.C.

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Table 2: Total PCBs detected in muscle tissue of *Callinectes sapidus* in the vicinity of Venture Chemicals, Incorporated, September 27, 1985 and October 10, 1985. All values in ppm.

Replicate	MD-629	MD-664	MD-630	MD-538	MD-535	MD-653	MD-631	MD-665	MD-634
1	.1627	.606	.189	.121	.207		1.479	<.05[a]	.036
2	.216	.952	.027	.286	.027		.253	<.05	<.05
3	.302	1.025	.258	.212	.057		.098	.085	.022
4[b]		1.215				.157			
Mean	.227	.949	.158	.206	.097		.61	.061	.036
Standard Deviation	.070	.254	.119	.083	.096		.757	.02	.014

a = Non-detectable values treated as .049

b = Values in Replicate row 4 collected September 27, 1985

Table 3: PCBs (ppm) in Crab Muscle Tissue from various locations.

Location	Species	Levels	Reference
Chesapeake Bay, MD	*C. sapidus*	N.D. -.08	Eisenberg and Topping, 1984
Hudson River, NY	*C. sapidus*	0.16-0.29 ppm	NY Dept. of Environ. Cons., 1981
Palos Verdes, CA	crab	.019	Young, 1982
Whale Branch, SC	*C. sapidus*	.014 - 1.479	Present study

References

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GEORGE - THIS IS THE SCDWMR REPORT. JW

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Polychlorinated Phenyls (PCB's) in the

Campbell Creek System, Beaufort County

Introduction

Beginning in 1972, the Chemical Oceanography Section of the Marine Resources Research Institute (MRRI) has been involved with specific environmental problems as related to South Carolina's marine resources. Initially this section focused its activities on determining trace metals concentrations in various estuarine systems along our coast. Other work included cooperations on evaluations of permit requests as reviewed by the Environmental Evaluations Section of the Office of Fisheries Management. In response to concerns expressed by commercial shrimpers, crabbers, and others, the Marine Resources Division (MRD) purchased a gas chromatograph (GC) in November 1984 to analyze samples for organic pollutants, especially certain pesticides and herbicides. The GC provided the means to include numerous organic pollutants in addition to the metals already analyzed at MRRI, both types of analyses to be used to complement ongoing studies of the Department of Health and Environmental Control (DHEC).

In response to a request from the Environmental Evaluation Section, the Chemical Oceanography Section collected oysters from Campbell Creek during August 1983 as part of an evaluation of Venture Chemical Company's permit request. Preliminary analyses performed at the College of Charleston indicated very complex mixtures of organic compounds were present in the oysters. Our metals analyses showed cadmium levels of 1.5-2.0 ppm and elevated levels of lead (> 2.0 ppm). (The NOAA Laboratory at Ft. Johnson found 1.5 ppm cadmium in oysters from the same group). Subsequent meetings with DHEC led to two separate studies by DHEC in 1983 and 1984 on contaminant levels in Campbell Creek (Marcus and Swearingen 1984, 1985).

At the request of commercial crabbers in Beaufort County, we initiated a study in the Campbell Creek - Whale Branch area in June, with samples being taken through early October (Table 1). Crab, oyster, sediment, and water samples were collected at Campbell Creek (WB04, WB05, WB06) and at three stations in Whale Branch (WB01, WB02, and WB03) (Figure 1).

Results and Discussion

The initial goal to be addressed by this study was that of environmental health, as expressed by Beaufort County crabbers, who noted that crab catches had declined over the last three years and suspected that pollution was a contributing factor. Based on high PCB levels in the sediments of Campbell Creek as reported by DHEC (Marcus and Searingen 1985), samples were analyzed for PCB's as well as pesticides.

Pesticide residues were detected in most samples typical of other parts of the state. No obvious problems were noted with respect to any of the commonly-occurring compounds. Our chromatograms, however, indicated high levels of complex PCB mixtures in sediments as per DHEC's study and in both crabs and oysters. Due to the complex mixture of PCB's and the fact that we found Aroclor 1232 in most samples, our values are reported as Aroclor 1232,

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although Aroclor 1242, 1254, and 1260 were present in many samples (Table 1). Due to low solubilities no quantifiable amounts of PCB's were detected in water samples and, hence, no concentrations are listed in Table 1. Since PCB's are fat soluble and can be highly concentrated by estuarine organisms, much higher concentrations can be found in tissue samples than in water samples. Bioconcentrations factors greater than 230,000 for blue crabs, greater than 670,000 for speckled trout have been reported (Duke et al. 1970, Nimmo et al. 1975). Our data illustrate significant bioconcentration by both blue crabs and oysters, e.g. water samples were less than 0.4 ng, whereas crab samples had individual PCB peaks up to 1000 ng or more in some cases (actual net concentrations were much lower on a µg/g basis).

Toxicity studies conducted on freshwater fish (sheepshead minnows) indicate that concentrations of 6.1 µg/g for Aroclor 1254 were lethal to 50% of the fish tested (Hansen et al. 1973). Sheepshead minnow fry from embryos containing 7.0 µg/g PCB's began dying a few hours after hatching. Our results were up to 7.73 µg/g in crab tissue (Table 1). Even though the effects of elevated PCB concentrations in marine organisms may not be well known, concentrations as high as we measured in Campbell Creek may be toxic or lethal to shrimp and finfish, if not blue crabs in particular. In addition, the bioaccumulation of PCB's may be harmful to mammals feeding on PCB-contaminated fish and shellfish. Platonow and Kalstad (1973) found that reproduction in ranch mink fed a diet with 0.64 µg/g of Aroclor 1254 was almost eliminated, whereas in another study (Ringer et al. 1972) a level of 2 µg/g PCB's precluded the survival of rank mink offspring. As a consequence, other estuarine organisms or mammals (including humans) could experience some harmful effects from eating estuarine organisms highly-contaminanted by PCB's.

With the above background, MRD contacted DHEC about the elevated PCB concentrations in blue crabs from Campbell Creek, feeling that an environmental and possibly a health hazard existed in Campbell Creek. Additional work needs to be conducted in the Campbell Creek-Whale Branch area on a larger scale to determine the extent of environmental degradation. Other studies should also be performed to discover what levels of PCB's and other pollutants within the respective organisms are harmful as opposed to concentrations in water.

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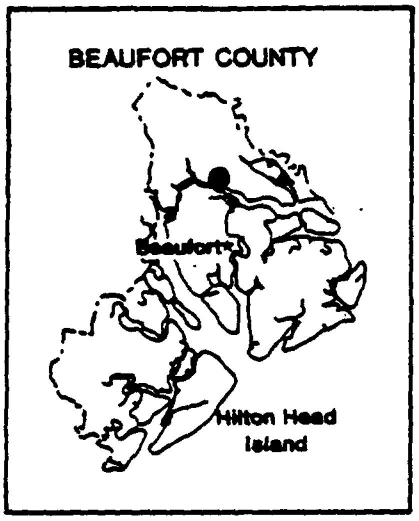
Table 1.

Values of Aroclor 1232 found in crabs, oysters, and sediments collected from sample sites in Huspah Creek, Whale Branch, and Campbell Creek. Values are in parts per million. (WB01, WB02 & WB03 are in Whale Branch; WB04, WB05 & WB06 are in Campbell Creek).

Date	Station	Crabs	Oysters	Sediment
3/29/85	Huspah Creek	*	0.97	**
6/3/85	Huspah Creek	*	*	0.24
6/3/85	WB04	*	*	25.21
7/2/85	WB04	7.73	*	*
7/11/85	WB04	*	0.83	*
8/27/85	WB04	2.17	0.91	7.71
8/27/85	WB04	1.01		
7/11/85	WB05	1.23	*	2.98
8/27/85	WB05	0.91	0.25	4.66
8/27/85	WB05	0.50		
7/11/85	WB06	1.14	0.28	12.37
8/27/85	WB06	0.99	0.23	2.20
8/27/85	WB06	2.79		
7/2/85	WB03	0.57	*	**
8/27/85	WB03	0.36	**	0.21
8/27/85	WB03	0.33		
7/2/85	WB02	0.22	*	1.21
7/11/85	WB02	*	*	0.59
8/27/85	WB02	0.10	*	**
8/27/85	WB02	0.34		
7/2/85	WB01	0.45	*	**
8/27/85	WB01	*	0.03	**
10/4/85	WB02	0.11[a]		
10/4/85	WB02	0.81[a]		
10/4/85	WB02	4.29[a,b]		
10/4/85	WB04	1.26[a]		
10/4/85	WB04	2.79[a,c]		
10/4/85	WB04	3.91[a]		
10/4/85	WB04	0.61[a,b]		
10/4/85	WB04	6.31[b,c]		
10/4/85	WB04	1.59[a,c]		
10/4/85	WB05	0.26[a]		
10/4/85	WB05	1.93[b]		
10/4/85	WB05	2.10[a]		

*No sample taken; **Too few peaks to ascertain presence of A1232; a = Backfin tissue; b = other body tissue; c = trap left at WB04 for two weeks.

Whale Branch-Campbell Creek Sampling Sites



SITE LOCATION

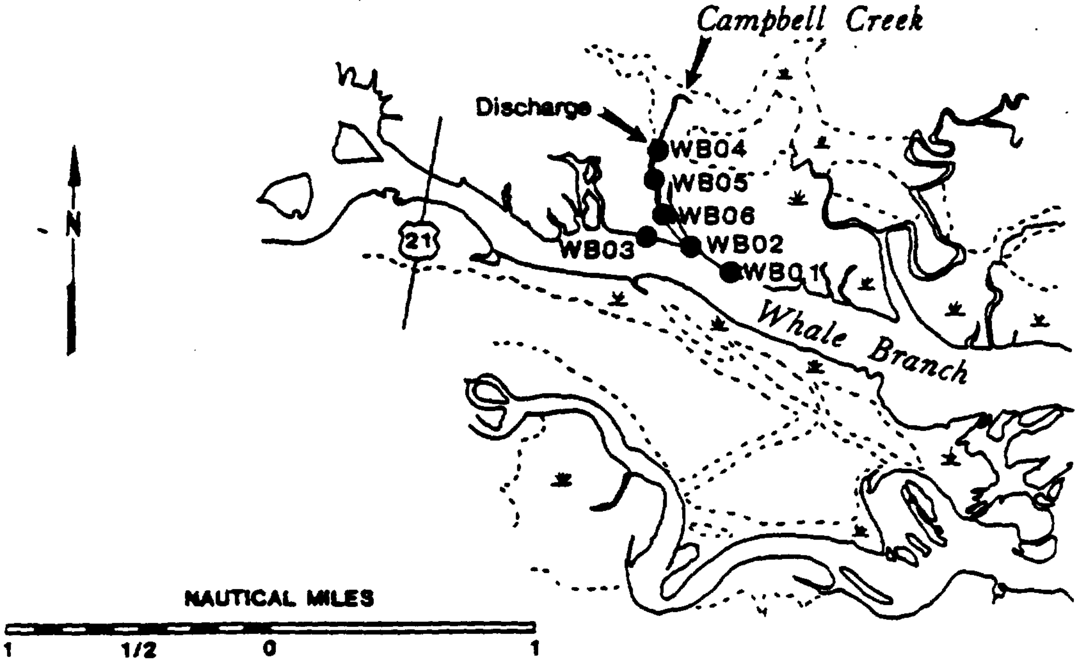


FIGURE 1.

South Carolina

Department of Health and Environmental Control

2600 Bull Street, Columbia, S.C. 29201, Telephone (803) 758-5257

obert S. Jackson, M.D., Commissioner
'arren R. Hardy, Director of Public Affairs

News Release

FOR IMMEDIATE RELEASE
November 1, 1985

COLUMBIA — Laboratory analyses of edible crabmeat samples taken from Campbell Creek and Whale Branch near Beaufort indicates no need for any restrictions on harvesting and consumption because of polychlorinated biphenyl (PCB) contamination, the state Department of Health and Environmental Control announced today.

"There is no need for any restrictions on the part of the public or commercial crabbers," according to Russell W. Sherer, director of DHEC's Division of Water Quality Assessment and Enforcement. "The data we have shows PCB levels to be below the two part per million tolerance limit of the U.S. Food and Drug Administration which is used as a cutoff for interstate shipment of shellfish.

"We found PCBs in nearly all of the samples taken from the nine sampling locations. The levels of PCBs were similar to levels reported by other states," Sherer said.

PCBs, once commonly used in transformers and other electrical equipment, were banned by the U.S. Environmental Protection Agency in the mid 1970s. It is a known carcinogen or cancer-causing agent.

Because of concerns about PCBs in crab tissues, DHEC plans to expand its coastal monitoring program.

"We will widen the monitoring effort to include at least 16 of the stations along the coast where we now study oysters, clams and the macroinvertebrate communities as well as water and sediments," Sherer indicated. "We will be adding crab tissue analysis for PCBs and other contaminants.

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Samples taken from the location closest to the outfall of the Venture Chemicals Inc. plant which discharges treated wastewater to Campbell Creek, showed higher overall PCB levels than the other eight sites but were still below the two parts per million level.

DHEC analyses of the company's treatment plant sludge revealed no PCB contamination and work conducted at Venture Chemicals does not indicate that the company is the source of the PCBs.

However, Dr. Robert F. Marino, director of health hazards evaluation for DHEC, said "while the levels are lower than the federal guidelines, someone who wants to minimize their exposure to PCBs may want to refrain from eating crabs from the area closest to the outfall."

Sherer added that DHEC has a restriction on shellfish gathering in areas near a discharge point.

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For further information:
Thom Berry - 758-5500

haled or swallowed. ... called the gas methyl iso cyanide.

Union Carbide called an immediate halt worldwide to the production and shipment of the poisonous material.

At a news conference in Danbury, another Union Carbide official, Jackson B. Browning, said: "We are doing what we can to bring the existence of this material to a halt through halting production and we are halting distribution, as I indicated, and we are taking this special added precaution of determining if the safety processes and devices are fully operational."

A doctor and four technicians have been sent to India to investigate, Browning said, adding that Union Carbide officials had been unable to contact company managers at the Bhopal plant.

Union Carbide's managing director in India, Y.P. Gokhale, said the gas began leaking when a storage tank valve broke under rising pressure. He said gas escaped for 40 minutes before the leak was stopped and the poisonous gas slowly began dissipating in the air.

By then the cloud of gas had settled over a 25-square-mile area inhabited primarily by poor laborers.

concluding that running ... Massachusetts Democrat "could very well have become a destructive situation than a constructive one."

He said lack of wide support from colleagues and O'Neill's promises that conservatives would be given a much stronger voice in House decisions prompted his decision to drop out.

"When a team is losing, the coach gets the blame," Stenholm, of Texas, told reporters. "(But) it became apparent that we are unable to change the coach. If you can't change the coach, you change the game plan. ... We are going to work within the Democratic Party."

But Stenholm bowed out with a shot at O'Neill, claiming his old-style liberalism was out of touch with the views of most Americans. O'Neill "is perceived as being the cause of our federal deficits. ... The speaker, in the eyes of many, in Texas and in the South, is the problem," Stenholm said.

Democrats kept most of the rest of their lead-

Rep. Thomas P. O'Neill Jr.

... the Democratic vice presidential nominee, could not run for re-election to her House seat.

At a separate caucus, Republicans also stuck by their leaders of the last Congress, re-electing Robert H. Michel of Illinois as minority leader, Trent Lott of Mississippi as minority whip and Jack Kemp of New York, a potential 1988 GOP presidential contender, as chairman of the GOP conference.

Michel, 61, in his acceptance speech, told colleagues that even though Republicans were the minority party in the House, "I believe we are the party that speaks for the majority of the American people."

He said he would try hard to rebuild the coalition of Republicans and conservative Democrats that helped propel President Reagan's tax and budget-cutting bills through the House in 1981 and early 1982.

DHEC Finds Ecological Problems In Creek Near Chemical Company

By KEN BURGER
Post-Courier Reporter

LOBECO — Almost a year after a Beaufort physician asked the state to investigate a chemical company he claimed was discharging toxic waste into Campbell Creek, the Department of Health and Environmental Control has issued a report identifying 66 organic chemicals being dumped by the plant.

The DHEC report states that several of these compounds could deliver toxic or narcotic effects to the aquatic community, and that some are cancer causing.

The general manager of Venture Chemicals Company, the subject of the report, says the DHEC report is distorted. The company is located 10 miles north of Beaufort.

Dr. Read Lewin, the only resident on Campbell Creek which empties into Whale Branch just north of Beaufort, called for the DHEC investigation last December after losing a battle to prevent County Council from approving a $3 million industrial revenue bond for expansion of the controversial plant.

The chemical plant, which has had three owners since it was built in 1966, sits approximately one-half mile from Campbell Creek. A pipe runs to the creek where the effluent is discharged. Venture produces intermediate dye materials which are shipped to other companies around the country to be converted into dyes. The plant also produces specialty organic chemicals.

"They are putting poison in the water," said Lewin, whose home sits a few hundred yards from the plant's discharge point. "I've seen the red-colored dye coming right out of the outflow, and I know it's damaging the creek."

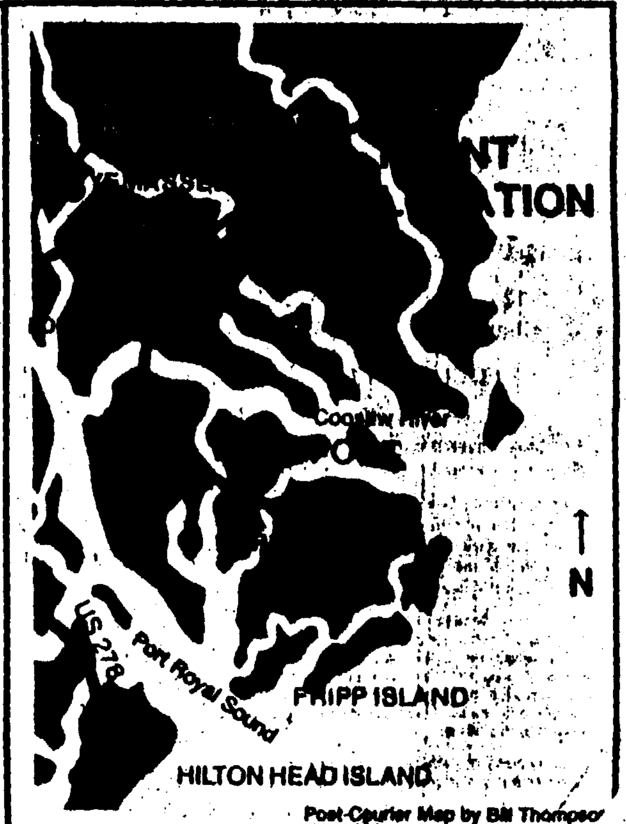
Lewin said he has spent more than $2,600 in legal fees to fight the company, which employs 60 people from the area.

Venture Chemical is owned by Enterra Corporation of Philadelphia which purchased the plant from American Color and Chemical Inc. in 1982. The plant was originally built by Berkshire Color Division of Tenneco Inc.

Specifically, DHEC noted in its report:

- The source of the majority of the 66 chemicals came from Venture Chemicals Company.
- Several of the compounds could cause toxic

See Chemical, Page 8-A



Post-Courier Map by Bill Thompson

...Chemical

Continued From Page 1-A

or narcotic effects on the biological community in Campbell Creek, and are considered definite or likely carcinogens (cancer causers).

- A reduction in the numbers of decapod crustaceans (shrimp, lobsters and crabs) in the area near the discharge.
- Fewer oysters in the creek, and more importantly, significantly fewer juvenile oysters.
- Severe biological degradation and toxic effects to fauna in the creek, but not fully extended into Whale Branch.
- No marked accumulation of selected heavy metals in oyster tissue or sediment.
- It is questionable as to whether Venture Chemical has efficiently and consistently treated the raw waste.
- Disinfection agents used by Venture, in some cases, actually increase the toxicity of some of the chemicals.
- Perhaps the most significant finding from sediment analyses was the identification of mercury in a detectable amount. The presence of any form of mercury must be considered undesireable and potentially hazardous.

"This company has been using the fact that they employ about 60 poor blacks as a smokescreen to what they are doing to the water," said Lewin. "They are ruining the waters around here, and there is no reason for our waters to be degraded to the point of damaging the shellfish.

"What they need to do is just figure out a way to haul that stuff out of here instead of dumping it in the creek," Lewin said.

John M. Meeks, general manager of the Venture plant who has worked for all three owners over the past 16 years, said his company is "definitely not" polluting the waters in the area.

"I've seen that report, and in my opinion the conclusions are in error," Meeks said. "They are qualitative and not quantitative. The numbers don't support the conclusions."

Meeks said he has been in touch with DHEC officials and expects another report to be done. He also produced an independent oyster study, paid for by Venture and compiled by the Greenwood engineering firm of Davis & Floyd, which claims the presence of such compounds is widespread in the area and not the result of a particular discharge to surface water.

"I am reluctant to give an opinion at this point. All I can say is that I am going through channels to isolate the reasoning and timing behind this report," Meeks said. "But I am satisfied that what we are doing here has no adverse effect on the waters here, and I'd like for the people of Beaufort County to know that.

"We have to live with these people, and I think we will find that hard to do for a while because of this report," Meeks said.

As for Lewin's idea to haul the waste away, Meeks said there are no such alternatives available to him at this time.

"It is not economical to haul off the waste," Meeks said. "The only long range alternative would be to change our product lines so that there would be zero discharge."

Jack C. Wright, DHEC's district director in Beaufort, said "there has been deleterious effects on organisms in Campbell Creek, not only in numbers but in the size of oysters.

"That area has been impacted heavily," Wright said. "We've had problems with plant die-offs two or three times in the past because of Venture."

The area, in fact, was closed for shellfishing eight months ago by DHEC.

Arthur Horne, executive director of the Beaufort County Development Commission and a former chairman of County Council, said Venture Chemicals is a "good corporate citizen" which pays its lowest paid workers more than minimum wage.

"Based on knowing their management and other personnel and my personal observation of the plant, I think they are a good corporate citizen," Horne said. "They have had an above-average impact on the area's economy."

Asked about the pipe which discharges wastewater into Campbell Creek, Horne said that he was not aware of a pipe leading from the plant to the water.

"I'm not aware of a pipe or any discharge that has ever amounted to fouling of waters, surface or subsurface, in or around that operation," Horne said.

Horne spoke in favor of Venture before County Council last year when the company was seeking the $3 million revenue bond. "I have no idea what they make out there," Horne said. "But when I represented them before council for the revenue bonds, I spoke with a lot of people and found no warts."

He admitted, however, that Venture is the only chemical company in Beaufort County, and that if another chemical company would try to locate here, he would not approve of it.

State Sen. James M. Waddell, a Beaufort insurance executive and chairman of the S.C. Coastal Council, said he was not up to date on Venture.

"I haven't heard much about them lately," Waddell said. "I haven't heard of any fish kills in that area, but they have had some discharge problems."

Waddell said anything built prior to the 1977 conception of the Coastal Council was not under the council's jurisdiction.

Venture Chemical strikes vo

BY DEAN FOSTER
Gazette staff writer

Venture Chemical Co.'s battle with Beaufort County Council member Janet Sawyer over a proposed $3 million expansion of the company's Lobeco plant was subdued Thursday.

A voluntary compromise was struck in Venture's discharging permit.

In council's Nov. 28 meeting, Mrs. Sawyer argued that Venture Chemical, which produces intermediate organic and inorganic chemicals, was discharging toxic wastewater into Campbell Creek. Despite her efforts, Venture's $3 million Industrial Revenue Bond passed its second reading before council.

Thursday morning, four days before the bond's third and final reading on Dec. 12, Mrs. Sawyer met with S.C. Department of Health and Environmental Control officials, Venture plant manager John Meeks, and other authorities to discuss what Sawyerthinks to be flaws in Venture's National Pollutant Discharge Elemination (NPDES) permit.

The result was an addition to the NPDES permit which calls for bio-accumulative testing and monitoring of marine life in estuaries surrounding the discharge point.

"I can speak with great assurance that Venture Chemical is doing everything possible to put out wastewater that is as clean as possible," Mrs. Sawyer said after the mee

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on a contract to produce a new chemical and needed to prove they had a valid NPDES permit.

In a letter from U.S. Fish and Wildlife field supervisor ger L. Banks to Gross dated July 1 many hazards of enture's Lobeco plant were outlined. Banks stated that inspection of the waste treatment system and the plant itself showed much of the equipment "operating at less than optimal efficiency."

Banks went on to say, "There appeared to be ample opportunity for spills and resultant runoff into the estuary. The receiving creek (Campbell) can only provide limited mixing and dilution of this effluent before it enters the estuary."

Banks also outlined some other important concerns:

• "This plant (operating under a different name) has a history of causing fish kills in the area.

• Present toxicity testing is limited to two pre-set times per year.

• There is a potential for bio-accumulation of toxicants in the estuarine organisms of Campbell Creek and Whale Branch."

According to wildlife department officials, portions of Whale Branch and other creeks have been closed to shelfishing while other portions are ranked class SA (suitable for human consumption).

"In summary," Banks stated, "the Venture Chemical Company produces a great number of chemical products that are potentially dangerous to the marine fauna in Campbell Creek, Whale Branch and the surrounding estuarine waters."

Nevertheless, Gross signed a modified NPDES permit Nov. 10 giving Venture Chemical authority to discharge up to 180,000 gallons of effluent per day into Campbell Creek until midnight, Dec. 31, 1985.

DHEC officials and Meeks contend that Venture's NPDES permit assures the safe operation of processing chemicals and discharging effluent. "Both state and federal laws (Pollution Control Act) stipulate to industry what results of non-compliance (of NPDES permit) are," Meeks said. "The entire facility can be shut down, our permit withdrawn, and we can be fined $10,000 per day (for non-compliance)."

Venture's current permit calls for the company to implement a Best Management Practices (BMP) plan. The plan "shall include a listing of all potential sources of spills or l

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Venture File

The Island Packet, Friday December 9, 1983

Chemical hearing planned

By HEATHER CONLEY

The public will have a chance Monday to say what it thinks about the proposed expansion of a waterside chemical company in northern Beaufort County.

Venture Chemical Company of Lobeco wants County Council to approve a $3-million industrial revenue bond to finance plant expansion.

The public hearing, scheduled for 4:15 p.m. at the County Office Building in Beaufort, will give both environmentalists and citizens concerned with the firm's impact on the economy a chance to air their views.

Council will consider a third and final reading on the bond issue soon after the public hearing is over.

In council's Nov. 28 meeting, council member Janet Sawyer of Beaufort argued that Venture Chemical, which may be called upon at any time to produce any of 43 intermediate organic and inorganic chemicals, was discharging toxic wastewater into Campbell Creek. Despite her efforts, the company passed its second reading before council, in a 5 to 4 vote.

Mrs. Sawyer said she wanted the discharge elimination permit, which was recently issued to the company by the S.C. Department of Health and Environmental Control, to include more safeguards for shellfish in the affected waters and their human comsumers alike.

After an informal meeting Thursday morning of concerned parties — officials from DHEC, the Venture plant manager and Mrs. Sawyer, among others — the council member reported that she was pleased with the results. DHEC has promised to tighten its discharge elimination permit by adding annual bio-accumulation tests and concerns about cleanup provisions and unannounced tests were partly provided for, she said.

Although the council member said she had not yet decided how she would vote on Monday's reading, she was satisfied that Venture Chemical was "doing the best possible job on its wastewater, considering its product."

THE BEAUFORT GAZETTE, Tuesday, December 13, 1983

Council OKs $3 million bon

By DEAN FOSTER
Gazette staff writer

Despite strong opposition from county residents concerned about environmental safety, Beaufort County Council passed on Monday the final reading of a $3 million Industrial Revenue Bond Issue for Venture Chemical Co.

The issue allows Venture to expand its Lobeco plant, which has been attacked by the departments of U.S. Fish and Wildlife, S.C. Wildlife, and the S.C. Coastal Council for contaminating Campbell Creek and surrounding estuaries by discharging toxic effluent.

Council, however, authorized the issue by a 5-3 vote with Bill Young, J. Patrick Vanderhoof and Martha Baumberger voting against the issue. Janet Sawyer, who openly criticized the S.C. Department of Health and Environmental Control for flaws in Venture's operating permit, did not vote.

During a break from the meeting Mrs. Sawyer said she chose not to vote because she was presiding as chairman of council at the time of the vote. Council's chairman has the option of voting but must vote in the case of a tie.

Several county residents raised environmental concerns about Venture's plant in a public hearing held before council's vote.

Philip Fairbanks, attorney for the S.C. Sierra Club, outlined numerous complaints from U.S. Wildlife, S.C. Wildlife, and S.C. Coastal Council to DHEC about the operation of Venture's Lobeco plant. "If our marine resources are rendered unfit for human

Bond

(Continued from Page 1A)

"because of the inadequacy of the protection provided by the state to the shellfish beds which support those operations."

Ralph Maggioni, president of the Maggioni oyster company, told council his company lost over $260,000 in oyster harvests because of "fecal chloroforms coming to the shellfish area," he said. According to Maggioni, it is becoming "more and more difficult for them (employees) to pick oysters because of pollution. We provide a strong financial base for many people," he said, "this is the soul of the Lowcountry economy."

A resident of the Campbell Creek area, Dr. Read Lewin, said he had heard stories about seafood contamination in the area but still witnessed people harvesting shrimp and shellfish in and around Campbell Creek. "The question comes to mind, why should a plant be open in the first place if it is polluting the environment?," Lewin said. "Should we let the plant pollute because it has been there (since 1966) and is established, to save some 40-odd jobs and say to hell with the environment?"

Lewin told council, "it seems more logical to at least postpone the issue to test tissue of marine animals - why rush?," he said. "Let's stop something before it gets started."

Arthur Horne, former council chairman, presented the issue to council and said he did not envy council's position. "John Meeks (plant manager) has nothing to hide and you should think about the 50 to 60 families (plant employees) when you say either Merry Christmas or I don't care," Horne said.

Mrs. Sawyer shared the outcome of her meeting last Thursday with Meeks, DHEC representaives and others with council after the public hearing. Mrs. Sawyer said a voluntary agreementby Venture to conduct bio-accumulation testing once per year was accomplished. DHECdid not act on testing the effluent or making venture stop production if the discharge is found to be in excess of the permit regulations, Mrs. Sawyer said.

Councilman Morris Campbell moved to table the issue until DHEC could satisfy all testing thought neccessary. According to Campbell, Councilman Joseph N. Kline convinced him that DHEC has done sufficient testing and Campbell chose not to pursue his notion. Kline then moved to vote on the issue and council agreed.

vcrnure file

The Island Packet, Wednesday December 14, 1983

Chemical plant bonds okayed

By DEAN FOSTER

BEAUFORT — Despite strong opposition from county residents concerned about environmental safety, Beaufort County Council passed on Monday the final reading of a $3-million industrial-revenue-bond issue for Venture Chemical Co.

The issue allows Venture to expand its Lobeco plant, which has been attacked by the departments of U.S. Fish and Wildlife, S.C. Wildlife and the S.C. Coastal Council for contaminating Campbell Creek and surrounding estuaries by discharging toxic effluent.

Council, however, authorized the issue by a 5-3 vote with Bill Young, J. Patrick Vanderhoof and Martha Baumberger voting against the issue. Janet Sawyer, who openly criticized the S.C. Department of Health and Environmental Control for flaws in Venture's operating permit, did not vote.

During a break from the meeting, Mrs. Sawyer said she chose not to vote because she was presiding as chairman of council at the time of the vote. Council's chairman has the option of voting but must vote in the case of a tie.

Several county residents raised environmental concerns about Venture's plant in a public hearing held before council's vote.

Philip Fairbanks, attorney for the S.C. Sierra Club, outlined numerous complaints from U.S. Wildlife, S.C. Wildlife, and S.C. Coastal Council to DHEC about the operation of Venture's Lobeco plant.

"If our marine resources are rendered unfit for human consumption by the bioconcentration of lethal chemicals discharged by this facility, it will not be sufficient for the members of this council to point to the issuance by DHEC of a rather hasty and ill-considered permit," Fairbanks said.

Fairbanks also commended Mrs. Sawyer for her efforts of bringing "public accountability" to the issue "after DHEC had pretty much abdicated its role by issuing a permit to the applicant in this matter despite a rather wretched history of fish kills and other serious matters," he said.

The state's commercial shellfish future was also questioned.

"The principal shellfish bed leaseholder is presently threatening to abandon operations in South Carolina," Fairbanks said, "because of the inadequacy of the protection provided by the state to the shellfish beds which support those operations."

Ralph Maggioni, president of the Maggioni oyster company, told council his company lost more than $260,000 in oyster harvests because of "fecal coliform (bacteria used to indicate the presence of animal or human waste) coming into the shellfish area," he said. According to Maggioni, it is becoming "more and more difficult for them (employees) to pick oysters because of pollution.

"We provide a strong financial base for many people," he said, "this is the soul of the Lowcountry economy."

A resident of the Campbell Creek area, Dr. Read Lewin, said he had heard stories about seafood contamination in the area but still witnessed people harvesting shrimp and shellfish in and around Campbell Creek.

"The question comes to mind, why should a plant be open in the first place if it is polluting the environment?," Lewin said. "Should we let the plant pollute because it has been there (since 1966) and is established, to save some 40-odd jobs and say to hell with the environment?

"It seems more logical to at least postpone the issue to test tissue of marine animals," Lewin said. "Why rush? Let's stop something before it gets started."

Arthur Horne, former chairman of Beaufort County Council, presented the issue to council and said he did not envy council's position.

"John Meeks (plant manager) has nothing to hide and you should think about the 50 to 60 families (plant employees) when you say either, 'Merry Christmas' or, 'I don't care,'" Horne said.

Mrs. Sawyer shared the outcome of her meeting last Thursday with Meeks, DHEC representatives and others with council after the public hearing. Mrs. Sawyer said a voluntary agreement by Venture to conduct bio-accumulation testing once a year was accomplished.

DHEC did not commit itself to testing the effluent or making Venture stop production if the discharge were found to be in excess of the permit regulations, Mrs. Mrs. Sawyer said.

Councilman Morris Campbell, at-large member from Hilton Head, moved to table the issue until DHEC could promise to provide testing to the county's satisfaction. According to Campbell, however, Councilman Joseph N. Kline, convinced him that DHEC has done sufficient testing and Campbell decided to drop his motion. Kline then moved to vote on the issue and council agreed.

—The News & Courier, Charleston, S.C., Tuesday, April 24, 1984

Bacteria In Shellfish Waters Linked To Discharges

By MARSHA WHITE
Post-Courier Reporter

Septic tank leaks or wastewater discharges may have contributed to bacterial problems that resulted in the recent closing of shellfish waters near Beaufort, a state health official said Monday.

Scientists at the S.C. Department of Health and Environmental Control are not sure what caused the high bacteria count that put an end to shellfish harvesting in part of Half-Moon Creek, Whale Branch and all of Huspah Creek, said Russell Berry, DHEC shellfish manager in Beaufort.

A correlation between rainfall and the increase in bacterial levels has been noted, which means waste from some area septic tanks may be leaking and making its way into the creeks through groundwater, Berry said.

Two other sources of wastewater, the James Davis Elementary School and Venture Chemical Co., also may be contributing to the problem, Berry said. DHEC officials are checking those discharges periodically to see if either the school or the company is the source of high bacteria levels.

Venture Chemical Co. manufactures different types of specialty chemicals on a contractual basis, but Berry said he is unsure what products are produced.

Dr. Read Lewin, who lives near Campbell Creek and Venture Chemical Co., has filed an appeal of DHEC's decision to grant the company a discharge permit. Lewin said Campbell Creek has been closed to shellfish harvesting for some time and the creek feeds into Whale Branch.

"The reason I'm appealing the DHEC permit is because DHEC granted them a new license to discharge wastes into Campbell Creek," Lewin said. "They not only got a new license to discharge into Campbell Creek until sometime in 1985, but they also got permission to manufacture a new chemical," Lewin said.

Information on the types of chemicals manufactured at the plant is very sketchy, Lewin said. But the plant expansion is supported by many leaders in the Beaufort area, because the plant will provide badly-needed jobs in the area.

"But of course they're eliminating thousands of jobs by closing the shellfish beds," Lewin said. One major shellfish harvesting operation has been moved to Georgia because of the closings and problems with pollution, Lewin said.

A spokesman for the Columbia DHEC office said that no date has been set yet on that appeal. A spokesman for the Venture Chemical Co. could not be reached for comment Monday.

File

GROSS, J. JOY, RENTZ, G. NELSON, M. MARCUS

The Island Packet, Friday December 7, 1984

More study set for Campbell Creek

By DEAN FOSTER

Several months will pass before enforcement action, if any, will be taken on Venture Chemical Company's discharge permit, state Department of Health and Environmental Control officials said Tuesday.

A water assessment report, based on November, 1983 samples of oyster tissue in Campbell Creek, listed the presence of 66 chemicals, some of which were found to be toxic and carcinogenic. DHEC officials, however, said they are not satisfied with the report's data and will wait on results from additional samples before taking action.

"The samples taken in November, 1983 are misleading," DHEC Industrial and Agricultural Wastewater Director Jim Joy, said.

"We are not satisfied and will do more monitoring of the area to support the lack of or presence of these compounds."

Dr. Read Lewin, who lives near the plant's discharge pipe on Campbell Creek, said he is not surprised by the report's (November, 1983) findings.

"I don't know if it (report) will help," Lewin said. "The chemical company will do anything they can to downplay this report."

According to Joy and Jack Wright, Beaufort's DHEC district director, DHEC will consider four sets of samples before taking action.

"Basically, the November, 1983 samples showed the presence of these chemicals and the other (August, 1984) samples did not," Joy said.

A study commissioned by Venture and compiled by Davis and Floyd Engineers of Greenwood, also found no presence of the hazardous chemicals, according to Joy. John Meeks, Venture plant manager, was involved in a series of company meetings Tuesday and Wednesday morning and could not be reached for comment.

"The summer work done by DHEC and by Venture does not correlate to the November, 1983 samples and therefore we need a time frame study to see if the results are seasonal or what," Joy said.

Joy and Wright agreed that the differing samples could be due to "seasonal variations" in the oysters tested. Additional DHEC testing of the Campbell Creek area was to have been conducted today, they said.

"The problem is that it takes several months to get the numerous laboratory results back," Wright said.

"We're really in a gray area with these two sets of samples," Wright said. "The samples taken in August, 1984 contradict what these (November, 1983) samples say."

DHEC officials have discussed updating the Campbell Creek water assessment report with the August, 1984 and December, 1984 samples, according to Wright, but no new report will be compiled.

Venture's National Pollutant Discharge Elimination System, (NPDES) permit was re-issued by DHEC in December, 1983 and expires in 1988, according to Wright. DHEC officials say they have no plans to revoke Venture's NPDES permit, which would prevent them from discharging the chemical waste, based on the Campbell Creek report.

"If we find they are in violation of the permit, we could begin with enforcement action of civil penalties and (have Venture) take corrective action," Wright said.

The modification of Venture's NPDES permit is also a possibility, according to Joy.

Venture's NPDES permit currently only calls for the monitoring of fecal coliforms in the effluent, Joy said, and could be changed to monitor amounts of total coliforms. "Disinfectant modifications" in the plant's treatment of their effluent is another possibility, he said.

"These monitoring requirements and chemical studies are all additional requirements over what we do now," Joy said.

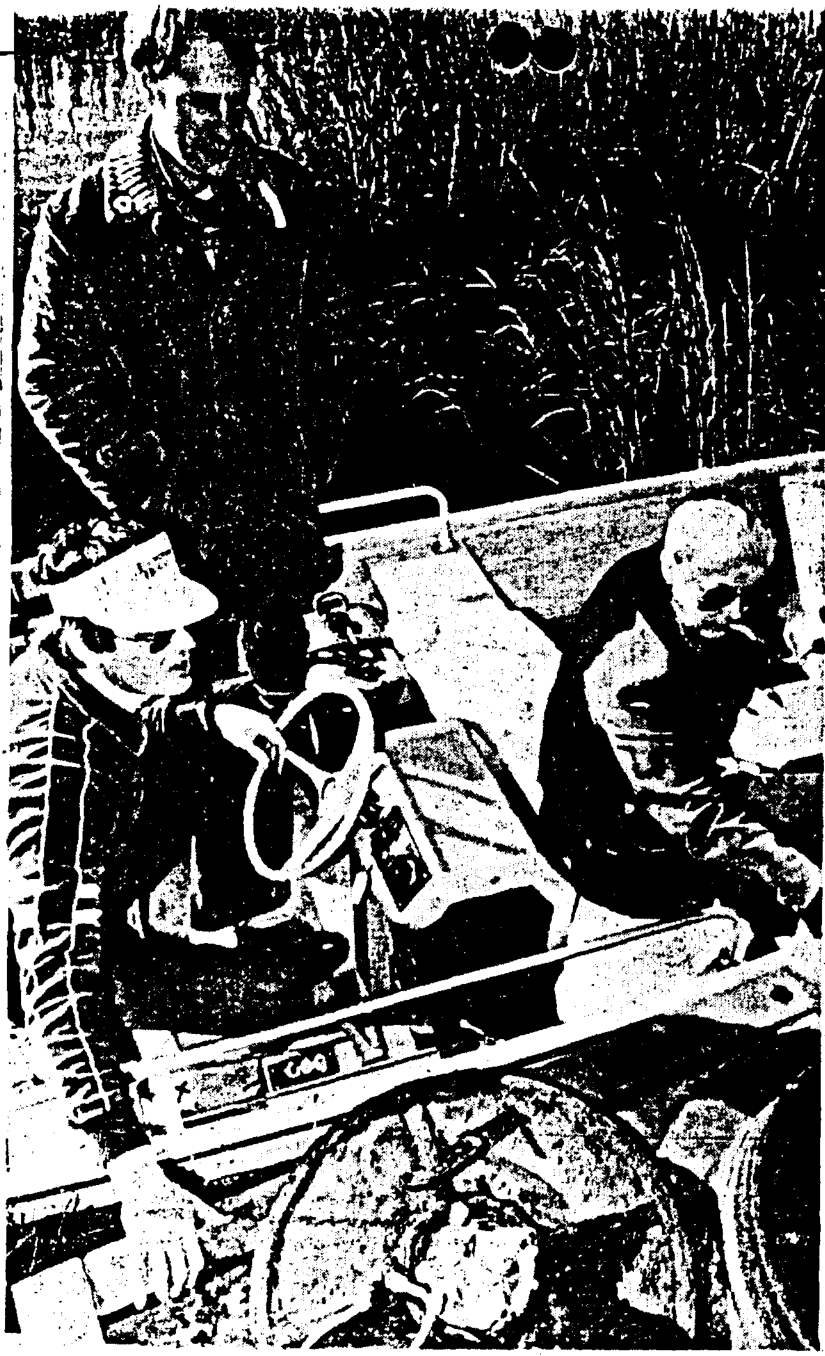
"There will be no immediate action on their discharge permit while we try to verify what is going on out there," he said. "We would not want to make any requirements that may not be neccessary as a result of (today's) samples."

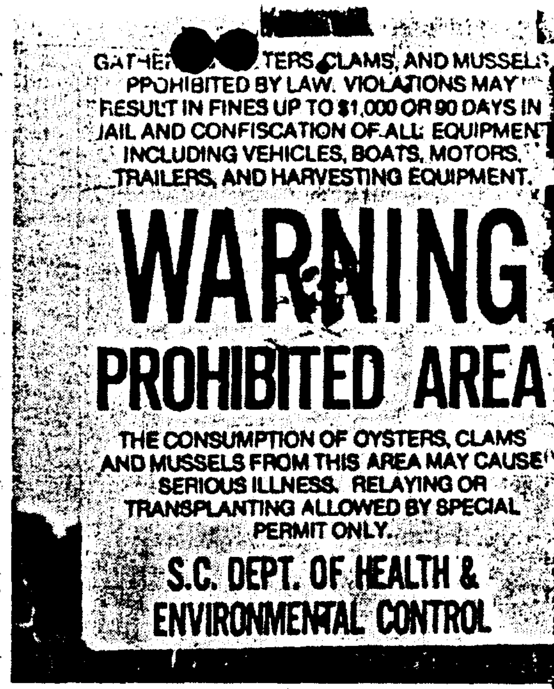
Lewin has spent the past year appealing DHEC's issuance of Venture's NPDES permit after Beaufort County Council approved a $3 million industrial revenue bond issue for the plant's expansion in December, 1983.

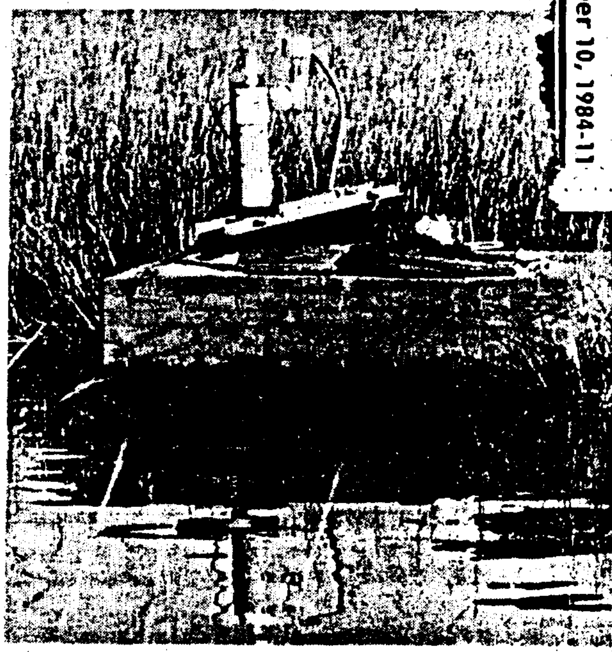
He advocates having Venture transport the effluent out of the area and calls for increased sampling of the Campbell Creek area by DHEC.

"Why are we talking about allowing our environment to be polluted at all — even if it is seasonal?," Lewin said. "No one seems to listen or care."

THE BEAUFORT GAZETTE, Monday, December 10, 1984-11







Bob Sofaly/Gazette

Firsthand look

At left, Dr. Read Lewin, Gordon Sproul (standing) and Janet Sawyer view the outfall area around Venture Chemical Company's discharge point in Campbell Creek Sunday. Top right, a state health department sign warns against harvesting shellfish in the area. Bottom right, Venture's discharge point is shown.

Officials to discuss toxic discharge

By DEAN FOSTER
Gazette staff writer

State health officials will meet with county leaders this Friday to answer questions on the department's reports of finding toxic chemicals in Campbell Creek near Lobeco.

A report on the area's water quality, released this past week by the S.C. Department of Health and Environmental Control, listed the presence of 66 chemicals (some toxic and carcinogenic) near the discharge pipe of Venture Chemical Co. in Lobeco.

County officials called the meeting to ask DHEC department heads what action is being taken... several creeks in the area to shellfishing due to the high level of coliform bacteria.

"Why didn't they do something at that time?," Mrs. Sawyer said. "Also, if it is against DHEC's regulations to discharge into Class SA waters, which Campbell Creek is, then why are they allowing it?

"We'll be asking specific questions about the report (water analysis of Campbell Creek) and about their provisions on shoring up that (Venture's discharge) permit," she said.

Venture plant manager John Meeks said he had not been invited to Friday's meeting ... in the area. DHEC's report released this past week is based on a single set of samples taken during November of 1983.

Mrs. Sawyer, however, did not agree with Meeks' idea of attending Friday's meeting.

"Our questions are for DHEC and I see no reason for Venture Chemicals to be there," Mrs. Sawyer said. "Nothing Venture can tell us will be helpful. All they (Venture) will do is excuse or explain their way out of it."

Dr. Read Lewin, who lives near the discharge point on Campbell Creek, took Mrs. Sawyer and USC-Beaufort professor Gor-

Discharge

(Continued from Page 1)

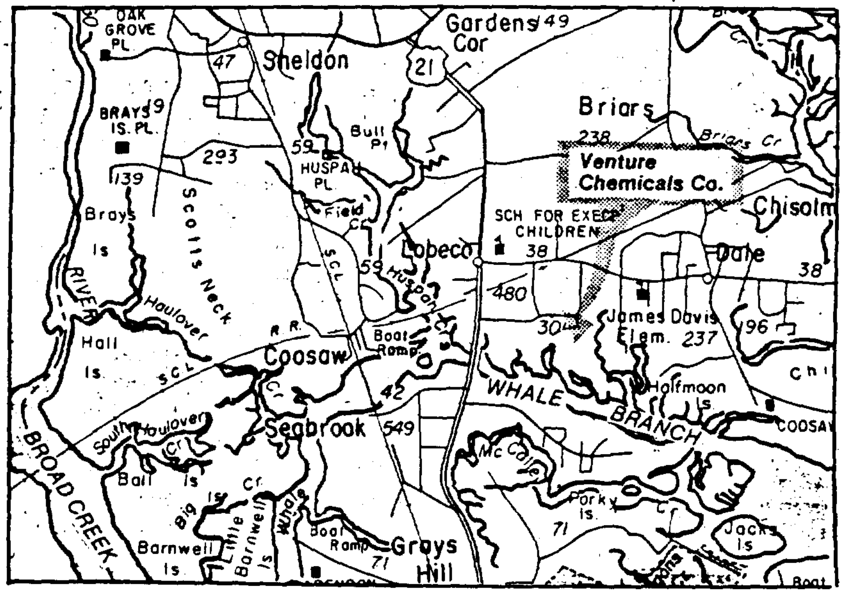
Moon Creek and Whale Branch River to shellfishing.

According to Mrs. Sawyer, the brackish water of Campbell Creek resembled other inland tributaries but an odor was prevalent. "You could smell it (discharge) rather than see it," she said.

Additional samples of the area were taken this past week and DHEC Industrial and Agricultural Wastewater Director Jim Joy, said the department may wait on the results before taking enforcement action, if any, on Venture's discharge permit.

Results from samples taken in the summer of 1984 (DHEC and Davis and Floyd) conflicted with the November 1983 samples (included in report), Joy said.

"The samples taken in November 1983 are misleading," Joy said. "We are not satisfied and will do more monitoring of the area to support the lack of or presence of these compounds."



Joy and DHEC Beaufort District Director Jack Wright agreed that the differing samples could be due to "seasonal variations" in the oysters tested.

"The problem is that it takes several months to get the numerous laboratory results (from this past week's sampling) back," Wright said. "We're really in a gray area with these two sets of samples."

Venture Chemical restrictions imposed

By FRAN SMITH

The state has designed a strategy to get Venture Chemical Co. clean up its act in the creek taking up to 400,000 gallons per day of its wastewater.

In a draft National Pollution Discharge Elimination System (NPDES) Permit out for public comment until May 19, the Department of Health and Environmental Control has included requirements it acknowledges have "not heretofore (been) imposed...on any permittee in South Carolina."

"We're going to limit the types of chemicals that may be handled there to only those that the treatment system can accommodate. ...We expect them to maintain the health of the stream itself and to keep the open shellfish grounds (in Whale Branch) open," said Bob Gross, chief of DHEC's Bureau of Water Pollution Control.

The U.S. Fish and Wildlife Service, which raised an alarm over data showing lead and cadmium in oyster tissue from the area more than a year ago, is "basically satisfied" with the changes DHEC plans in the permit, said Harvey Geitner of the agency's office in Charleston.

"It is a good initial step, brought about, I believe, because of the interest of a lot of people, including the Beaufort County Council," said Geitner.

Coastal Council Planning Coordinator Mac Burdette said that agency is also "basically satisfied" with the new draft permit. The council is going to ask for all of the future monitoring reports and is suggesting that the company dispose of its domestic wastewater on the land, instead of in the creek, Burdette said.

Running a "batch operation," meaning that the plant produces various specialty chemicals, depending on its market demand, Venture has had trouble in the past adjusting its wastewater treatment process to clean up differing constituents. It will now have to notify DHEC 30 days before the intended manufacture of a new product or use of a new raw material, and DHEC may require prior testing of the process and may deny permission.

Also according to the draft permit, the company would be required to do more monitoring, more research on ways to reduce toxicity and more analyses of the effects of the discharge on marine life than it has been doing. It would also have to control spills and leaks from storage, materials-transfer, sludge and waste-disposal areas, following a "Best Management Practices" plan for such an operation.

To help address the mystery of the presence of toxic PCBs found in the creek during the most recent tests, Venture is to test for PCBs weekly "until questions about sources are resolved" and report its findings to DHEC, according to the draft permit.

Other tentative requirements include the following:

• Venture has been performing toxicity tests on shrimp and will have to continue those tests annually during February, June and October.

• Starting next month it will also conduct monthly effluent toxicity tests on oyster larvae. In September of every year it is to analyze oysters for organic chemicals and metals.

• It is to survey oyster spat recruitment in Campbell Creek and other sites during June or July of every year, starting in 1985.

• By the end of next month Venture is to submit a plan to reduce discharge toxicity; by the end of September it is to complete an evaluation of the effect of chlorine in its discharge; by the end of October it is to submit a plan for a new system, with a schedule of implementation, for limiting chlorine toxicity.

"The company shall develop and submit a program to improve effluent quality and thereby eliminate adverse effects in Campbell Creek and receiving waters," the draft says.

Venture's discharge, which results from the production of a changing list of specialty chemicals, goes into Campbell Creek, a 1.3-mile long tributary of Whale Branch, a SA (shellfish standard) river near Beaufort. In 1983 DHEC investigators found 66 organic chemicals in the creek's water, sediment and oyster tissue and concluded that the chemical plant's discharge was severely damaging the area.

Since then, Venture has taken several steps to improve the situation, including trucking some of its waste to an approved land-disposal site) and both DHEC and Venture have done additional testing, with improved results.

But the actual permit in effect now was renewed in December 1983, and the draft permit that went out on public notice last week is the first official proposal for legally modifying the requirements on the company.

Venture is the only chemical manufacturer on the coast, and DHEC officials have said that it probably could not be permitted in its present location if it were not already in place. There has been a chemical plant at the spot on Campbell Creek at Lobeco, north of Beaufort, for about 16 years.

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FES ____ DGN ____
WGD ____ RAS ____
MGW ____ GEM ____

FILE

THE BEAUFORT GAZETTE, Wednesday, December 12, 1984

Files link discharge to ban

By FRAN SMITH
Special to The Gazette

Pollution that led to a shellfishing ban in a river and two creeks last spring is linked to Venture Chemical Co.'s wastewater discharge, according to files in DHEC's Lowcountry District office in Beaufort.

When announcing April 17 that parts of Whale Branch, all of Huspah Creek and part of Half Moon Creek had been found to be contaminated, Luke Hause, the head of DHEC's shellfish and recreational waters, told The Beaufort Gazette that septic-tank runoff or the presence of wildlife in the area may account for the high bacteria counts in the water.

Heavy rains may have exacerbated the general problem affecting L.P. Maggioni and Co. leases and public oystering areas in those waters, said another Department of Health and Environmental Control spokesman at the time.

But internal memoranda and correspondence in DHEC's Venture Chemical file state that plant operators added sludge from City of Beaufort and Fripp Island sewage-treatment plants to the chemical plant's wastewater stream shortly before the bacteria pollution began showing up.

By "seeding" its treatment process with domestic residue, the chemical plant increased the volume of bacteria — the principal factor in the treatment of organic chemical wastewater — in its waste.

The files do not show whether the bacterial seeding had any impact on the amount of chemical compounds going into the estuary, but they do show that, after the seeding, the number of bacteria in nearby shellfish waters rose to as many as several hundred times the safe limits.

The files also show that DHEC officials acknowledged internally the connection between the sewage and the shellfish at least three weeks before they closed and posted the waters and announced the ban publicly, saying, according to The Beaufort Gazette, that the "source of the coliforms had not yet been determined."

(Coliform bacteria are a common indicator of the presence of waste matter generated by warm-blooded animals.)

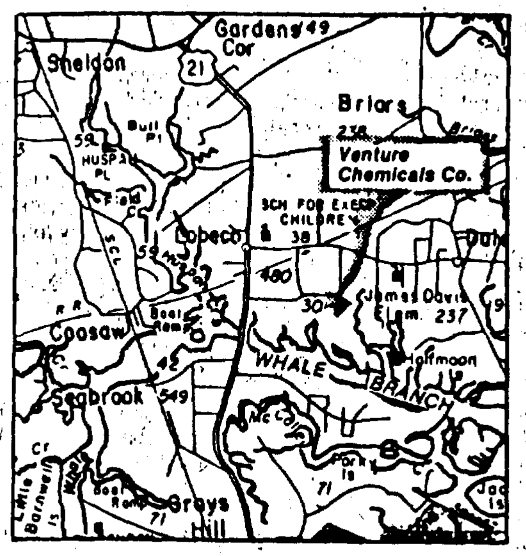
One sample of effluent from Venture Chemical showed the presence of more than 240,000 total coliform bacteria per 100 millileters, compared to the standard acceptable for shellfish waters of 70 coliform bacteria per 100 millileters, says a March 27 memo from the Lowcountry DHEC District to the Industrial Wastewater Division.

"For the past few months we have been collecting unsatisfactory water samples in Whale Branch, and we suspect that Venture Chemical's discharge could be causing some or most of the problem," wrote District Director Marshall Dixon on that date.

Venture discharges its wastewater from an outfall in 1.3-kilometer Campbell Creek, which empties into Whale Branch. Huspah and Half Moon are nearby tributaries. Because of Venture's presence, all of Campbell Creek and the banks of Whale Branch 500 feet on each side of the creek's [illegible] have been closed to shellfishing at least [illegible]

On April [illegible] the Lowcountry District shellfish manager advised Hause of the following:

• That the areas at the time open but later banned had been showing "sporadically unacceptable" test results and that water sampling had increased to try to clarify the problem;



• That Venture Chemical had had "two plant upsets" since Jan. 1;

• That rejuvenation of the upset chemical wastewater treatment system with "super bugs" (bacteria) from domestic sewage takes from 10 days to three weeks;

• That flows from Venture had increased from 150,000 gallons per day to 350,000 gallons per day since Dec. 15, 1983;

• That one type of pesticide and a component of another pesticide were being produced by Venture;

• That during the plant upsets, the pesticide production waste was "not being sufficiently treated";

• That there was a concern that waste from the pesticides "may possibly be concentrated in the food chain."

• That district officials concurred with the U.S. Food and Drug Administration's recommended closure zone as a preventative health measure.

(This was the first time that the federal agency's involvement is mentioned in the 1984 file on Venture.)

On April 13, Hause wrote a memo to the file, noting that Food and Drug Administration personnel had focused on the "Venture Chemical/Whale Branch/Campbell Creek complex" in February and "made some recommendations for our staff to implement with regards to the increasing the buffer zone, if necessary, and closing off certain other areas that are not now closed."

He wrote that new monitoring stations had been established but no decision had been made on whether to impose the new closures. Hause indicated concern about inquiries from "several news agencies" interested in the subject.

"It appears that because Venture Chemical has tripled their effluent, the impacted area has correspondingly increased," Hause wrote, adding, "A determination will be made soon regarding the necessity of an increased...closure area around Campbell Creek as it confluences with Whale Branch. [illegible]"

When the increased closures were announced, however, several DHEC officials said several times that the cause of the pollution was unknown.

There are other informational gaps in the files.

Pesticide production

1) A memo to the DHEC file from the Industrial Wastewater Division reported on a Feb. 17, 1983, meeting with Venture officials at which "a recently proposed discharge of pesticide-manufacturing wastewater" was discussed and at which it was concluded: "Any discharge of pesticide wastewater at this site is unacceptable." The memo said the proximity of open shellfish harvesting waters and the lack of continuous dilution water in the stream (Campbell Creek, which is very small at low tide) "are major factors in the unsuitability of this site."

Nevertheless, the April 10, 1983, memo from the Lowcountry District office to Hause reported that the company was producing "one type of pesticide and a component of another pesticide."

2) A June 12 inspection report says the Venture Chemical plant is designed to handle 400,000 gallons of wastewater per day but says the company's well pumped 2.7 million gallons per day in December 1983. It does not explain what happened to the extra gallons of water.

3) Although test results from the November 1983 sampling, showing chemical contaminants, and the spring 1984 sampling, showing bacterial contaminants, had been available to DHEC staff and Venture for at least several weeks by Sept. 7, 1984, Venture president Jack Cowan wrote DHEC that the company had invested substantial finances on studies and that: "Data generated to date indicates that Venture Chemicals Inc. is not a major factor in environmental impact to receiving waters or surrounding areas."

Cowan's letter said the company was in the process of reducing the number of products it manufactures while broadening its base of operations at the same time.

Cowan's letter also acknowledged the following: "It became apparent in early March 1984 that organic overloading of our activated sludge treatment was due to" waste from a product, PPG-1292, put into production in January 1984. Waste from that product is now going to another site, said Cowan.

Cowan did not identify that site. One DHEC official told The Island Packet that some waste formerly treated at the plant is now going to Aiken. A Dec. 2, 1983, letter gives Venture permission to dispose of three to seven tons of sludge at the Allendale County landfill.

On a boat trip into Campbell Creek, Whale Branch and Huspah Creek Sunday, Dec. 9, a party of five could not find any DHEC signs warning the public not to pick oysters, clams or mussels in Campbell Creek and found only two signs in all of the closure, which covers several miles of creek banks.

The Coastal Council certified that renewal of Venture's permit would be consistent with the Coastal Zone Management Act in November 1983. Conditions on that approval were that the permit could be modified or revoked, that several agencies would contribute to establishment of parameters for the DHEC study, that proper signage would be maintained around the closed areas and that close attention would be paid to the possibility of pollution by heavy metals and carcinogens.

A Coastal Council spokesman said this week that it appears several of those conditions have not been met.

BFT. GAZETTE Fri. 3/15/85

Creek findings mixed

By DEAN FOSTER
Gazette staff writer

Recent studies of Campbell Creek by state health officials show an improved water quality and a healthier crop of shellfish in the area although traces of polychlorinated biphenyl were found in the estuary's sediment.

State Department of Health and Environmental Control officials said they did not know where the PCBs came from but that research teams will continue investigating the area.

DHEC officials released their findings Thursday of samples taken of Campbell Creek, Whale Branch River and surrounding waters in December 1984.

Stricter discharge controls will be placed on Venture Chemical Co., which discharges its wastewater in Campbell Creek, as a result of the study. DHEC will mandate in Venture's NPDES discharge permit that the company be required to increase monitoring of marine life and sediments in the area.

The testing was conducted to compare conflicting data from three earlier reports in 1983 and 1984. A water quality assessment of Campbell Creek in November 1983 turned up the presence of 66 chemicals, many of them toxic and carcinogenic, in oyster tissue while separate reports in August 1984 found no chemicals present. BL?

Public shellfish grounds in Whale Branch and Huspah Creek, which have been closed since April 1984, were opened for harvesting Thursday as a result of the recent report.

While fewer synthetic chemical compounds were found in sediment samples taken this past December, DHEC tests found evidence of PCBs near Venture's outfall pipe in Campbell Creek.

DHEC Water Pollution Control Director Bob Gross said his department does not know where the highly toxic PCBs originated from but that DHEC officials are still investigating.

Gross said Venture does not use PCBs in their chemical production and that the chemical is "unlikely" to have formed in the area. "We have checked electrical transformers in the area and have found no leaks," Gross said. "The origin is now unknown but we will be doing a lot of work to find out where it is coming from."

According to Gross, the PCBs in the area were found in sediment and does not propose a public health hazard as no evidence of PCBs were found in oyster or water samples. PCBs (polychlornated biphenyls) are highly carcinogenic and have been used in the past in pesticides and as an insulator in electrical transformers.

Gross said PCBs have a tendency to cling to sediments and not mix with water. "And we will be doing a tremendous amount of work out there until we find out what's caused it to show up," he said.

Results of the December 1984 study showed no significant levels of heavy metals or "chemical pollutants attributable to Venture Chemical" in shellfish meats and sediments in the test area.

"While DHEC is not interpreting this as assured recovery of the area, it is an indicator that recovery may be beginning," Gross said.

Modifications to Venture's NPDES wastewater discharge permit include: new limits on bacteria in the discharge; additional controls on chlorine levels; periodic chemical monitoring of the effluent; periodic monitoring of the oysters and additional biological testing in the effluent and in the stream.

"We will require a thorough disinfection without overchlorinating the wastewater," Gross said. "Also, both total and fecal coliforms will be tested."

Venture is also required to contact DHEC before the company begins production of any new chemical.

DHEC officials said they were encouraged that the water quality in Campbell Creek and surrounding waters is improving by the re-establishment of several colonies of marine life.

Test results divided marine life into two groups: hard substrates (oysters, clams and other mussels) which re-

Creek

(Continued from Page 1A)

produce once a year, and soft substrates (worms and other non-shell animals) which reproduce once a month.

Glenda Swearengin, a DHEC biologist who helped research the study, said their samples showed an improvement and new growth in the soft substrate community. Ms. Swearengin said soft substrates respond quicker to an upgrade in the water quality than do hard substrates since their reproductive cycles are more frequent.

An improvement in the hard substrate community could be expected during their reproduction this summer, she said.

Gross said Venture had taken several products out of production in the past year and that the company has increased their efficiency in treating their wastewater.

"You can tell the difference in the color of the effluent," Gross said. "It used to dark, almost black, but now the discharge is almost clear.

"The environment is improving," Gross said. "We have some good news and bad news but we feel the good news is better than the bad news is bad."

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Venture permit changes please local leaders

BY DEAN FOSTER
Gazette staff writer

County leaders said they were pleased with action taken on Venture Chemical Company's wastewater discharge permit Thursday in a meeting with state health officials.

The meeting marked the second time in four months that Beaufort County Council has met with state Department of Health and Environmental Control department heads over reports of toxic pollution in the Campbell Creek, Whale Branch River area.

DHEC Water Pollution Control Director Bob Gross told council, "We have some good news and bad news but the good news is better than the bad news is bad."

The good news for council came with stiffer controls on Venture's discharge permit which allows the chemical manufacturing plant to dump its wastewater into Campbell Creek. Council members were also glad to hear of the reopening of public shellfish beds in the Whale Branch-Huspah Creek area which have been closed since April 1984.

Reports of finding highly toxic PCBs near Venture's outfall pipe in Campbell Creek, however, stirred concern in council members. But Gross assured the county leaders that DHEC "will be doing a tremendous amount of work to find out the cause."

While work continues on finding the source of PCBs, Gross said DHEC will continue to monitor Venture's wastewater reports, conduct surprise inspections and check the effects on marine life in the area.

When asked of the long-term effects on marine life from years of pollution in the area, DHEC biologist Mike Marcus said the December 1984 study points out that some colonies of animals have already begun to re-establish themselves in the area.

"On the short-term, aquatic life has improved a great deal," Marcus said. "And within a year, it should be largely cleaned up because improvement in some animals has already been noticed."

Marcus said oysters and other marine life have the ability to "purge themselves" of chemicals and other compounds but that some levels of chemicals are still found in the sediment of the area.

Jim Joy, DHEC's NPDES permit administrator, outlined several modifications the agency will make to Venture's wastewater discharge permit.

Periodic monitoring of the wastewater will be done by an outside consultant to Venture while the amount of chlorine used to breakdown the waste will be cut down, he said. Venture will also have to report any changes in their chemcial production to DHEC.

Councilman William L. McBride questioned testing done under the guidance of Venture officials and said that the county needs to be sure DHEC will monitor test results.

Joy said DHEC will analyze all reports generated by Venture and conduct their own periodic tests. Gross said DHEC brought legal action against a company this past year for falsifying their reports.

(See VENTURE, Page 12A)

Venture

(Continued from Page 1A)

Read Lewin, a Beaufort physician who lives on Campbell Creek, said DHEC's announced inspections of the plant would not turn up any results. "There has not been one unannounced inspection of that plant in the past five years," Lewin said. "And it seems reasonable to me that to announce an inspection before your arrival would allow them to get their backyard cleaned up."

Gross, however, said Venture's wastewater treatment system contains weeks and months of chemical waste. "There would be no way they could get rid of it," he said.

After several questions on DHEC's plans to keep the plant in check, council member Janet Sawyer said she was "delighted" with the new discharge restrictions. "I feel you're taking the right steps," she said.

Councilman Joel Martin said the county welcomes the revenue and jobs Venture brings into the county but that the environment is its most precious asset.

"You may feel that Venture has been singled out but you must realize its because of our interest in the environment," Martin said. "I assure you that you are welcome in this community as long as you operate with the environment in mind. Your cooperation is requested."

Venture Plant Manager John Meeks said his company shares the concern for the environment.

"Our sincere concern for the environment is as much a part of Venture as it is for the rest of the community," Meeks said. "The permit restrictions are rightfully requested and the people of Beaufort County have the right for that."

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(See VENTURE, Page 12A)

COMMUNICATION SLIP

To: Jack Wright
Low Country EDC

Date: 3-28-85

....Approval
....Necessary action
....Prepare reply
....Comment
....Note and return
....Note and file
....Investigate
....Signature
....Confer
....As requested
....For information

REMARKS

I assume this is not accurate?

Ronny

Venture

(Continued from Page 1A)

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Venture Chemical gets 5-year discharge permit

By FRAN SMITH
Special to The Gazette

The state gave a five-year, conditional permit to Venture Chemical Co. of Lobeco last Thursday, authorizing the company to continue discharging wastewater into Campbell Creek.

Requirements include the performance of a one-time study by the S.C. Department of Health and Environmental Control on the effect of the chemicals in the effluent on aquatic organisms in the creek; erection or maintenance of signs saying that shellfishing is prohibited in the area and an annual check on heavy metal concentrations.

The company, which employs 65 persons in the production of more than 40 chemical products, was seeking a five-year renewal on a permit that expired in June 1981.

DHEC issued the permit on the day after the S.C. Coastal Council's management committee gave its approval, based on provisions that the permit could be modified or revoked after certain studies are done.

After DHEC officials said it could be issued in early August, the council held up certification for three months, in order to consider the negative comments of the S.C. Department of Wildlife and Marine Resources and the U.S. Fish and Wildlife Service.

Biologists in both departments expressed reservations about the operation, which, they said, is unique on the South Carolina coast.

Although the creek, which empties into Whale Branch, an open shellfishing area, is rated SA (shellfish standard), it is technically a "buffer zone" from which clams and oysters are not to be gathered.

The effect of the new permit is that the closure will continue and no steps are to be taken to upgrade the creek's water quality.

However, the terms established by coastal council and agreed to by DHEC require that permanent monitoring stations be planned; that an in-depth water quality assessment of the creek and Whale Branch be done; that the permit is subject to withdrawal.

The intent, according to a coastal council spokesman, is to keep the contamination in Campbell from spreading to Whale Branch.

Federal biologists found high levels of lead and cadmium in oyster tissue from Campbell Creek in August and expressed concern because of the amount of chemicals found in the water and the oyster tissue and the lack of knowledge about them. They recommended a barrage of tests.

In some of the tests that followed it was determined that the heavy metals have not impacted Whale Branch.

One of the biologists who did the sampling in the creek and sounded the alarm about the findings said he is "not real satisfied" with the terms of the permit since it does not provide for any clean-up and does not require unannounced tests on the effluent.

He added that if the permit were sought for a new operation, it would not likely be granted because the Clean Water Act prohibits degradation and mandates upgrading of streams when possible.

However, the conditions DHEC put on the permit are a "good sign," provided there is a follow-up to make sure that at least the situation does not worsen, in the biologist's opinion.

There is no limit on the amount of wastewater that can be put into the creek; the concentrations of toxicities in the effluent must be diluted when the volume exceeds 200,000 gallons per day.

State water quality standards deal with solids, dissolved oxygen, coliform bacteria, pH and temperature. When toxic wastes are involved, the requirement for SA classification is that the amounts taste, color, odor or sanitary condition" of clams, mussels or oysters; or should not impair the waters for the "best usage" assigned.

There is a "buffer zone" provision in those standards, however.

LAW ENVIRONMENTAL SERVICES

PRELIMINARY HYDROGEOLOGIC ASSESSMENT

for

VENTURE CHEMICALS INC.

LOBECO, SOUTH CAROLINA

JUNE 21, 1985

LAW ENVIRONMENTAL SERVICES
DIVISION OF LAW ENGINEERING TESTING COMPANY
2749 DELK ROAD, S.E.
MARIETTA, GEORGIA 30067
(404) 952-9005

July 2, 1985

Venture Chemicals, Inc.
P.O. Box 815
South Carolina Highway 38
Lobeco, South Carolina 29931

Attention: Mr. John M. Meeks

Subject: Preliminary Hydrogeologic Assessment
Venture Chemical Plant
Lobeco, South Carolina
Law Environmental Services Project No. AE5238

Dear Mr. Meeks:

Law Environmental Services is pleased to submit this preliminary hydrogeologic assessment report of Venture Chemicals, Lobeco, South Carolina plant site. Our services were performed in general accordance with the scope of work outlined in the March 18, 1985 Ground-Water Detection Monitoring Plan. Our services were authorized by your Purchase Order No. 6676 dated April 8, 1985.

Our services as described in this report include the installation and development of six (6) Type II ground water quality monitoring wells, permeability testing of selected wells, water-level measurements, evaluation of hydrogeologic data, and preparation of a report. Ground-water sampling and chemical analyses were performed by others.

We appreciate the opportunity to assist Venture Chemicals with this important project. Please call us if you have any questions about this report.

Sincerely yours,

LAW ENVIRONMENTAL SERVICES

William M. Gierke

William G. Gierke
Staff Hydrogeologist

Charles A. Spiers

Charles A. Spiers, P.G.
Project Hydrogeologist

Thomas L. Cross ds

Thomas L. Cross, P.E.
Senior Hydrologist

Enclosure

WGG:CAS:TLC:ds

TABLE OF CONTENTS

INTRODUCTION

Venture Chemicals, Inc. reached an agreement with the South Carolina Department of Health and Environmental Control (DHEC) to implement a ground-water monitoring program at Venture Chemical's Lobeco, South Carolina facility. The proposed monitoring well plan was reviewed and approved by Mr. Charles Clymer of DHEC as stated in his April 8, 1985 letter. However, several exceptions to the plan were noted in Mr. Clymer's letter. Most of these dealt with sampling and analyses of ground water from monitoring wells, which was performed by Davis and Floyd.

Other concerns noted in DHEC's letter are addressed in this report. This report discusses the installation of six monitoring wells and data generated from the wells, along with other pertinent site hydrogeologic data.

LOCATION AND DESCRIPTION

Venture Chemicals, Inc. operates a plant located in Lobeco, South Carolina approximately 12 miles northwest of the town of Beaufort, South Carolina (Figure 1). The site is located approximately one mile north of the Whale Branch of the Coosaw River and 0.75 miles east of U.S. Route 21. The facility property comprises about 250 acres and the plant occupies about 50 acres. Figure 2 illustrates the layout of the facility.

The plant primarily manufactures agri-products, dye intermediates, and drilling fluid chemicals for the oil industry. Chemicals used and produced on-site consist primarily of organic compounds. Acidic industrial waste water from the plant is treated and neutralized on-site, prior to discharge to Campbell's Creek (see inset on Figure 1) in accordance with NPDES permit requirements. All wastes treated on-site are considered non-hazardous. Sludge from the bio-treatment area is disposed of off-site in a DHEC approved landfill. Venture Chemicals transports liquid hazardous wastes off-site.

Previous tenants at this site include Tenneco Company from 1967 to 1974 and American Color Chemical Company from 1974 to 1982.

REGIONAL HYDROGEOLOGY

The Lobeco, South Carolina area is underlain by sedimentary rocks that range in age from late Cretaceous to Holocene, comprising an overall thicknes of about 3,500 feet. This sequence of sedimentary rocks supplies all of the ground water used in the area (Hayes, 1979).

The principal aquifer beneath the site is composed of the Santee Limestone and basal portion of the Cooper Marl. These stratigraphic units form the principal artesian aquifer that supplies the majority of ground water in Beaufort County. A

gamma ray log (Figure 4) of the deep observation well at the site shows that the top of the principal artesian aquifer is about 80 feet below land surface.

Specific yields of wells open to the principal artesian aquifer range from about 50 gallons per minute (gpm) to about 2,500 gpm (Hayes, 1979). Two deep production water wells exist at the site (Figure 2). These wells are 263 and 307 feet deep and periodically pump about 350 gpm each. The well sare screened at various intervals in the principal artesian aquifer (see Appendix for well details and logs). The most productive interval screened in these wells is the upper permeable zone of the principal artesian aquifer which extends from about 80 to 150 feet below land surface (Figure 4). Pumping of the two wells has caused a cone of depression of about 10 feet in the principal artesian aquifer as indicated on the regional potentiometric map published by The South Carolina Water Resources Commission (SCWRC) in June, 1984. The water level of the on-site SCWRC observation well was measured at 11.71 feet below mean sea level on March 27, 1985 (Table 1).

Overlying the principal aquifer is the Hawthorn formation which is composed of phosphatic, clayey sand and sandy clay with occasional zones of dolomitic, sandy to clayey limestone. The upper and lower sections of the Hawthorn formation act as confining beds. The middle section of the Hawthorn formation may be an aquifer (Hawthorn aquifer) in some areas; however, published

literature (Hayes, 1979) along with geologic logs and a gamma log (Figure 4) of the deep observation well on-site indicate that the Hawthorn aquifer is not present beneath the plant site. The Hawthorn formation beneath the site appears to be a confining unit for the principal artesian aquifer.

Sediments exposed at the surface that overlie the Hawthorn formation consist of Pleistocene to Holocene deposits that include brown and gray to blue silty sandy clays mixed with white to tan silty quartz sand. These sediments comprise the "uppermost" or shallow aquifer at the site which is unconfined or has water table conditions (Figure 3). This aquifer does not have a direct hydraulic connection with the underlying principal aquifer because of the confining characteristics of the clayey Hawthorn formation. The lack of interconnection between the "uppermost" aquifer and the principal artesian aquifer is demonstrated by the water level elevation difference between shallow monitoring wells and deeper wells (Figure 2). This is discussed in more detail in the site Ground-Water Conditions section of this report.

SITE GEOLOGIC CONDITIONS

The soils encountered at the six soil test boring locations primarily consisted of very loose to firm, gray to tan slightly clayey silty fine sand. Silty medium sand was found at depths greater than 23.5 feet below land surface in borings, V-1, V-4, V-5, and V-6. Silty sandy clays interbedded with silty fine sands were encountered in borings V-1, V-2, and V-3 at depths of 8.5 to 18.5 feet. This clay-rich zone appears to be discontinuous toward the south as illustrated by the hydrogeologic cross-section A-A' (Figure 3). Sandy clayey silt was encountered in boring V-4 at depths of 18.5 to 23.5 feet. As shown on Figure 3, this clayey silt (locally called "gumbo") zone is not continuous across the site.

The soil sediments encountered in the soil test borings are Pleistocene to Holocene in age and overlie the Hawthorn formation which is the confining unit for the underlying principal artesian aquifer. A gamma log (Figure 4) of the deep observation well indicates that the thickness of these sediments is approximately 50 feet.

MONITORING WELL INSTALLATION

Six (6) Type-II ground-water quality monitoring wells (designated V-1 through V-6) were installed at the Venture Chemical's site under the supervision of Law Environmental Services personnel. Field work commenced on April 23 and was completed on April 27, 1985. Well V-1 was installed as an upgradient "background" well. Wells V-2 through V-6 are downgradient of selected plant facilities. Monitoring wells were installed in boreholes drilled with a hollow stem auger. Depths of the wells ranged from 23.5 to 29.0 feet.

The wells were screened in shallow sediments that consisted of silty fine sands and fine sandy clays. Test boring records that include schematic diagrams of well construction and soil descriptions are provided in the Appendix.

SITE HYDROGEOLOGY

Unconfined ground water (water table conditions) was encountered in wells V-1 through V-6. Depth to water in the monitoring wells (Table 1) ranged from 5.9 feet in the downgradient well V-6 to 10.6 feet below ground surface in the upgradient well V-1. Corresponding ground-water elevations for these wells ranged from 3.47 feet to 10.38 feet, National Geodetic Vertical Datum of 1924 (NGVD), respectively (Table 1).

The ground-water level in the deep observation well (monitored by the South Carolina Water Resources Commission), that is screened in the principal artesian aquifer is 11.71 feet below sea level. This water level is 21.6 feet lower in elevation than the water level (9.87 feet above MSL) measured in the nearest monitoring well V-3 which is screened in the "uppermost" unconfined aquifer. An attempt was made to measure water levels in the two deep production wells at the site. We were unable to obtain water levels because of an obstruction in each well that prevented the measuring tape from reaching the water level.

The large difference in water level between the two aquifers

(21.6 feet), suggests that there is little or no hydraulic connection between the "uppermost" unconfined aquifer and the underlying principal artesian aquifer, even though the deeper aquifer is heavily pumped. This lack of hydraulic connection implies that downward seepage from the "uppermost" aquifer to the lower principal artesian aquifer is not likely to occur. As previously mentioned, the two aquifers are separated by the Hawthorn formation which is considered to be a confining bed.

Water elevations of the east and west holding basins were measured at 12.02 and 12.75 feet NGVD, respectively. These elevations are 6.43 and 7.16 feet higher than the water level in well V-5 which is directly downgradient (~ 10 feet) from the holding basins. This difference in water levels suggests that mounding of ground water caused by the holding basins is negligible.

A potentiometric map (Figure 2) derived from water levels obtained from site monitoring wells on April 27, 1985 shows that the direction of ground-water flow in the "uppermost" aquifer is to the south, toward Campbells Creek. In the "uppermost" aquifer, a slight hydraulic gradient of 0.003 ft/ft exists across the site.

Field permeability tests (found in the Appendix) performed on monitoring wells V-1, V-3, V-4, and V-6 yielded hydraulic conductivity (k) values ranging from 1.6 x 10^{-4} centimeters per second (cm/s) in well V-6 to 1.3 x 10^{-3} cm/s in well V-3 (Table 2). An average k-value for the permeability tests is 4.8 x 10^{-4} cm/s. This value is representative of the silty fine sands found in test holes at each monitoring well location.

The velocity of ground-water flow at the site can be estimated by using the formula V=Ki/Ne (Darcy's Law)

where; V = Velocity (cm/sec)

K = hydraulic conductivity (cm/sec)

i = hydraulic gradient (ft/ft)

Ne = effective porosity (dimensionless)

An estimated ground-water flow velocity was estimated by using the following data:

K = 4.8 x 10^{-4} cm/s

i = 0.003 ft/ft

Ne = 0.20 (assumed)

Based on the above data, an estimated flow velocity of 7.2 x 10^{-6} cm/s (7.4 feet/year) is calculated for ground water in the uppermost aquifer at the site.

CONCLUSIONS

Based on existing data, the following conclusions are presented:

1. The ground-water flow direction in the "uppermost" aquifer at the Venture Chemical's facility is from north to south, toward Campbells Creek.

2. An estimated ground-water flow velocity in the site area is 7.2×10^{-6} cm/s or 7.4 feet/year.

3. Significant differences between water levels in the holding basins and nearby monitoring wells suggests that mounding of ground water caused by the basins is negligible.

4. The "uppermost" unconfined aquifer and the underlying principal artesian aquifer do not appear to be hydraulically connected. Evidence supporting this lack of connection includes the presence of the Hawthorn Formation (a confining bed) and water level differences of 21.6 feet or more between the two aquifers.

REFERENCES

Department of the Navy Facilities Engineering Command, 1982. Soil Mechanics. NAVFAC Design Manual 7.1.

Hayes, Larry R., 1979. The Ground-Water Resources of Beaufort, Colleton, Hampton, and Jasper Counties. South Carolina Water Resources Commission Report No. 9, 91 pp.

Spigner, B.C., and Ransom C., 1979. Report on Ground-Water Conditions in the Low Country Area, South Carolina. South Carolina Water Resources Commission Report Number 132, 144 pp.

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
SC	SCD046507018

II. SITE NAME AND LOCATION American Coke and Chemical

01 SITE NAME (Legal, common, or descriptive name of site): ~~Venture Chemicals, Inc.~~	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: Hwy 480
03 CITY: Lobeco	04 STATE: SC · 05 ZIP CODE: 29931 · 06 COUNTY: Beaufort · 07 COUNTY CODE: 13 · 08 CONG DIST:
09 COORDINATES LATITUDE: 32° 32' 34.0" · LONGITUDE: 080° 43' 34.0"	

10 DIRECTIONS TO SITE (Starting from nearest public road)
- Plant is located on Hwy 480 in Lobeco, South Carolina.

III. RESPONSIBLE PARTIES

01 OWNER (if known): Venture Chemicals, Inc.	02 STREET (Business, mailing, residential): Hwy 480
03 CITY: Lobeco	04 STATE: SC · 05 ZIP CODE: 29931 · 06 TELEPHONE NUMBER: 803 846-8171
07 OPERATOR (If known and different from owner): John Meeks, Plant Manager	08 STREET (Business, mailing, residential): Hwy 480
09 CITY: Lobeco	10 STATE: SC · 11 ZIP CODE: 29931 · 12 TELEPHONE NUMBER: (803)846-8171

13 TYPE OF OWNERSHIP (Check one)
☒ A. PRIVATE ☐ B. FEDERAL: ______ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: ______ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply) Not in district files
☐ A. RCRA 3001 DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☒ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION ☒ YES ☐ NO DATE 4/25/85 (MONTH DAY YEAR)
BY (Check all that apply) ☐ A. EPA ☐ B. EPA CONTRACTOR ☒ C. STATE ☐ D. OTHER CONTRACTOR ☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: ______ (Specify)
CONTRACTOR NAME(S): ______

02 SITE STATUS (Check one) ☒ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN
03 YEARS OF OPERATION ______ BEGINNING YEAR ______ ENDING YEAR ☒ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
* EPA identified 6 priority pollutants in waste stream in 1978 (Fe, Pb, Hg, Ni, Zn)
* Information in district files

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
Not known at this time.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☒ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
John Meeks	Venture Chemicals, Inc.	(803) 846-8171

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
W.G. Dukes, Jr.	E.Q.C.	S.C.D.H.E.C.	(803)524-9760	6/28/85 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	SCD046507018

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- [x] A. SOLID
- [ ] B. POWDER, FINES
- [ ] C. SLUDGE
- [ ] D. OTHER ______ (Specify)
- [ ] E. SLURRY
- [x] F. LIQUID
- [ ] G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS unk.

CUBIC YARDS ______

NO. OF DRUMS ______

03 WASTE CHARACTERISTICS (Check all that apply)

- [x] A. TOXIC
- [ ] B. CORROSIVE
- [ ] C. RADIOACTIVE
- [x] D. PERSISTENT
- [ ] E. SOLUBLE
- [ ] F. INFECTIOUS
- [ ] G. FLAMMABLE
- [ ] H. IGNITABLE
- [ ] I. HIGHLY VOLATILE
- [ ] J. EXPLOSIVE
- [ ] K. REACTIVE
- [ ] L. INCOMPATIBLE
- [ ] M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS	unk.	unk.	found in waste stream

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
	Iron				
	Lead				
	Mercury				
	Nickel				
	Zinc				

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

District File

knowledge of site

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
SC	SCD046507018

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☑ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ________) ☑ POTENTIAL ☒ ALLEGED
Not known at this time

03 POPULATION POTENTIALLY AFFECTED: UNKNOWN
04 NARRATIVE DESCRIPTION

Because of an unlined industrial acid lagoon which existed prior to 1977, possible groundwater contamination may be present. Please note that proposals have been submitted by Venture Chemicals to D.H.E.C. for ground water sampling.

01 ☑ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE ________) ☑ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: unk.
04 NARRATIVE DESCRIPTION

Sampling by S.C.D.H.E.C in August 1984 identified thirty-four different organic chemical compounds in an area around Venture Chemicals. Please refer to S.C.D.H.E.C. Technical Report No. 003-85 entitled A Summary of Water Quality Sampling activities at Campbell C

01 ☐ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: ________) ☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: ________
04 NARRATIVE DESCRIPTION

None observed

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: ________) ☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: ________
04 NARRATIVE DESCRIPTION

None observed

01 ☐ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: ________) ☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: ________
04 NARRATIVE DESCRIPTION

Not Known

01 ☐ F. CONTAMINATION OF SOIL — 02 ☐ OBSERVED (DATE: ________) ☐ POTENTIAL ☐ ALLEGED

03 AREA POTENTIALLY AFFECTED: ________ (Acres)
04 NARRATIVE DESCRIPTION

None observed

01 ☑ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ________) ☑ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: UNKNOWN
04 NARRATIVE DESCRIPTION

Nearest resident on private well is believed to be approximately 1/4 mile from plant site.

01 ☐ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ________) ☐ POTENTIAL ☐ ALLEGED

03 WORKERS POTENTIALLY AFFECTED: ________
04 NARRATIVE DESCRIPTION

Not Known

01 ☐ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ________) ☐ POTENTIAL ☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: ________
04 NARRATIVE DESCRIPTION

Not Known

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
SC	SCD045070178

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None observed

01 ☐ K. DAMAGE TO FAUNA 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (include name(s) of species)

None observed

01 ☐ L. CONTAMINATION OF FOOD CHAIN 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Not known

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES (Spills/runoff/standing liquids/leaking drums) 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ______ 04 NARRATIVE DESCRIPTION

None observed

01 ☐ N. DAMAGE TO OFFSITE PROPERTY 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Not known.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None observed

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Not known

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

Not known.

III. TOTAL POPULATION POTENTIALLY AFFECTED: ______

IV. COMMENTS

None

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

S.C. D.H.E.C. Solid/Hazardous Waste Files
S.C. D.H.E.C. Ground Water Protection Division Files
S.C. D.H.E.C. Technical Report No. 003-85

First Edition 1943
Prepared under the direction of the Chief of Engineers, U. S. Army,
By Army Map Service (QU), 1942
Based on U S G S quadrangle, Green Pond, 1:62,500 (1918)
Control by U S G S
Surveyed by U S G S 1918
Revised from single lens vertical aerial photographs
Aerial photography A A A Department of Agriculture, 1938 39
Polyconic Projection, North American Datum 1927.

H-15 ROAD CLASSIFICATION 1942

Dependable hard surface heavy-duty road	Loose surface graded dry weather road	U. S. Route 160
Secondary hard surface all weather road	Dirt road	State Route 30

More than two lanes indicated by note along road with tick at point of change 3 LANE · 4 LANE

Green Pond Quad

South Carolina Department of Health
and Environmental Control

Water Pollution Control

PERMIT

TO DISCHARGE WASTEWATER IN ACCORDANCE WITH THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

THIS CERTIFIES THAT

Venture Chemicals, Inc.

has been granted permission to discharge wastewater from a facility located at

Lobeco, South Carolina, Beaufort County

to receiving waters named

Campbell Creek to Whale Branch to Coosaw River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976) and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."

James A. Joy, Jr., P. E.

DIRECTOR, DIVISION OF INDUSTRIAL & AGRICULTURAL WASTEWATER
BUREAU OF WATER POLLUTION CONTROL

Issued: MAY 23 1985

Expires: JUN 30 1990

Effective: JUL 1 1985

Permit No.: SC0000914

MAY 28 1985

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting through the expiration date the permittee is authorized to discharge from outfall(s) serial number(s) 001: process, sanitary & cooling water

Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS kg/day (lbs/day) Monthly Average	Daily Max.	Inst. Max.	Other Units (Specify) Monthly Average	Daily Max.	Inst. Max.	MONITORING REQUIREMEN Measurement Frequency	Samp Typ
Flow-m^3/day (MGD)	-	-	-	1510(0.40)	3030(0.80)	-	Daily	Continuou
BOD_5	-	-	-	-	120mg/l	-	2/week	12Hr. Comp
TSS	91(200)	181(400)	-	-	-	-	2/week	24Hr. Comp
Ammonia	-	-	-	-	-	-	2/week	12Hr. Comp
Ultimate oxygen demand*	-	-	-	-	-	-	2/week	12Hr. Comp
Chlorine (Total residual)	-	-	-	-	0.2mg/l	-	3/week	Grab
Toxicity**	-	-	-	-	-	-	3/year	Continuous
Lead++	-	-	-	-	-	-	1/month++	12Hr. Comp
Total coliforms	-	-	-	70/100ml***	230/100ml	-	2/week	Grab

*UOD discharged is not to exceed 136 kg. (300 pounds) for any tidal cycle. See Part III for definition of UOD
**See Part III for additional requirements.
***Monthly median.
+Sampling shall be carried out according to Part I.8.,j.(1),(2), or (3).
++Limits may be added and or sample frequency modified administratively, if appropriate, after 1 year of samp

2. The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored: daily by grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts; nor, shall the effluent cause a visible sheen on the receiving waters.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): After treatment but prior to mixing with the receiving stream.

B. SCHEDULE OF COMPLIANCE

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

   N/A

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

C. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be present 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 the true discharge rates throughout the range of expected discharge volumes. The primary flow device must be accessible to the use of a continuous flow recorder. Where a flume is present, a separate stilling well for Department/EPA use must be provided if required by the Department.

3. Reporting Monitoring Results

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (DHEC Form 1922) postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on OCT 2 8 1985. Three signed copies of these, and all other reports required herein, shall be submitted to the Department:

S. C. Department of Health and Environmental Control
ATTN: NPDES Administration Section
2600 Bull Street
Columbia, South Carolina 29201

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to State Environmental Laboratory Certification Regulation 61-81 and Section 304(h) of the Act, as amended. (Federal Register, October 16, 1973; Title 40, Chapter I, Sub-chapter D, Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants." Amended by Federal Register, December 1, 1976, and any other amendments that may be promulgated.)

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. the exact place, date and time of sampling;

b. the dates and times the analyses were performed;

c. the person(s) who performed the analyses and the laboratory certification number where applicable;

d. the analytical techniques or methods used; and

e. the results of all required analyses.

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified herein, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (DHEC 1922). Such increased frequency shall also be indicated. Additional or accelerated monitoring may be required to determine the nature and impact of a non-complying discharge on the environment or to determine if a single non-complying sample is representative of the long term condition (monthly average).

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analysis performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Department. The permittee shall furnish to the Department upon request, copies of records required to be kept by this permit.

8. Definitions

a. The "monthly average", other than for fecal coliform, is the arithmetic mean of all samples collected in a calendar month period. The monthly average for fecal coliform bacteria is the geometric mean of all samples collected in a calendar month period. The monthly average loading is the arithmetic average of all individual loading determinations made during the month.

b. The "weekly average", other than for fecal coliform bacteria, is the arithmetic mean of all the samples collected during a one-week period. The weekly average for fecal coliform bacteria is the geometric mean of all samples collected during a one-week period. For self-monitoring purposes, weekly periods in a calendar month are defined as three consecutive seven day intervals starting with the first day of the calendar month and a fourth interval containing seven days plus those days beyond the 28th day in a calendar month. The value to be reported as "Weekly Maximum" is the single highest of the four weekly averages computed during a calendar month. The weekly average loading is the arithmetic average of all individual loading determinations made during the week.

c. The "daily maximum" is the highest average value recorded of samples collected on any single day during the calendar month.

d. The "instantaneous maximum" is the highest value recorded of any sample collected during the calendar month.

e. Arithmetic Mean: The arithmetic mean of any set of values is the summation of the individual values divided by the number of individual values.

f. Geometric Mean: The geometric mean of any set of values is the Nth root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

g. Department: The South Carolina Department of Health and Environmental Control.

h. Act: The Clean Water Act (Formerly referred to as the Federal Water Pollution Control Act) Public Law 92-500, as amended.

i. Grab Sample: An individual discrete or single influent or effluent portion of at least 100 milliliters collected at a time representative of the discharge and over a period not exceeding 15 minutes and retained separately for analysis. Instantaneous flow measured at the time of grab sample collection shall be used to calculate quantity.

j. Composite Sample: One of the following four types of composite samples as defined is specified within this permit:

(1) An influent or effluent portion collected continuously over a specified period of time at a rate proportional to the flow.

(2) A combination of not less than 8 influent or effluent grab samples collected at regular (equal) intervals over a specified period of time, properly preserved, (See part I.C.3.) and composited by increasing the volume of each aliquot in proportion to flow. If continuous flow measurement is not used to composite in proportion to flow, the following method will be used: Take an instantaneous flow measurement each time a grab sample is collected. At the end of the sampling period, sum the instantaneous flow measurements to obtain a total flow to determine the partial amount (percentage) of each grab sample to be combined to obtain the composite sample.

(3) A combination of not less than 8 influent or effluent grab samples of equal volume but at variable time intervals that are inversely proportional to the volume of the flow. That is, the time interval between aliquots is reduced as the volume of flow increases.

(4) A combination of not less than 8 influent or effluent grab samples of constant (equal) volume collected at regular (equal) time intervals over a specified period of time, while being properly preserved.

Continuous flow or the sum of instantaneous flows measured and averaged for the specified compositing time period shall be used with composite sample results to calculate quantity.

9. Right of Entry

The permittee shall allow the Commissioner of the Department of Health and Environmental Control, the Regional Administrator of EPA, and/or their authorized representatives:

a. To enter upon the permittee's premises where a regulated facility or activity and effluent source is located in which any records are required to be kept under the terms and conditions of this permit, and,

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit and sample or monitor any substances or parameters at any location for the purposes of assuring permit compliance.

A. GENERAL REQUIREMENTS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit non-compliance constitutes a violation of the Act and the S.C. Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for the denial of a permit renewal application.

2. Civil and Criminal Liability

a. Any person who violates a term, condition or schedule of compliance contained within this permit is subject to the actions defined by Sections 48-1-320 and 48-1-330 of the S.C. Pollution Control Act.

b. Except as provided in permit conditions on "Bypassing" (Part II, C.2.), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for non-compliance.

c. It shall not be an acceptable defense of the 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.

d. It is the responsibility of the permittee to have a treatment facility that will meet the final effluent limitations of this permit. The approval of plans and specifications by the Department does not relieve the permittee of responsibility for compliance.

3. 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 to under Section 311 of the Act, the S.C. Pollution Control Act or applicable provisions of the S.C. Hazardous Waste Management Act and the S.C. Oil and Gas Act.

4. Permit Modification

a. The permittee shall furnish to the Department within a reasonable time any relevant information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit, or to determine compliance with the permit.

b. Upon sufficient cause, this permit may be modified, revoked, reissued, or terminated during its term, after public notice and opportunity for a hearing. Modifications deemed to be minor will not require public notice.

c. The filing of a request by the permittee for a permit modification, or a notification of planned changes or anticipated non-compliance, does not stay any permit condition.

5. Toxic Pollutants

Notwithstanding Part II.A.4. above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitations for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. 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 Act.

7. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, 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.

8. 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 circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

9. Onshore and Offshore Construction

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

B. REPORTING REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any planned facility expansions, production increases, or process modifications which will result in a new or different discharge of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the Department of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. Twenty-Four Hour Non-Compliance Reporting

a. The permittee shall report any non-compliance with provisions specified in this permit which may endanger public health or the environment. The permittee shall notify the Department orally within 24 hours of becoming aware of such conditions. During normal working hours call 803/758-5496. After hour reporting should be made to the 24 hour Emergency Response telephone number 803/758-5531. The permittee shall provide the following information to the Department in writing, within five (5) days of becoming aware of such conditions:

1. A description of the discharge and cause of non-compliance; and,

2. The period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the non-complying discharge.

b. The following violations shall be included in a 24 hour report when they might endanger health or the environment:

1. An unanticipated bypass which exceeds any effluent limitation in this permit;

2. Any upset which exceeds any effluent limitation in the permit.

c. As soon as the permittee has knowledge of or anticipates the need for a bypass, but not later than 10 days before the date of the bypass, it shall notify the Department and provide a determination of the need for bypass as well as the anticipated quality, quantity, time of duration, and effect of the bypass.

3. Other Non-Compliance

The permittee shall report in narrative form, all instances of non-compliance not previously reported under Section B, Paragraph B.2., at the time Discharge Monitoring Reports are submitted. The reports shall contain the information listed in Paragraph B.2.a.

4. Transfer of Ownership or Control

A permit may be transferred to another party under the following conditions:

a. The permittee notifies the Department of the proposed transfer at least thirty (30) days in advance of the proposed transfer date;

b. A written agreement is submitted to the Department between the existing and new permittee containing a specific date for the transfer of permit responsibility, coverage, and liability for violations up to that date and thereafter.

Transfers are not effective if, within 30 days of receipt of proposal, the Department disagrees and notifies the current permittee and the new permittee of the intent to modify, revoke and reissue, or terminate the permit and to require that a new application be filed.

5. Expiration of Permit

The permittee is not authorized to discharge after the expiration date of this permit, unless a completed application for reissuance is submitted no later than 180 days prior to the expiration date. Permission may be granted to submit an application later than this, but not later than the expiration date of the permit. In accordance with Section 1-23-370 of the code of laws of South Carolina, if a timely and sufficient application is made for any activity of a continuing nature, the existing permit does not expire until a final determination is made to renew or deny renewal of the existing permit.

6. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified.

a. All permit applications shall be signed as follows:

   1. For a corporation: by a principal executive officer of at least the level of vice-president or by a duly authorized representative;

   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.

b. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by duly authorized representation only if:

1. The authorization is made in writing by a person described above and submitted to the Department;

2. The authorization specifies 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, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

7. Availability of Reports

Except for data determined to be confidential under Section 48-1-270 of the S.C. Pollution Control Act, all reports prepared in accordance with the terms and conditions of this permit shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 48-1-340 of the S.C. Pollution Control Act.

8. Changes in Discharges of Toxic Pollutants or Hazardous Substances

a. The permittee shall notify the Department as soon as it knows or has reason to believe that any activity has occurred or will occur which would result in the discharge in any outfall of:

1. Any toxic pollutant(s) identified under Section 307(a) of the Act which exceed the highest of the following concentrations and are not limited in the permit.

- 1 mg/l for antimony (Sb);
- 0.500 mg/l for 2,5-dinitrophenol or 2-methyl, -4,6-dinitrophenol;
- 0.200 mg/l for acrolein or acrylonitrile;
- 0.100 mg/l for any other toxic pollutant; or,
- Ten (10) times the maximum concentration value reported in the permit application.

2. Any hazardous substance(s) identified under Section 311 of the Act as determined by Federal Regulation 40 CFR 117.

b. The permittee must notify the Department as soon as it knows or has reason to believe that it has begun or expects to begin to use or manufacture as an intermediate or final product or by-product any toxic pollutant or hazardous substance which was not reported in the permit application.

C. OPERATION AND MAINTENANCE

1. Facilities Operation

a. 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 includes effective performance based on design facility removals, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls as determined by the laboratory certification program of the Department. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit. Maintenance of facilities, which necessitates unavoidable interruption of operation and degradation of effluent quality shall be scheduled during non-critical water quality periods and carried out in a manner approved by the Department.

b. The permittee shall provide for an operator, as certified by the South Carolina Board of Certification for Environmental Systems Operators, with a grade equal to or higher than the classification designated in Part IIIA3. The name and grade of the operator of record shall be submitted to the Department prior to placing the facility into operation. A roster of operators associated with the facility's operation and their certification grades shall also be submitted with the name of the "operator-in-charge". Any changes in operator or operators shall be submitted to the Department as they occur.

2. Bypassing

Any intentional diversion from or bypass of waste streams from any portion of wastewater collection and treatment facilities which is not a designed or established operating mode for the facility is prohibited except (a) where unavoidable to prevent loss of life, personal injury or severe property damage, or (b) where excessive storm drainage or run-off would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit and there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities or retention of untreated wastes. "Severe property damage" does not mean economic loss caused by delays in production.

3. Duty to Mitigate, Halt or Reduce Activity

The permittee shall take all reasonable steps to prevent, minimize or correct any adverse impact on public health or the environment resulting from non-compliance with this permit. Upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with this permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided.

4. Power Failures

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I.B., provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I.B., have a plan of operation which will:

b. Halt, reduce, or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

5. Removed Substances

Solids, sludges, filter backwash or other residuals removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent such materials from entering State waters and in accordance with guidelines issued pursuant to Section 405 of the Act, and the terms of a construction or NPDES and/or solid or hazardous waste permit issued by the Department.

PART III

A. OTHER REQUIREMENTS

1. The permittee shall maintain at the permitted facility a complete Operations and Maintenance Manual for the waste treatment plant. The manual shall be made available for on-site review during normal working hours. The manual shall contain operation and maintenance instructions for all equipment and appurtenances associated with the waste treatment plant. The manual shall contain a general description of the treatment process(es), operating characteristics that will produce maximum treatment efficiency and corrective action to be taken should operating difficulties be encountered.

2. The permittee shall provide for the performance of routine daily treatment plant inspections by the certified operator as defined in Part II.C.1. The inspection shall include, but is not limited to, areas which require a visual observation to determine efficient operations and for which immediate corrective measures can be taken using the O & M manual as a guide. All inspections shall be recorded and shall include the date, time and name of person making the inspection, corrective measures taken, and routine equipment maintenance, repair, or replacement performed. The permittee shall maintain all records of inspections at the permitted facility as required by Part I.C.7, and the records shall be made available for on-site review during normal working hours.

3. The wastewater treatment plant shall be assigned a classification of Group III in the Permit to Construct which is issued by the Department. This classification corresponds to an operator with a grade of B.

4. The permittee shall maintain an all weather access road to the wastewater treatment plant and appurtenances at all times.

5. This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C),(D) and (E), 304(b)(2), and (4) and 307(a)(2) of the Clean Water Act, as amended, if the effluent standard or limitation so issued or approved:

   (a) Contains different conditions or is more stringent than any effluent limitation in the permit; or

   (b) Controls any pollutant not limited in the permit.

   The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

6. The permittee shall maintain and update as appropriate a Best Management Practices (BMP) Plan to identify and control the discharge of signficiant amounts of oils and the hazardous and toxic substances listed in 40 CFR Part 177 and Tables II and III of Appendix D to 40 CFR Part 122. The plan shall include a listing of the potential sources of spills or leaks of these

materials, a method for containment, a description of training, inspection and security procedures, and emergency response measures to be taken in the event of a discharge to surface waters or plans and/or procedures which constitute an equivalent BMP. Sources of such discharges may include materials storage areas; in-plant transfer, process and material handling areas; loading and unloading operations; plant site runoff; and sludge and waste disposal areas. The BMP plan shall be developed in accordance with good engineering practices, shall be documented in narrative form, and shall include any necessary plot plans, drawings, or maps. The BMP plan shall be maintained at the plant site and shall be available for inspection by EPA and Permit Issuing Authority personnel.

7. If this permit requires continuous measuing of the pH of the effluent, the permittee shall maintain the pH of such effluent within the range set in the permit, except excursions from the range are permitted subject to the following limitations:

   a. The total time during which the pH values are outside the required range shall not exceed 7 hours and 26 minutes in any calendar month; and,

   b. No individual excursion from the range of pH values shall exceed 60 minutes.

8. The permittee shall notify the Agency at least 30 days before the intended manufacture of a new product or use of a new raw material. If such new product or raw material is to enter the wastewater stream, approval shall be obtained from the Agency before beginning operations, and the permit may be modified to include monitoring requirements and/or limits for the new chemical.

9. The discharge is to occur only on outgoing tide and is not to enter the stream less than ½ hour after tidal outflows begin. It is to be terminated early enough during the tidal cycle that the plume of the discharge is washed completely into Whale Branch. Adequate monitoring and timing equipment, with recording, must be maintained to show that the discharge meets the above.

10. Ultimate oxygen demand (UOD) is defined for this permit as 1.5 times 5-day BOD plus 4.5 times total ammonia. UOD is to be reported as pounds per tidal cycle, with BOD_5 and ammonia composited over one complete tidal cycle (about 12 consecutive hours).

11. The permittee shall monitor all parameters consistent with conditions established by this permit on the first Wednesday of every calendar month, unless otherwise approved by the Department. Additional monitoring necessary to meet the frequency requirements of this permit (Part I.A.- Effluent Limitations and Monitoring Requirements) shall be performed by the permittee.

12. Waste activated sludge, after drying, shall be disposed of in an Agency approved landfill as authorized by the Department.

13. The Company shall carry out monitoring, with results reported with Discharge Monitoring Reports, for the following:

a. Quarterly:

2-amino-9,10-anthracenedione	Dichloromethane(methylene chloride)
aniline	Diphenylhydrazine
9,10-anthracenedione	formaldehyde
arsenic	mercury
benzene	1,1'-sulfonyl bis(4-chloro)benzene
cadmium	1,2,3-trichlorobenzene
copper	

b. Weekly, until questions about sources are resolved, then quarterly:

PCB's

The permit may be reopened to revise monitoring or to add limits if so indicated by analyses.

14. Toxicity shall be measured using Mysidopsis bahia in accordance with the U.S. Environmental Protection Agency document, Methods for Measuring the Acute Toxicity of Effluent to Aquatic Organisms or other method approved by this office; testing shall be conducted annually during February, June and October. Toxicity shall not occur at less than an effluent concentration of 66 percent. Reports are to be submitted no later than 30 days after completion of tests, except that a violation is to be reported within 5 days after completing the test. Revision of these requirements may be made administratively after 1 year, if appropriate after review of all biological information required by the permit.

15. The Company shall develop and submit a program to improve effluent quality and thereby eliminate adverse effects in Campbell Creek and receiving waters. Study plans shall be submitted for approval for each aspect of the program. The program shall include:

a. Monthly effluent toxicity tests on oyster larvae, consisting of 48-hour static tests, to begin in May, 1985.

b. A survey of oyster spat recruitment in Campbell Creek, along with control stations, during June or July of each year, beginning in 1985.

c. A study plan to reduce discharge toxicity, to be submitted by May 31, 1985. The study is to evaluate methods of reduction, including chlorine-related toxicity, and to develop an engineering report proposing any needed facilities. The chlorine toxicity evaluation is to be submitted by September 30, 1985, and the overall report of evaluation and recommendations by October 31, 1985. The reports are to include schedules for placing proposed systems into operation, and an approved schedule shall become a part of this permit.

d. A complete macroinvertebrate assessment of Campbell Creek, along with control stations, to be conducted annually in November or December, beginning in 1985.

e. The South Carolina Department of Health and Environmental Control and the permittee acknowledge that the methods of testing and evaluating as defined in paragraphs a. and b. above are new requirements not heretofore imposed by the Agency on any permittee in South Carolina. Amendments to or modifications of testing methodology and or frequency may be necessary as experience is gained and effluent quality is improved; and, after a year of monitoring, the requirements may be revised administratively as indicated by the biological evaluations.

16. The company shall perform analyses of oysters for organics (volatiles and acid and base/neutral extractables) and metals (arsenic, cadmium, chromium, copper, lead, and nickel) each year in September and report the results to DHEC within 45 days after sampling. Samples shall be taken from the mouth of Campbell Creek, near the confluence of Huspah Creek and Whale Branch, and from the mouth of Haulover Creek.

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Robert S. Jackson, M.D.

MEMORANDUM

TO: Tom Kurimcak, Director
Analytical Services Division

Wayne Fanning, Manager
Trident Regional Laboratory

FROM: Mike Marcus *Mike Marcus*
Stream and Facility Monitoring Section

Glenda Swearingen *Glenda Swearingen*
Biological Services Section

SUBJECT: Water Quality Assessment of Campbell Creek
Venture Chemical Company - Beaufort County

DATE: November 10, 1983

During the process of reissuance of a NPDES permit for the above-referenced facility, several questions and concerns have arisen both in-house and out-of-house over the potential environmental impact that may currently exist in Campbell Creek due to the prior discharge of wastewater there. Some preliminary evidence suggests that certain heavy metals concentrations in oyster tissue in Campbell Creek may be elevated and that the oysters generally are stunted compared to those in nearby Whale Branch. Furthermore, this facility, being a specialty chemical manufacturer, has the potential to discharge numerous and complex organic chemical constituents. Effluent toxicity has been documented several times in the past.

A water quality assessment has been planned to address the questions of altered chemical and biological integrity of the region at and near the Venture Chemical Company. The assessment will utilize various chemical and biological parameters from the sediment and macroinvertebrate community phases.

Field sampling will be conducted on November 15, 1983, given no hazardous weather conditions exist.

A. Survey Area (See attached map)

MD-629 - Campbell Creek upstream from the Venture Chemical Company treatment facility outfall.
MD-630 - Campbell Creek downstream from the Venture Chemical Company treatment facility outfall.
MD-538 - Mouth of Campbell Creek at Whale Branch.
MD-535 - Whale Branch immediately north of US 21.
MD-631 - Unnamed tributary to Haulover Creek.

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B. Phase Parameters

1. Sediment

The approximate top three centimeters of sediment will be collected from each station (Section A) and analyzed for priority pollutants to include:

Heavy metals - As, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Zn
Acid extractable compounds
Base-neutral extractable compounds (including PAH)
Pesticides

2. Oysters

a) One sample of 15 oysters will be collected from each station (Section A) and analyzed for fecal coliform bacteria and standard plate counts.

b) Three replicates of 15 oysters per replicate will be collected from each station (Section A) and analyzed for the same selected heavy metals and priority pollutants as cited for sediment samples. Analyses for volatile organic compounds will also be included for these samples.

c) Fifteen oysters from those stations listed in Section A will be collected and examined for condition index according to the air-weighing method of Lawrence and Scott.

3. Biological Community Structure

An assessment of the biological community structure will be performed at those same stations used in the condition index analysis. Collections for this part of the overall assessment will consist of quantitative samples (two 0.1 m^2 hard substrate and three sediment grabs).

C. Wastewater Treatment Facility Sampling

1. The Trident District Office will conduct a routine compliance sampling inspection (CSI) of the Venture Chemical Company treatment facility effluent for all appropriate parameters specified in the NPDES permit.

2. In conjunction with the CSI, the facility effluent will also be sampled for priority pollutants. Phenol and sulfide analyses will be conducted at the Trident Regional Laboratory at North Charleston. All other analyses (including cyanide) will be conducted at the Columbia Central Laboratories. The Trident Regional Laboratory will receive the samples from the field and then ship them to Columbia via normal courier procedures.

D. Quality Assurance

All sampling procedures and field analyses will conform to all applicable sections in The Standard Operating Procedures Manual and Quality Assurance Procedures Plan (SCDHEC). All laboratory analyses will be in accordance with Procedures and Quality Control Manual for Chemistry Laboratories (SCDHEC) and Laboratory Procedures for Environmental Microbiology (SCDHEC).

E. General Instructions

1. Field collections will be conducted by the Stream and Facility Monitoring Section and the Biological Services Section on November 15, 1983. These Sections will provide all necessary equipment and supplies for the sampling of sediment and oysters. Low tide is predicted to occur in the assessment area at approximately 11:30 AM.

2. Oyster samples will be transported to the Trident Regional Laboratory at Sullivans Island for bacteriological analyses and for preparation of other oysters for chemical analyses. This preparation shall consist of cleaning, shucking and packing in appropriate containers for shipment to the Columbia Laboratories.

3. Once oyster samples are prepared, they will be shipped to the Columbia Laboratories by courier as per the marina assessment.

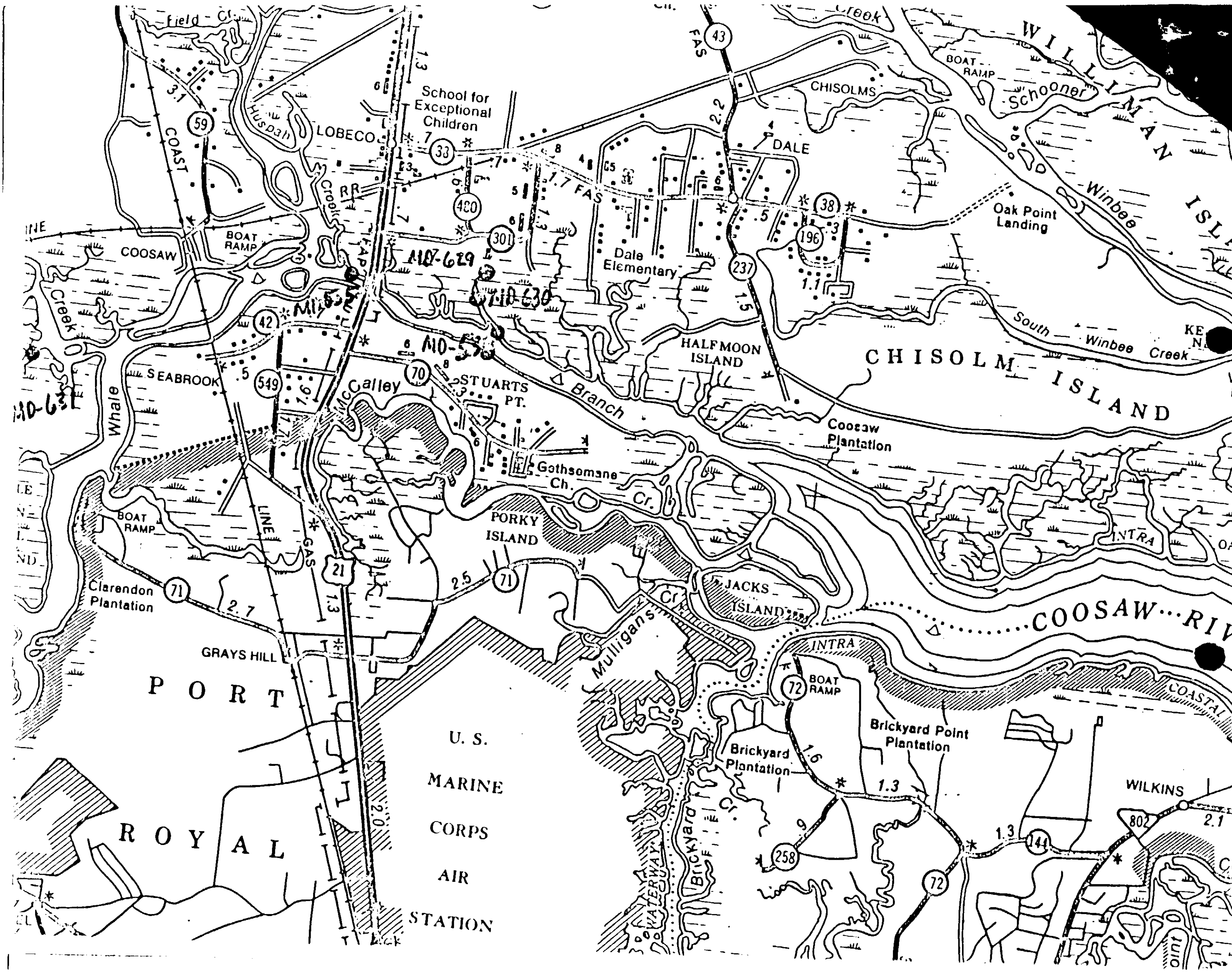
4. Condition index analyses will be conducted at the Biological Services Laboratory in Columbia.

5. Inclimate weather will not affect the planned assessment activities. In the event of hazardous weather conditions, the assessment will be postponed until such conditions have ceased and will be rescheduled at the earliest possible time.

If you have any questionsor if I can provide any further information, please contact me.

MM/al

cc: Russ Sherer
Alton Boozer
Harry Gaymon
Noel Hurley
Glenda Swearingen



PORT ROYAL
U. S. MARINE CORPS AIR STATION
CHISOLM ISLAND
COOSAW RIV
School for Exceptional Children
LOBECO
DALE
CHISOLMS
Dale Elementary
HALFMOON ISLAND
Oak Point Landing
South Winbee Creek
Winbee
Schooner
BOAT RAMP
COOSAW
SEABROOK
Whale
Creek
McCalley
STUARTS PT.
Gethsemane Ch.
Branch
Cr.
Coosaw Plantation
PORKY ISLAND
JACKS ISLAND
Mulligans Cr.
Clarendon Plantation
GRAYS HILL
COAST LINE
GAS LINE
INTRA
COASTAL
WATERWAY
Brickyard Cr.
Brickyard Plantation
Brickyard Point Plantation
WILKINS
MD-629
MD-630
MD-631

South Carolina Department of Health and Environmental Control

2600 Bull Street
lumbia, S.C. 29201

Commissioner
bert S. Jackson, M.D.

August 31, 1983

MEMORANDUM

TO: Marshall Dixon, Director
Ernie Wilson, Shellfish Manager
Low Country District

FROM: J. Luke Hause, P.E., Director
Shellfish & Recreational Waters Division
Bureau of Water Supply & Special Programs

RE: FDA Report On Oyster Meats - Campbell Creek

Recently, Tom Herrington, FDA Atlanta phoned to discuss an event he had with U.S. Fish and Game concerning input to a NPDES permit. The permit was for Venture Chemical located at Lobeco, S.C. with discharge of industrial waste to Campbell Creek, which is a tributary of Whale Branch. He said oyster meat samples were collected above the existing outfall in Campbell Creek and these samples were tested for lead and cadmium. The test results were: 10.2 ppm Pb and 2.5 ppm Cd. These levels, according to Herrington, exceeded the proposed FDA alert action levels for both lead and cadmium.

Please investigate the following:

(1) What is this increased discharge? (Venture)
(2) How much is this discharge? (GPM)
(3) What are the NPDES effluent limits?
(4) What impact does the proposed NPDES have on existing and future shellfish communities in the vicinity?
(5) Are the shellfish pollution signs still posted as per the description in the published Prohibited Area Booklet?

Please respond in writing at your earliest convenience. Please address each item as stated above.

Thank you.

cc: FDA Atlanta
Bob Gross
DHEC, Industrial WasteWater

Andy Yasinsac
Oct. 10, 1983

Venture Chem., Beaufort Co.

Area 14 Pike & Dukes

mg/kg	14:00 Sta 2 #669	14:20 Sta 2a #670
Cd	1.7	1.6
Cr	<1.0	<1.0
Cu	32	24
Hg	<0.25	<0.25
Mn	5.8	6.0
Ni	1.0	1.2
Pb	1.5	1.6
Zn	1000	900

Above in call from Alfreda Mouchette

EPA

POTENTIAL HAZARDOUS WASTE SITE
FINAL STRATEGY DETERMINATION

REGION: IV
SITE NUMBER: SC000010018

File this form in the regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force *(EN-335)*; 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME	B. STREET	
American Color + Chemical	P.O. Box 815	
C. CITY	**D. STATE**	**E. ZIP CODE**
Lobeco	S.C.	29931

II. FINAL DETERMINATION

Indicate the recommended action*(s)* and agency*(ies)* that should be involved by marking 'X' in the appropriate boxes.

RECOMMENDATION	MARK 'X'	ACTION AGENCY: EPA	STATE	LOCAL	PRIVATE
A. NO ACTION NEEDED	X				
B. REMEDIAL ACTION NEEDED, BUT NO RESOURCES AVAILABLE *(If yes, complete Section III.)*					
C. REMEDIAL ACTION *(If yes, complete Section IV.)*					
D. ENFORCEMENT ACTION *(If yes, specify in Part E whether the case will be primarily managed by the EPA or the State and what type of enforcement action is anticipated.)*					

E. RATIONALE FOR FINAL STRATEGY DETERMINATION

Based on data and reports generated by E+E (Ecology & Environment, Inc.). Further, this facility has Interim Status under RCRA. Site is monitored on a regular basis by the Facility & SCDHEC.

F. IF A CASE DEVELOPMENT PLAN HAS BEEN PREPARED, SPECIFY THE DATE PREPARED *(mo., day, & yr.)*	G. IF AN ENFORCEMENT CASE HAS BEEN FILED, SPECIFY THE DATE FILED *(mo., day, & yr.)*

H. PREPARER INFORMATION

1. NAME	2. TELEPHONE NUMBER	3. DATE *(mo., day, & yr.)*
Ron Jorner	257-2234	4/30/81

III. REMEDIAL ACTIONS TO BE TAKEN WHEN RESOURCES BECOME AVAILABLE

List all remedial actions, such as excavation, removal, etc. to be taken as soon as resources become available. See instructions for a list of Key Words for each of the actions to be used in the spaces below. Provide an estimate of the approximate cost of the remedy.

A. REMEDIAL ACTION	B. ESTIMATED COST	C. REMARKS
	$	
	$	
	$	
	$	
	$	
	$	
	$	
	$	
D. TOTAL ESTIMATED COST	$	

Continued From Front

IV. REMEDIAL ACTIONS

A. SHORT TERM/EMERGENCY ACTIONS *(On Site and Off-Site)*: List all emergency actions taken or planned to bring the site under immediate control, e.g., restrict access, provide alternate water supply, etc. See instructions for a list of Key Words for each of the actions to be used in the spaces below.

1. ACTION	2. ACTION START DATE *(mo,day,&yr)*	3. ACTION END DATE *(mo,day,&yr)*	4. ACTION AGENCY *(EPA, State, Private Party)*	5. COST	6. SPECIFY 311 OR OTHER ACTION; INDICATE THE MAGNITUDE OF THE WORK REQUIRED.
				$	
				$	
				$	
				$	
				$	
				$	

B. LONG TERM STRATEGY *(On Site and Off-Site)*: List all long term solutions, e.g., excavation, removal, ground water monitoring wells, etc. See instructions for a list of Key Words for each of the actions to be used in the spaces below.

1. ACTION	2. ACTION START DATE *(mo,day,&yr)*	3. ACTION END DATE *(mo,day,&yr)*	4. ACTION AGENCY *(EPA, State Private Party)*	5. COST	6. SPECIFY 311 OR OTHER ACTION. INDICATE THE MAGNITUDE OF THE WORK REQUIRED.
				$	
				$	
				$	
				$	
				$	
				$	

C. MANHOURS AND COST BY ACTION AGENCY

1. ACTION AGENCY	2. TOTAL MAN-HOURS FOR REMEDIAL ACTIVITIES	3. TOTAL COST FOR REMEDIAL ACTIVITIES
a. EPA		$
b. STATE		$
c. PRIVATE PARTIES		$
d. OTHER *(specify)*:		$

EPA

POTENTIAL HAZARDOUS WASTE SITE IDENTIFICATION AND PRELIMINARY ASSESSMENT

REGION: IV

SITE NUMBER (to be assigned by Hq): SC000010019

NOTE: This form is completed for each potential hazardous waste site to help set priorities for site inspection. The information submitted on this form is based on available records and may be updated on subsequent forms as a result of additional inquiries and on-site inspections.

GENERAL INSTRUCTIONS: Complete Sections I and III through X as completely as possible before Section II *(Preliminary Assessment)*. File this form in the Regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force *(EN-335)*; 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME: American Color & Chemical

B. STREET (or other identifier): P.O. Box 815

C. CITY: Lobeco, S.C.

D. STATE: S.C.

E. ZIP CODE: 29931

F. COUNTY NAME: Beaufort

G. OWNER/OPERATOR (if known)

1. NAME: American Color & Chemical

2. TELEPHONE NUMBER: (803) 846-8171

H. TYPE OF OWNERSHIP

☐ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☐ 4. MUNICIPAL ☒ 5. PRIVATE ☐ 6. UNKNOWN

I. SITE DESCRIPTION: Aerated equalization and aeration basin from modified lagoon.

J. HOW IDENTIFIED (i.e., citizen's complaints, OSHA citations, etc.): Moffatt

K. DATE IDENTIFIED (mo., day, & yr.):

L. PRINCIPAL STATE CONTACT

1. NAME: Earl Williams, Division Director DHEC

2. TELEPHONE NUMBER: (803) 758-5861

II. PRELIMINARY ASSESSMENT *(complete this section last)*

A. APPARENT SERIOUSNESS OF PROBLEM

☒ 1. HIGH ☐ 2. MEDIUM ☐ 3. LOW ☐ 4. NONE ☐ 5. UNKNOWN

B. RECOMMENDATION

☐ 1. NO ACTION NEEDED *(no hazard)*

☐ 2. IMMEDIATE SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR:
b. WILL BE PERFORMED BY:

☒ 3. SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR:
b. WILL BE PERFORMED BY: E&E

☐ 4. SITE INSPECTION NEEDED *(low priority)*

C. PREPARER INFORMATION

1. NAME: B. J. Garland

2. TELEPHONE NUMBER: (404) 288-7711

3. DATE (mo., day, & yr.): 1-14-81

III. SITE INFORMATION

A. SITE STATUS

☒ 1. ACTIVE *(Those industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if infrequently.)*

☐ 2. INACTIVE *(Those sites which no longer receive wastes.)*

☐ 3. OTHER (specify): *(Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.)*

B. IS GENERATOR ON SITE?

☐ 1. NO ☒ 2. YES *(specify generator's four-digit SIC Code)*:

C. AREA OF SITE *(in acres)*:

D. IF APPARENT SERIOUSNESS OF SITE IS HIGH, SPECIFY COORDINATES

1. LATITUDE (deg.—min.—sec.): 32° 23'

2. LONGITUDE (deg.—min.—sec.): 8° 4' 40"

E. ARE THERE BUILDINGS ON THE SITE?

☐ 1. NO ☐ 2. YES *(specify)*:

T2070-2 (10-79)

Continue On Reverse

Continued From Front

IV. CHARACTERIZATION OF SITE ACTIVITY

Indicate the major site activity(ies) and details relating to each activity by marking 'X' in the appropriate boxes.

'X'	A. TRANSPORTER	'X'	B. STORER	'X'	C. TREATER	'X'	D. DISPOSER
	1. RAIL		1. PILE		1. FILTRATION		1. LANDFILL
	2. SHIP	X	2. SURFACE IMPOUNDMENT		2. INCINERATION		2. LANDFARM
	3. BARGE		3. DRUMS		3. VOLUME REDUCTION		3. OPEN DUMP
	4. TRUCK		4. TANK, ABOVE GROUND		4. RECYCLING/RECOVERY	X	4. SURFACE IMPOUNDMENT
	5. PIPELINE		5. TANK, BELOW GROUND		5. CHEM./PHYS. TREATMENT		5. MIDNIGHT DUMPING
	6. OTHER *(specify)*:		6. OTHER *(specify)*:		6. BIOLOGICAL TREATMENT		6. INCINERATION
					7. WASTE OIL REPROCESSING		7. UNDERGROUND INJECTION
					8. SOLVENT RECOVERY		8. OTHER *(specify)*:
				X	9. OTHER *(specify)*: Areation and equalization basin		

E. SPECIFY DETAILS OF SITE ACTIVITIES AS NEEDED Unlined industrial acid lagoon permitted 1-10-67. Modified 11-18-77 arected equalization basin and areation basin. EPA identified 16 priority pollutants in waste stream Jan. 7-14, 1978. Also high metals (Fe, Pb, Hg, Ni, Zn). Highly permeable marine sands. artesian limestone aquifer about 60' (18M) deep.

V. WASTE RELATED INFORMATION

A. WASTE TYPE

- [ ] 1. UNKNOWN
- [X] 2. LIQUID
- [ ] 3. SOLID
- [X] 4. SLUDGE
- [ ] 5. GAS

B. WASTE CHARACTERISTICS

- [ ] 1. UNKNOWN
- [X] 2. CORROSIVE
- [ ] 3. IGNITABLE
- [ ] 4. RADIOACTIVE
- [ ] 5. HIGHLY VOLATILE
- [X] 6. TOXIC
- [X] 7. REACTIVE
- [ ] 8. INERT
- [ ] 9. FLAMMABLE
- [ ] 10. OTHER *(specify)*:

C. WASTE CATEGORIES

1. Are records of wastes available? Specify items such as manifests, inventories, etc. below.

2. Estimate the amount *(specify unit of measure)* of waste by category; mark 'X' to indicate which wastes are present.

	a. SLUDGE	b. OIL	c. SOLVENTS	d. CHEMICALS	e. SOLIDS	f. OTHER
AMOUNT	unknown		unknown		unknown	
UNIT OF MEASURE						

a. SLUDGE

- [X] (1) PAINT, PIGMENTS
- [X] (2) METALS SLUDGES
- [ ] (3) POTW
- [ ] (4) ALUMINUM SLUDGE
- [ ] (5) OTHER *(specify)*:

b. OIL

- [ ] (1) OILY WASTES
- [ ] (2) OTHER *(specify)*:

c. SOLVENTS

- [ ] (1) HALOGENATED SOLVENTS
- [ ] (2) NON-HALOGNTD. SOLVENTS
- [ ] (3) OTHER *(specify)*:

d. CHEMICALS

- [X] (1) ACIDS
- [ ] (2) PICKLING LIQUORS
- [ ] (3) CAUSTICS
- [ ] (4) PESTICIDES
- [X] (5) DYES/INKS
- [ ] (6) CYANIDE
- [ ] (7) PHENOLS
- [ ] (8) HALOGENS
- [ ] (9) PCB
- [X] (10) METALS
- [ ] (11) OTHER *(specify)*

e. SOLIDS

- [ ] (1) FLYASH
- [ ] (2) ASBESTOS
- [ ] (3) MILLING/MINE TAILINGS
- [ ] (4) FERROUS SMLTG. WASTES
- [ ] (5) NON-FERROUS SMLTG. WASTES
- [ ] (6) OTHER *(specify)*: Pigments

f. OTHER

- [ ] (1) LABORATORY PHARMACEUT.
- [ ] (2) HOSPITAL
- [ ] (3) RADIOACTIVE
- [ ] (4) MUNICIPAL
- [ ] (5) OTHER *(specify)*:

Continue On Page 3

Continued From Page 2

V. WASTE RELATED INFORMATION *(continued)*

3. LIST SUBSTANCES OF GREATEST CONCERN WHICH MAY BE ON THE SITE *(place in descending order of hazard).*

6 priority pollutants plus (Fe, Pb, Hg, Ni, Zn)

4. ADDITIONAL COMMENTS OR NARRATIVE DESCRIPTION OF SITUATION KNOWN OR REPORTED TO EXIST AT THE SITE.

See IV E

VI. HAZARD DESCRIPTION

A. TYPE OF HAZARD	B. POTENTIAL HAZARD *(mark 'X')*	C. ALLEGED INCIDENT *(mark 'X')*	D. DATE OF INCIDENT *(mo., day, yr.)*	E. REMARKS
1. NO HAZARD				
2. HUMAN HEALTH	X			toxic chemicals
3. NON-WORKER INJURY/EXPOSURE				
4. WORKER INJURY				Potential H_2O well contamination
5. CONTAMINATION OF WATER SUPPLY	X			
6. CONTAMINATION OF FOOD CHAIN				
7. CONTAMINATION OF GROUND WATER	X			
8. CONTAMINATION OF SURFACE WATER	X			
9. DAMAGE TO FLORA/FAUNA	X			
10. FISH KILL				
11. CONTAMINATION OF AIR				
12. NOTICEABLE ODORS				
13. CONTAMINATION OF SOIL	X			
14. PROPERTY DAMAGE				
15. FIRE OR EXPLOSION				
16. SPILLS/LEAKING CONTAINERS/RUNOFF/STANDING LIQUIDS	X			
17. SEWER, STORM DRAIN PROBLEMS				
18. EROSION PROBLEMS				
19. INADEQUATE SECURITY	X			
20. INCOMPATIBLE WASTES				
21. MIDNIGHT DUMPING				
22. OTHER *(specify)*:				

Continued From Front

VII. PERMIT INFORMATION

A. INDICATE ALL APPLICABLE PERMITS HELD BY THE SITE.

- [ ] 1. NPDES PERMIT
- [ ] 2. SPCC PLAN
- [ ] 3. STATE PERMIT *(specify)*:
- [ ] 4. AIR PERMITS
- [ ] 5. LOCAL PERMIT
- [ ] 6. RCRA TRANSPORTER
- [ ] 7. RCRA STORER
- [ ] 8. RCRA TREATER
- [ ] 9. RCRA DISPOSER
- [ ] 10. OTHER *(specify)*:

See IV. F

B. IN COMPLIANCE?

- [ ] 1. YES
- [ ] 2. NO
- [ ] 3. UNKNOWN

4. WITH RESPECT TO *(list regulation name & number)*:

VIII. PAST REGULATORY ACTIONS

- [ ] A. NONE
- [X] B. YES *(summarize below)*

See IV. F

IX. INSPECTION ACTIVITY *(past or on-going)*

- [ ] A. NONE
- [X] B. YES *(complete items 1,2,3, & 4 below)*

1. TYPE OF ACTIVITY	2. DATE OF PAST ACTION *(mo., day, & yr.)*	3. PERFORMED BY: *(EPA/State)*	4. DESCRIPTION
Waste stream pollutants	Jan. 7-14 1978	EPA	6 priority pollutants
high (Fe, Pb, Hg, Ni, Zn)	Jan. 7-14 1978	EPA	

X. REMEDIAL ACTIVITY *(past or on-going)*

- [X] A. NONE
- [ ] B. YES *(complete items 1, 2, 3, & 4 below)*

1. TYPE OF ACTIVITY	2. DATE OF PAST ACTION *(mo., day, & yr.)*	3. PERFORMED BY: *(EPA/State)*	4. DESCRIPTION

NOTE: Based on the information in Sections III through X, fill out the Preliminary Assessment *(Section II)* information on the first page of this form.

State Print out

091913G

South Carolina Department of Health
and Environmental Control
Solid Waste Management Division
2600 Bull Street
Columbia, SC 29201
Phone: (803) 758-5681

041113G

DHEC USE ONLY:
I.D.# _ / _ _ / _ _ _ _ / _

Instructions for completing this Form on reverse side.

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

A. General.

(1) Identification.

(a) Name of person or organization conducting hazardous waste activities: American Color & Chemical Corporation

(b) Mailing Address: P.O. Box 815
Lobeco, S.C. 29931

(c) Phone Number: 803-846-8171

(2) Principal technical contacts (Name(s), mailing address(es) and phone number(s)): John M. Meeks, Plant Manager, P.O. Box 815; Lobeco, S.C. 29931
Joseph F. Jacobetz, Director, Environmental Engineering,
P.O. Box 88, Lock Haven, Pa. 17745

(3) Types of hazardous waste activities person or organization conducts within the State: (Check all applicable boxes.)

(a) Generation of hazardous waste [X]

(b) Transportation of hazardous waste (other than on-site of generation or on-site of treatment, storage or disposal facility) [ ]

(c) Treatment, storage, or disposal of hazardous waste at a facility owned or operated by the person or organization [ ]

(4) Certification: I hereby certify (or declare) that the information provided herein is complete and correct to the best of my knowledge. I understand that all information on this form may be made available to the public unless otherwise noted as provided under (5) below. I am authorized to sign official documents for the organization or person identified in (1) (a) above.

Joseph F. Jacobetz	J. F. Jacobetz Dir. Environmental Engr.	7/9/80
Signature	Name and Title	Date

(5) Confidentiality.

Information reported to the Department in this Notification may be claimed as confidential, and therefore exempt from public disclosure under Section 6B of the South Carolina Hazardous Waste Management Act, which reads:

> Information obtained by the department under this chapter shall be available to the public, unless the department certifies such information as being proprietary. The department may make such certification where any person shows, to the satisfaction of the department, that the information, or parts thereof, if made public, would divulge methods, production rates, processes, or other confidential information entitled to protection. Nothing in this subsection shall be construed as limiting the disclosure of information by the department to any officer, employee or authorized representative of the State concerned with effecting this chapter, providing such person respects the proprietary nature of the information.

In order for information to be considered for confidentiality, the Department must be supplied with a detailed list of exactly what information is claimed as confidential and on what basis the claim of confidentiality is made, including facts and information to support such claim. Upon receiving such claim, the Department will make a determination as to whether or not the information is entitled to confidentiality. A determination by the Department that a portion of the Notification will be considered confidential does not serve as a determination that the entire Notification will be considered confidential.

(6) Warning: Section 12 of the Hazardous Waste Management Act provided for significant penalties for violations of the Act; the rules and regulations promulgated pursuant to the Act; or orders issued by the Board, Commissioner, or the Department. No hazardous waste as defined under Section C , shall be generated, stored, transported, or disposed within the State unless

notification of hazardous waste activity has been submitted to the Department according to the regulations promulgated under the Act.

B. Generator.

(1) Mailing address of place of generation: American Color & Chemical Corp.
P. O. Box 815, Lobeco, S.C. 29931

(2) Location of place of generation: S.C. Hiway 38, Lobeco, S.C.

(3) Phone number at place of generation: 803-846-8171

(4) County in which place of generation is located: Beaufort

(5) General Description of generator's operations at the location of generation: Plant is a manufacturer of organic chemical intermediates utilized principally in dye manufacture elsewhere. SIC 2865. The intermediates are produced in small batch sizes. Due to the cyclical nature of the dye business, where color preferences and demand levels change, the production schedule of organic chemical intermediates at the plant changes significantly from month to month.

(6) Types of hazardous waste(s) generated at location: (Check all applicable boxes.)

- (a) Ignitable ☐
- (b) Corrosive ☒
- (c) Reactive ☐
- (d) Toxic ☐
- (e) Listed ☒

6,000,000

(7) Estimated amount of hazardous waste generated at location annually in pounds (pounds/year): 6,000,000 pounds/year.

(8) For each hazardous waste produced at the location submit a completed Hazardous Waste Information Form (DHEC Form No. 1986).

C. Transporter.

(1) General description of kind of transportation transporter is engaged in: ______

(2) State and county in which the transporter has his principal place of business: ______ State ______ County

(3) Location, mailing address, and phone number of all terminals or other transportation facilities the transporter maintains within the State: ______

(4) Identification code(s) if transporter has previously been assigned a hazardous waste identification code by the Federal Environmental Protection Agency or any other state. Also include source of I.D. Code and by whom such codes were assigned: ______

(5) Interstate Commerce Commission Number or South Carolina Public Service Commission Number (state whether number is ICC or PSC): ______

(6) Types of hazardous wastes handled by the transporter: (Check all applicable boxes.)

- (a) Ignitable ☐
- (b) Corrosive ☐
- (c) Reactive ☐
- (d) Toxic ☐
- (e) Listed ☐

(7) Estimated amount of hazardous wastes handled annually by transporter in pounds (pounds/year): ____________________

D. Hazardous Waste Facilities.

(1) Name of facility: ____________________

____

(2) Mailing address of facility: ____________________

____

____

(3) Location of facility: ____________________

____

____

(4) Phone number of facility: ____________________

(5) County in which facility is located: ____________________

(6) Type of operations conducted at the facility: (Check all applicable boxes).

- (a) Treatment of hazardous waste ☐
- (b) Storage of hazardous waste ☐
- (c) Disposal of hazardous waste ☐

(7) Submit on a separate sheet of paper a description of the hazardous waste activities conducted at the facility.

(8) Types of hazardous wastes handled at the facility: (Check all applicable boxes.)

- (a) Ignitable ☐
- (b) Corrosive ☐
- (c) Reactive ☐
- (d) Toxic ☐
- (e) Listed ☐

(9) Estimated amount of hazardous waste treated, stored, or disposed annually at the facility in pounds (pounds/year): ____________________

General Instructions

(1) This Notification Form is to be used by all persons required to file a Notification Form with the Department by Section D of the Emergency Hazardous Waste Regulation.

(2) All definitions contained in the Hazardous Waste Management Act (Section 44-56-10 et seq. of the 1976 S.C. Code of Laws) and Section A of the Emergency Hazardous Waste Regulation shall apply to this Form.

(3) Generators of hazardous waste shall complete Parts A and B of this Form. A separate Notification Form shall be completed for each place of generation if the generator produces hazardous waste at more than one location within the State.

(4) Transporters of hazardous waste shall complete Parts A and C of this Form. A person who transports hazardous waste solely on the site of generation or solely on the site of a hazardous waste facility is not considered a transporter for this Notification.

(5) Owner(s)/Operator(s) of hazardous waste treatment, storage, or disposal facilities shall complete Parts A and D of this Form. A separate Notification Form shall be completed for each separate facility (if the owner/operator has more than one location within the State at which hazardous waste is treated, stored, or disposed.)

(6) If a question arises as to how to complete a particular item of this Form or additional copies of this Form are needed, please contact the Solid Waste Management Division at the telephone number or address given on the front of this Form.

(7) If additional space is needed to complete any item, attach a separate sheet to complete the item. Clearly identify on the separate sheet which item is being continued on that sheet.

(8) Type or print in ink all items of this Form except the signature in item A(4), which must be signed in ink.

Specific Instructions

A. General.
(1) Self-explanatory.
(2) Principal Technical Contacts. Enter the name, address, and telephone number of an individual or individuals whom the Department may contact for clarification of information submitted on this Form.
(3) Self-explanatory.
(4) Certification. An individual authorized to sign official documents for the organization or person identified in A(1)(a) shall enter his signature, name, title, and date. The signature shall be in ink.
(5) Self-explanatory.
(6) Self-explanatory.

B. Generator
(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) Give the county in which place of generation is located. If place of generation is located in more than one county, give the county in which the place of generation is primarily located.
(5) Self-explanatory.
(6) Types of hazardous waste(s) generated at location:
(a) Ignitable waste - the waste meets the ignitable characteristics of Section C of the Emergency Hazardous Waste Regulation.
(b) Corrosive waste - the waste meets the corrosive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(c) Reactive waste - the waste meets the reactive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(d) Toxic waste - the waste meets the toxic characteristics Section C of the Emergency Hazardous Waste Regulation.

(e) Listed waste - the waste is listed as a hazardous waste under Section C of the Emergency Hazardous Waste Regulation.
(7) Give estimated amount of hazardous waste producted per year at the location based upon the best available information. The generator may be required by the Department to produce information as to the basis of this estimation.
(8) Self-explanatory.

C. Transporter.
(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) Self-explanatory.
(5) If transporter has not been assigned either a ICC or PSC number, state "None".
(6) Types of hazardous wastes handled by the transporter:
(a) Ignitable waste - the waste meets the ignitable characteristics of Section C of the Emergency Hazardous Waste Regulation.
(b) Corrosive waste - the waste meets the corrosive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(c) Reactive waste - the waste meets the reactive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(d) Toxic waste - the waste meets the toxic characteristics of Section C of the Emergency Hazardous Waste Regulation.
(e) Listed waste - the waste is listed as a hazardous waste under Section C of the Emergency Hazardous Waste Regulation.
(7) Give estimated amount of hazardous waste transported by the transporter annually based upon the best available information. The transporter may be required by the Department to produce information as to the basis of this estimation.

D. Hazardous Waste Facilities.
(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) Self-explanatory.
(5) Give the county in which the facility is located. If the facility is located in more than one county give the county in which the facility is primarily located.
(6) Before answering this question, be sure to read the definitions of "treatment", "storage", and "disposal" contained in the Emergency Hazardous Waste Regulation.
(7) Self-explanatory.
(8) Types of hazardous wastes handled by facility:
(a) Ignitable waste - the waste meets the ignitable characteristics of Section C of the Emergency Hazardous Waste Regulation.
(b) Corrosive waste - the waste meets the corrosive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(c) Reactive waste - the waste meets the reactive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(d) Toxic waste - the waste meets the toxic characteristics of Section C of the Emergency Hazardous Waste Regulation.
(e) Listed waste - the waste is listed as a hazardous waste under Section C of the Emergency Hazardous Waste Regulation.
(9) Give estimated amount of hazardous waste handled by the facility annually based upon the best available information. The generator may be required by the Department to produce information as to the basis of this estimation.

South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201
Phone: (803) 758-5681

001

DHEC USE ONLY:
I.D.# _ _/_ _ _/_ _ _ _/_
Waste Code_ _ _ _

Instructions for completing this Form on reverse side.

HAZARDOUS WASTE INFORMATION

(1) Name of generator: American Color & Chemical Corporation

(2) Place of generation: Beaufort County, S.C.

(3) General description of hazardous waste, including process producing waste: Waste is sulfuric acid, varying in strength from 35-60% H_2SO_4. This acid is generated through chemical reactions in production of organic dye intermediates. Spent acid is isolated from product, collected and sold as neutralizing media for alkaline effluent streams.

(4) Description of the hazardous waste:
Sulfuric Acid, ranging in strength from 35-60% H_2SO_4

(5) Check the hazardous waste characteristics the waste exhibits as identified in Section C of the Emergency Hazardous Waste Regulation; or if the waste is listed as a hazardous waste, check "Listed"; or if the waste has been declared hazardous by the generator, check the hazardous waste characteristic(s) as identified in Section C of the Emergency Hazardous Waste Regulation the generator suspects the waste to exhibit.

- (a) Ignitable ☐
- (b) Corrosive ☒
- (c) Reactive ☐
- (d) Toxic ☐
- (e) Listed ☐

(6) Attach any information obtained from the testing of the waste performed to determine their hazard. If the generator declares the waste to be hazardous attach information on what basis the decision to declare the waste hazardous was made.
pH of material is ± 0.1

(7) Estimated amount of the waste produced per year in pounds (pounds/waste):
6,000,000 pounds/year

(8) Describe the method(s) by which this waste is currently being sold including the name and address of any facility to which the waste is being sent.
See attachment

(9) Certification: I hereby certify (or declare) that the information provided herein is complete and correct to the best of my knowledge. I understand that all information on this Form may be made available to the public except those portions entitled to confidentiality as provided by Section 6B of the South Carolina Hazardous Waste Management Act. I am authorized to sign official documents for the generator named in (1) above.

[signature] — Signature | J. F. Jacobetz, Dir. Env. Eng. — Name and Title | 7/9/80 — Date

NOTE: Additional copies of this Form may be reproduced locally as needed.

DHEC 1-86(9/14/79)

South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201
Phone: (803) 758-5681

007

DHEC USE ONLY:
I.D.# _ / _ _ / _ _ _ _ / _
Waste Code _ _ _ _

Instructions for completing this Form on reverse side.

HAZARDOUS WASTE INFORMATION

(1) Name of generator: American Color & Chemical Corporation

(2) Place of generation: Beaufort County, S.C.

(3) General description of hazardous waste, including process producing waste:

Waste lubricating oils from lubricating production equipment and transportation vehicles.

(4) Description of the hazardous waste:

Miscellaneous used oils from lubricating production equipment and transportation vehicles.

(5) Check the hazardous waste characteristics the waste exhibits as identified in Section C of the Emergency Hazardous Waste Regulation; or if the waste is listed as a hazardous waste, check "Listed"; or if the waste has been declared hazardous by the generator, check the hazardous waste characteristic(s) as identified in Section C of the Emergency Hazardous Waste Regulation the generator suspects the waste to exhibit.

- (a) Ignitable ☐
- (b) Corrosive ☐
- (c) Reactive ☐
- (d) Toxic ☐
- (e) Listed ☒

(6) Attach any information obtained from the testing of the waste performed to determine their hazard. If the generator declares the waste to be hazardous attach information on what basis the decision to declare the waste hazardous was made.

(7) Estimated amount of the waste produced per year in pounds (pounds/waste):

2,000 pounds

(8) Describe the method(s) by which this waste is currently being treated, stored, or disposed, including the name and address of any facility to which the waste is being sent.

Oil presently being picked up by C&M Oil Industries; 1020 Wappoo Rd.; Charleston, S.C. 29406, for re-refinement.

(9) Certification: I hereby certify (or declare) that the information provided herein is complete and correct to the best of my knowledge. I understand that all information on this Form may be made available to the public except those portions entitled to confidentiality as provided by Section 6B of the South Carolina Hazardous Waste Management Act. I am authorized to sign official documents for the generator named in (1) above.

Signature	Name and Title	Date
J F Jacobetz	J. F. Jacobetz, Dir. Env. Engr.	7/9/80

NOTE: Additional copies of this Form may be reproduced locally as needed.

General Instructions

1. This Hazardous Waste Information Form is to be used when designated by the Department. A separate Form shall be completed for each hazardous waste.

2. All definitions contained in the Hazardous Waste Management Act (Section 44-56-10 et seq. of the 1976 S.C. Code of Laws) and the Emergency Hazardous Waste Regulation shall apply to this Form.

3. If a question arises as to how to complete a particular item of this Form or additional copies of this Form are needed, please contact the Solid Waste Management Division at the telephone number or address given on the front of this Form.

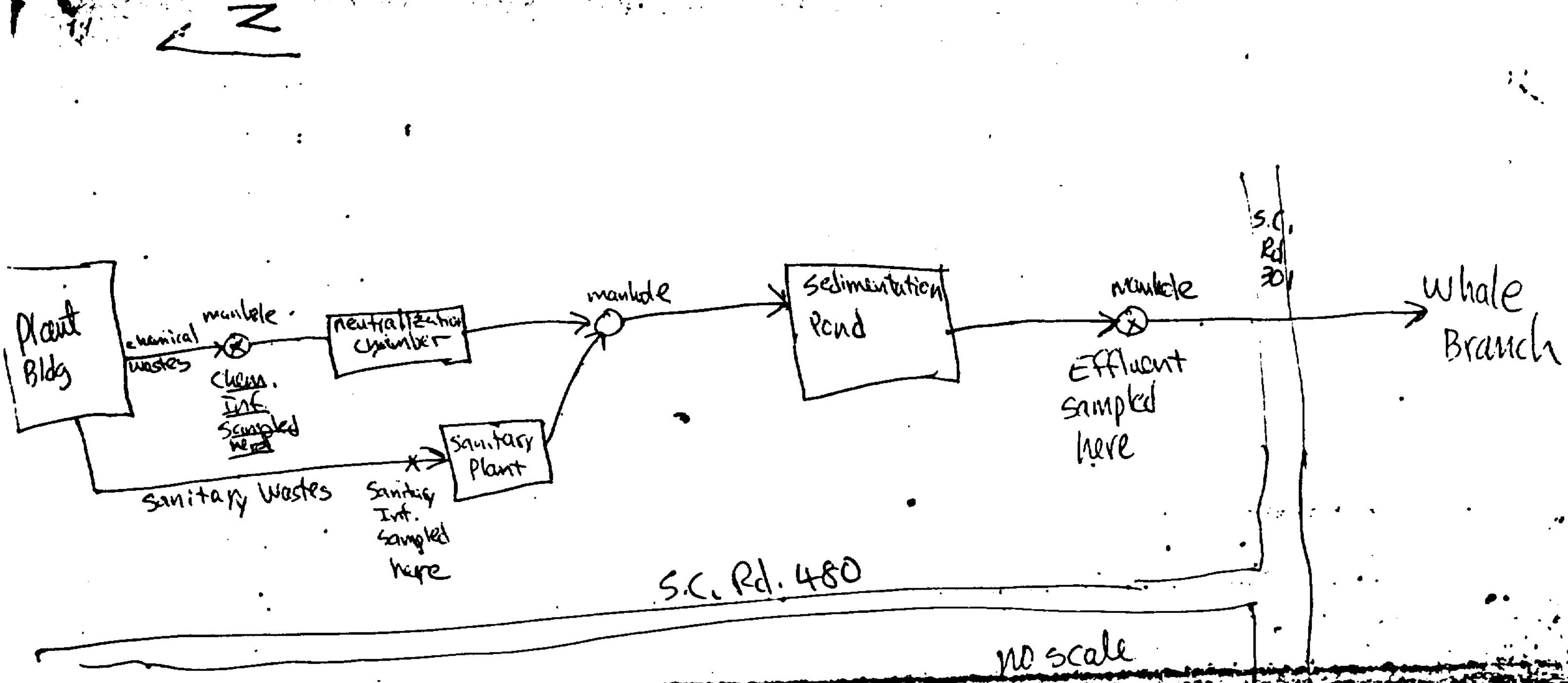
4. If additional space is needed to complete any item, attach a separate sheet to complete the item. Clearly identify on the separate sheet which item is being continued on that sheet.

5. Type or print in ink all items of this Form except the signature required in item (9), which must be signed in ink.

Specific Instructions

(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) A description of the hazardous waste handled by general type and specific contents using the best available information.
(5) Self-explanatory.
(6) Self-explanatory.
(7) Give estimated amount of the waste produced per year based upon the best available information. The generator may be required by the Department to produce information as to the basis of this estimation.
(8) Self-explanatory.
(9) Certification. An individual authorized to sign official documents for the organization or person identified in (1) shall enter his signature, name, title, and date. The signature shall be in ink.

Attachment


N
Plant Bldg
chemical wastes
manhole
Chem. Inf. Sampled here
neutralization chamber
manhole
Sanitary Plant
Sanitary Wastes
Sanitary Inf. Sampled here
Sedimentation Pond
manhole
Effluent sampled here
S.C. Rd 30
Whale Branch
S.C. Rd. 480
no scale

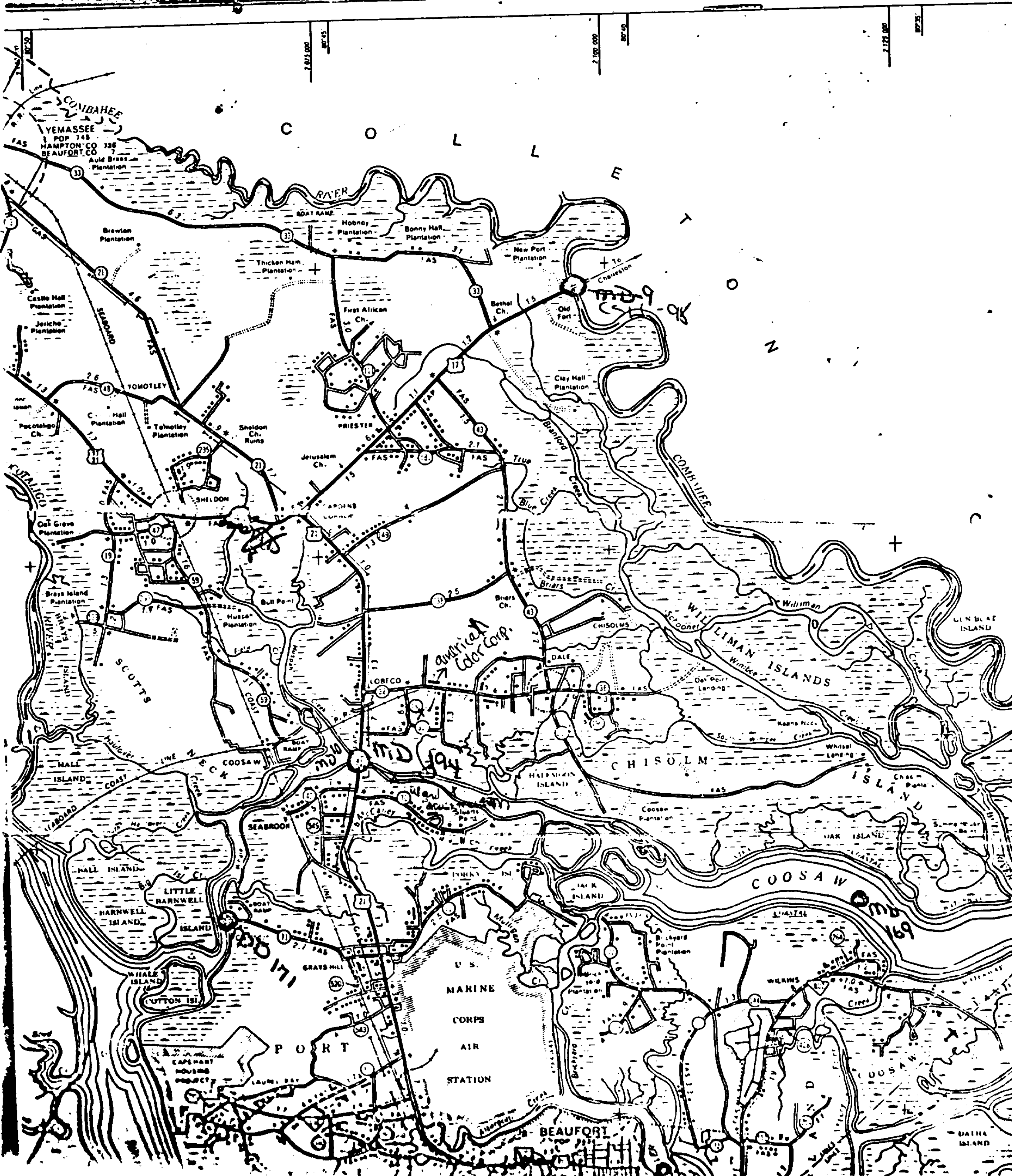

C O L L E T O N
YEMASSEE
COMBAHEE RIVER
TOMOTLEY
SHELDON
SCOTTS
american Color Corp.
LOBECO
CHISOLM ISLAND
WILLIMAN ISLANDS
COOSAW
COMBAHEE
HALL ISLAND
LITTLE BARNWELL
BARNWELL ISLAND
WHALE ISLAND
U.S. MARINE CORPS AIR STATION
BEAUFORT
PORT
MD 9
MD 194
MD 169
MD 171

FIGURE 1
STUDY AREA

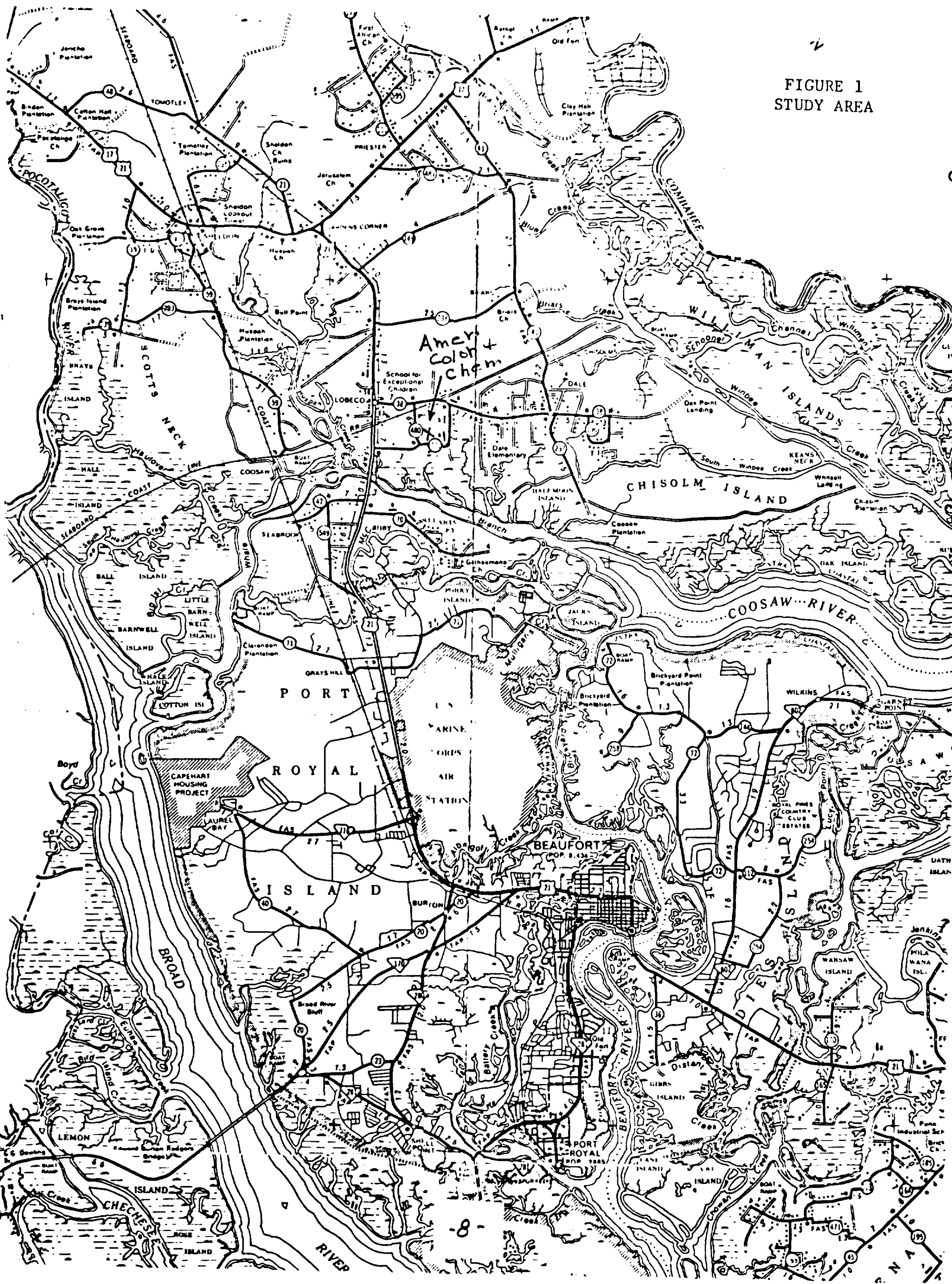
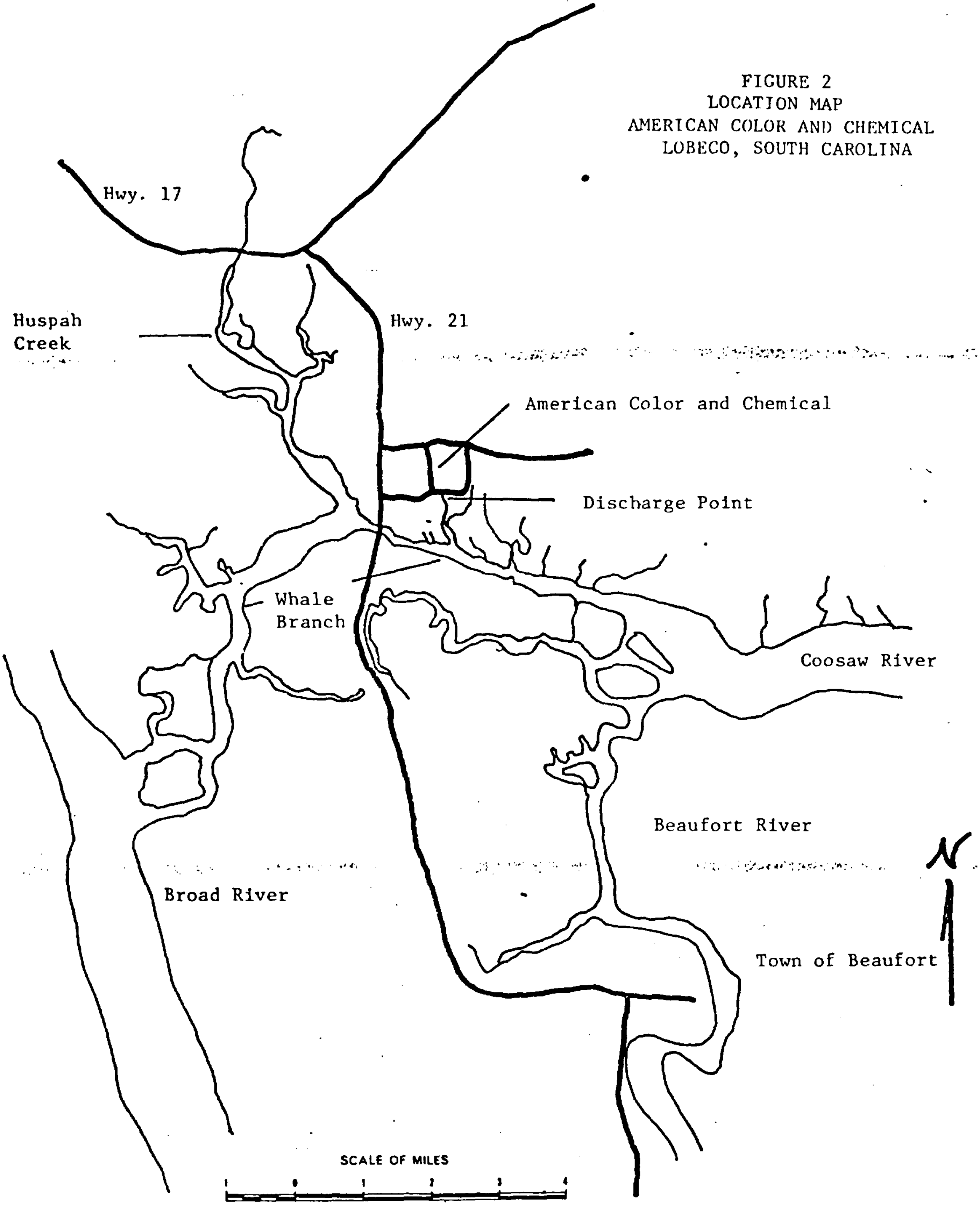
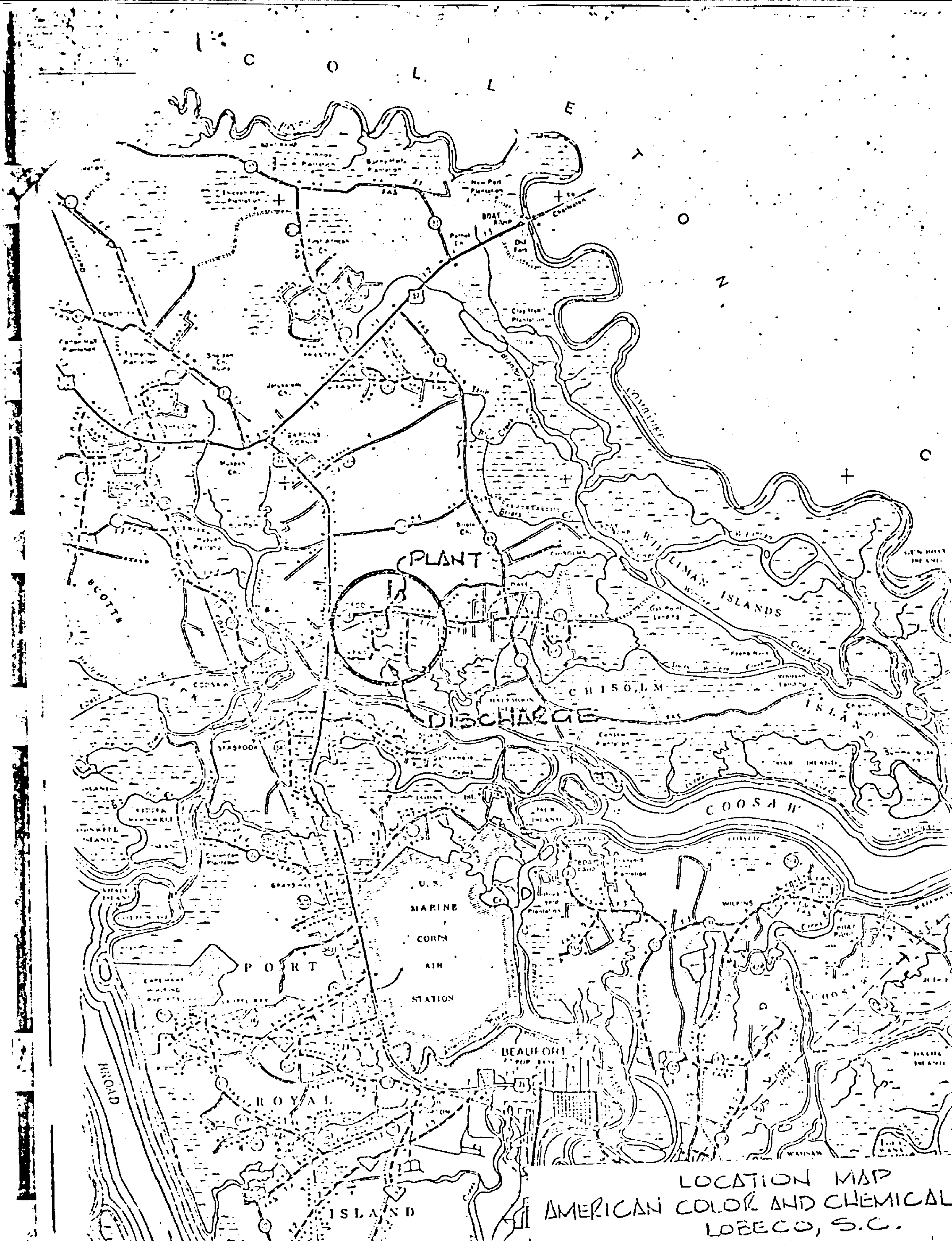


FIGURE 2
LOCATION MAP
AMERICAN COLOR AND CHEMICAL
LOBECO, SOUTH CAROLINA





LOCATION MAP
AMERICAN COLOR AND CHEMICAL
LOBECO, S.C.

American
Color &
Chemical
Corporation

P.O. Box 88
Mt Vernon Street
Lock Haven, Pa. 17745
Telephone (717) 748-6747

January 28, 1981

Mr. Robert G. Gross, P.E.
Director, Industrial Wastewater Division
Bureau of Wastewater Control
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Re: NPDES SC0000914
Lobeco, Beaufort County

Dear Mr. Gross:

I am enclosing for your information and file the analysis on our final effluent for priority pollutants.

For reference, we are also including sample locations, collection field data sheets and analysis on raw water and mixed effluent.

Note that no pesticides have been found. The reports are self-explanatory.

Should you have any questions, please call.

Very truly yours,

J. F. Jacobetz

J. F. Jacobetz, Director
Safety & Environmental Services

JFJ/hew

RECEIVED

FEB 2 1981

...CRICULTU...
WASTEWATER DIVISION

E

JAN 2 6 1981

Davis & Floyd, Inc.

CONSULTING ENGINEERS

POST OFFICE DRAWER 428

GREENWOOD, SOUTH CAROLINA 29646

January 21, 1981
ECB-20-81

Mr. John Meeks
American Color & Chemical Corporation
S. C. Highway No. 38
Lobeco, SC 29931

RE: Priority Pollutant Sampling and Analyses

Dear Mr. Meeks:

In October, 1980, a priority pollutant sampling and analysis program was conducted at American Color & Chemical Corporation at Lobeco, South Carolina. This program was conducted by Davis & Floyd, Inc., Greenwood, South Carolina.

The sampling program was conducted in accordance with the EPA protocol presented in the EPA publication, "Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants." During this sampling program, one 72 hour composite sample was collected from each of three sampling locations as follows:

Sample Point No. 1 - raw water, taken just after the well water storage tank.

Sample Point No. 2 - main pump station, collected after the industrial and domestic wastewaters are combined.

Sample Point No. 3 - final effluent, collected at the manhole in front of the effluent sump.

VOA grab samples were collected twice daily at each sampling point during the 72 hour sampling period.

After the sampling period was completed, a portion of each composite sample was taken for traditional analyses which were performed by the Davis & Floyd, Inc. laboratory. The remaining composite sample and VOA grabs were shipped to Southern Research Institute in Birmingham, Alabama, for priority pollutant analyses.

Southern Research Institute

2000 NINTH AVENUE SOUTH
BIRMINGHAM, ALABAMA 35255
TELEPHONE 205-323-6592

December 16, 1980

Mr. E. Carl Burrell
Davis and Floyd Engineers, Inc.
P. O. Drawer 428
Greenwood, South Carolina 29646

Dear Carl:

Enclosed as an attachment to this letter are the results of our analyses for the "Priority Pollutants" in the samples from American Color and Chemical Corporation, Labeco, S.C., received on October 17, 1980.

The samples were analyzed for metals in accordance with the EPA protocol described in "Methods for Chemical Analysis of Water and Wastes", EPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, March 1979. The organics in the samples were analyzed in accordance with the EPA protocol described in "Methods for Organic Compounds in Municipal and Industrial Wastewater", EPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, April 1979. The samples were analyzed for pesticides by GC/EC; none were detected in these samples.

If there are any questions or if we can be of any further assistance, please call us.

Very truly yours,

David W. Mason

David W. Mason
Associate Chemist

Ruby H. James

Ruby H. James
Head, Environmental Analytical
Chemistry Section

Approved by:

H. C. Miller

Herbert C. Miller
Head, Analytical and Physical
Chemistry Division

SORI-EAS-80-966
Project 4628-I
(3:15)

American Color & Chemical Corporation

South Carolina Highway #38
P. O. Box 815
Lobeco, S. C. 29931
Telephone (803) 846-8171

July 9, 1980

Mr. Hartsill Truesdale, Director
Solid & Hazardous Waste
Management Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Dear Mr. Truesdale,

This letter confirms our telephone conversation of June 27, 1980 covering filing of notification as a generator of hazardous waste in compliance with "HAZARDOUS WASTE MANAGEMENT REGULATIONS" dated March 31, 1980. As I indicated in our phone conversation, these Regulations were not distributed to American Color & Chemical Corporation, Lobeco, S. C. until your forwarded copy was received on July 1, 1980.

In compliance with these Regulations, a Notification of Hazardous Waste Activity is enclosed herewith, (DHEC-1986, DHEC-1987). Hazard classification is based on R.61-79.1B (1)(b), Corrosive Waste, since the pH of this material is ± 0.1.

It is the opinion of American Color & Chemical Corporation and requested herewith, that this material be exempted from the Hazardous Waste Classification as described in R.61-79.1A (2)(f). This spent sulfuric acid is formed as a by-product in this manufacturing facility. This by-product, ranging in strength from 35-60% Sulfuric Acid, is sold to the following customers:

1. Greenwood Mills, Inc., P.O. Dr. 1726, Orangeburg, S.C. 29911
2. Allied Products Corp; Fabric America Group, Kerr Finishing, Travelers Rest, S.C. 29690
3. Magnolia Finishing Company; Blacksburg, S.C. 29702

This spent Sulfuric Acid is used in all cases, to neutralize alkaline effluent streams as part of the customers' wastewater treatment plants. The customers are operating their wastewater treatment facilities under NPDES permits.

AMERICAN COLOR & CHEMICAL CORPORATION
July 9, 1980
Page 2
continued

With the Sulfuric Acid eliminated from the Hazardous Waste Classification, the notification, DHEC-1986, covering lubricating oils would also be eliminated based on volume of 2,000 pounds per year.

Please feel free to call if there are questions concerning this letter or enclosures.

Your consideration of the recommended classifications is appreciated.

Sincerely,

AMERICAN COLOR & CHEMICAL CORPORATION

Joseph F. Jacobetz

Joseph F. Jacobetz
Director, Environmental Engineering

JFJ:jda

Encl.

RECEIVED
JUL 14 1980
S. C. DEPT. OF HEALTH AND
ENVIRONMENTAL CONTROL
SOLID WASTE

The customers, as listed below, are operating their wastewater treatment facilities under NPDES Permits.

1. Greenwood Mills, Inc.
   P. O. Drawer 1726
   Orangeburg, S.C. 29911

2. Allied Products Corp.
   Fabric America Group
   Kerr Finishing Plant
   Travelers Rest, S.C. 29690

3. Magnolia Finishing Company

   Blacksburg, S.C. 29702

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

REGION: IV

SITE NUMBER (to be assigned by Hq): SC0000100018

GENERAL INSTRUCTIONS: Complete Sections I and III through XV of this form as completely as possible. Then use the information on this form to develop a Tentative Disposition (Section II). File this form in its entirety in the regional Hazardous Waste Log File. Be sure to include all appropriate Supplemental Reports in the file. Submit a copy of the forms to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Tack Force (EN-335); 401 M St., SW; Washington, DC 20460.

American Color & Chemical Corporation
P.O. Box 815
So. Carolina Hwy. No. 38
Lobeco, S.C. 29931
(803) 846-8171

John M. Meeks
Plant Manager

ENTIFICATION

B. STREET (or other identifier)

D. STATE | E. ZIP CODE | F. COUNTY NAME: Beaufort

2. TELEPHONE NUMBER

5. STATE | 6. ZIP CODE

e)

2. TELEPHONE NUMBER

3. CITY | 4. STATE | 5. ZIP CODE

I. SITE DESCRIPTION
neutralization, sedimentation units & lagoons for NPDES discharge

J. TYPE OF OWNERSHIP
- [ ] 1. FEDERAL
- [ ] 2. STATE
- [ ] 3. COUNTY
- [ ] 4. MUNICIPAL
- [x] 5. PRIVATE

II. TENTATIVE DISPOSITION (complete this section last)

A. ESTIMATE DATE OF TENTATIVE DISPOSITION (mo., day, & yr.)

B. APPARENT SERIOUSNESS OF PROBLEM
- [ ] 1. HIGH
- [x] 2. MEDIUM
- [ ] 3. LOW
- [ ] 4. NONE

C. PREPARER INFORMATION

1. NAME: B. G. Garland
2. TELEPHONE NUMBER: (404) 288-7711
3. DATE (mo., day, & yr.): 4-6-81

III. INSPECTION INFORMATION

A. PRINCIPAL INSPECTOR INFORMATION

1. NAME: B. G. Garland
2. TITLE: Env. Eng.
3. ORGANIZATION: E & E
4. TELEPHONE NO. (area code & no.): (404) 288-7711

B. INSPECTION PARTICIPANTS

1. NAME	2. ORGANIZATION	3. TELEPHONE NO.
B. G. Garland	E & E	(404) 288-7711
Frank Mills	E & E	(404) 288-7711
Marshall Dixon	Dist. Dir. S.C. DHEC	(803) 524-9760

C. SITE REPRESENTATIVES INTERVIEWED (corporate officials, workers, residents)

1. NAME	2. TITLE & TELEPHONE NO.	3. ADDRESS
John Meeks	Plant Mgr. (803) 846-8171	Lobeco, S.C. 29931

Continued From Front

III. INSPECTION INFORMATION (continued)

D. GENERATOR INFORMATION (sources of waste)

1. NAME	2. TELEPHONE NO.	3. ADDRESS	4. WASTE TYPE GENERATED
John M. Meeks	(803) 846-8171	Lobeco, S.C.	dye intermediates

E. TRANSPORTER/HAULER INFORMATION

1. NAME	2. TELEPHONE NO.	3. ADDRESS	4. WASTE TYPE TRANSPORTED
NA			

F. IF WASTE IS PROCESSED ON SITE AND ALSO SHIPPED TO OTHER SITES, IDENTIFY OFF-SITE FACILITIES USED FOR DISPOSAL.

1. NAME	2. TELEPHONE NO.	3. ADDRESS
		wastes (acid) neutralized and treated in
		lagoons and discharged to tidal estuary.

G. DATE OF INSPECTION (mo., day, & yr.) 3-31-81

H. TIME OF INSPECTION P.M.

I. ACCESS GAINED BY: (credentials must be shown in all cases) [X] 1. PERMISSION [ ] 2. WARRANT

J. WEATHER (describe) Fair

IV. SAMPLING INFORMATION

A. Mark 'X' for the types of samples taken and indicate where they have been sent e.g., regional lab, other EPA lab, contractor, etc. and estimate when the results will be available.

1. SAMPLE TYPE	2. SAMPLE TAKEN (mark 'X')	3. SAMPLE SENT TO:	4. DATE RESULTS AVAILABLE
a. GROUNDWATER			
b. SURFACE WATER			
c. WASTE			
d. AIR			
e. RUNOFF			
f. SPILL			
g. SOIL			
h. VEGETATION			
i. OTHER (specify)		Pictures, sketches, measurements	

B. FIELD MEASUREMENTS TAKEN (e.g., radioactivity, explosivity, PH, etc.)

1. TYPE	2. LOCATION OF MEASUREMENTS	3. RESULTS

 Continue On Page 3

Continued From Page 2

IV. SAMPLING INFORMATION (continued)

C. PHOTOS

1. TYPE OF PHOTOS: [X] a. GROUND [ ] b. AERIAL

2. PHOTOS IN CUSTODY OF: E&E

D. SITE MAPPED?

[ ] YES. SPECIFY LOCATION OF MAPS: maps & sketches obtained from company and State files.

E. COORDINATES

1. LATITUDE (deg.-min.-sec.) 32° 23'

2. LONGITUDE (deg.-min.-sec.) 8° 4' 40"

V. SITE INFORMATION

A. SITE STATUS

[X] 1. ACTIVE (Those inductrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if infrequently.)

[ ] 2. INACTIVE (Those sites which no longer receive wastes.)

[ ] 3. OTHER (specify): (Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.)

B. IS GENERATOR ON SITE?

[ ] 1. NO [X] 2. YES (specify generator's four-digit SIC Code): 2865

C. AREA OF SITE (in acres)
2500 acres
20 developed
2.5 lagoons

D. ARE THERE BUILDINGS ON THE SITE?

[ ] 1. NO [X] 2. YES (specify): Plant Bldgs.

VI. CHARACTERIZATION OF SITE ACTIVITY

Indicate the major site activity(ies) and details relating to each activity by marking 'X' in the appropriate boxes.

'X'	A. TRANSPORTER	'X'	B. STORER	'X'	C. TREATER	'X'	D. DISPOSER
	1. RAIL		1. PILE		1. FILTRATION		1. LANDFILL
	2. SHIP	X	2. SURFACE IMPOUNDMENT		2. INCINERATION		2. LANDFARM
	3. BARGE		3. DRUMS		3. VOLUME REDUCTION		3. OPEN DUMP
	4. TRUCK		4. TANK, ABOVE GROUND		4. RECYCLING/RECOVERY	X	4. SURFACE IMPOUNDMENT
	5. PIPELINE		5. TANK, BELOW GROUND	X	5. CHEM./PHYS./TREATMENT		5. MIDNIGHT DUMPING
	6. OTHER (specify):		6. OTHER (specify):		6. BIOLOGICAL TREATMENT		6. INCINERATION
					7. WASTE OIL REPROCESSING		7. UNDERGROUND INJECTION
					8. SOLVENT RECOVERY		8. OTHER (specify):
				X	9. OTHER (specify): areation and equalization basins		

E. SUPPLEMENTAL REPORTS: If the site falls within any of the categories listed below, Supplemental Reports must be completed. Indicate which Supplemental Reports you have filled out and attached to this for.. Sketches & Sample reports obtained

[ ] 1. STORAGE [ ] 2. INCINERATION [ ] 3. LANDFILL [X] 4. SURFACE IMPOUNDMENT [ ] 5. DEEP WELL

[X] 6. CHEM/BIO/PHYS TREATMENT [ ] 7. LANDFARM [ ] 8. OPEN DUMP [ ] 9. TRANSPORTER [ ] 10. RECYCLOR/RECLAIMER

VII. WASTE RELATED INFORMATION

A. WASTE TYPE

[X] 1. LIQUID [ ] 2. SOLID [ ] 3. SLUDGE [ ] 4. GAS

B. WASTE CHARACTERISTICS

[ ] 1. CORROSIVE [ ] 2. IGNITABLE [ ] 3. RADIOACTIVE [ ] 4. HIGHLY VOLATILE

[X] 5. TOXIC [ ] 6. REACTIVE [ ] 7. INERT [ ] 8. FLAMMABLE

[ ] 9. OTHER (specify):

C. WASTE CATEGORIES

1. Are records of wastes available? Specify items such as manifests, inventories, etc. below. Company records and NPDES samples. Monitoring wells soon.

Continued From Front

VII. WASTE RELATED INFORMATION *(continued)*

2. Estimate the amount *(specify unit of measure)* of waste by category; mark 'X' to indicate which wastes are present.

a. SLUDGE	b. OIL	c. SOLVENTS	d. CHEMICALS	e. SOLIDS	f. OTHER
AMOUNT	AMOUNT 2000 lbs/yr.	AMOUNT	AMOUNT 6,000,000 lbs/yr.	AMOUNT	AMOUNT
UNIT OF MEASURE	UNIT OF MEASURE Pounds	UNIT OF MEASURE	UNIT OF MEASURE Pounds	UNIT OF MEASURE	UNIT OF MEASURE
'X'	'X'	'X'	'X'	'X'	'X'
[ ] (1) PAINT, PIGMENTS	[ ] (1) OILY WASTES	[ ] (1) HALOGENATED SOLVENTS	[X] (1) ACIDS	[ ] (1) FLYASH	[ ] (1) LABORATORY, PHARMACEUT.
[ ] (2) METALS SLUDGES	[ ] (2) OTHER(*specify*): Picked up by reclaimers	[ ] (2) NON-HALOGNTD. SOLVENTS	[ ] (2) PICKLING LIQUORS	[ ] (2) ASBESTOS	[ ] (2) HOSPITAL
[ ] (3) POTW		[ ] (3) OTHER(*specify*):	[ ] (3) CAUSTICS	[ ] (3) MILLING/MINE TAILINGS	[ ] (3) RADIOACTIVE
[ ] (4) ALUMINUM SLUDGE			[ ] (4) PESTICIDES	[ ] (4) FERROUS SMELTING WASTES	[ ] (4) MUNICIPAL
[ ] (5) OTHER(*specify*):			[X] (5) DYES/INKS	[ ] (5) NON-FERROUS SMLTG. WASTES	[ ] (5) OTHER(*specify*):
			[ ] (6) CYANIDE	[X] (6) OTHER(*specify*): Pigments	
			[ ] (7) PHENOLS		
			[ ] (8) HALOGENS		
			[ ] (9) PCB		
			[X] (10) METALS ~~None~~		
			[ ] (11) OTHER(*specify*):		

D. LIST SUBSTANCES OF GREATEST CONCERN WHICH ARE ON THE SITE *(place in descending order of hazard)*

1. SUBSTANCE	2. FORM *(mark 'X')* a. SOLID	b. LIQ.	c. VAPOR	3. TOXICITY *(mark 'X')* a. HIGH	b. MED.	c. LOW	d. NONE	4. CAS NUMBER	5. AMOUNT	6. UNIT
see VIII below										

VIII. HAZARD DESCRIPTION

FIELD EVALUATION HAZARD DESCRIPTION: Place an 'X' in the box to indicate that the listed hazard exists. Describe the hazard in the space provided.

[X] A. HUMAN HEALTH HAZARDS Waste consists of acid dye intermediates. It is equalized and aerated and somewhat decolored before final discharge at neutral PH into tidal estuary at high outgoing tide.

Continue On Page 5

Continued From Page 4

VIII. HAZARD DESCRIPTION *(continued)*

☐ B. NON-WORKER INJURY/EXPOSURE

☐ C. WORKER INJURY/EXPOSURE

☐ D. CONTAMINATION OF WATER SUPPLY

Plant has 2 - 300' drinking wells; one is 100 ft. NE. and one is 100 ft. S.E. of production Building. Both are regularly monitored.

☐ E. CONTAMINATION OF FOOD CHAIN

☐ F. CONTAMINATION OF GROUND WATER

NPDES permit shows some priority pollutants. (Fe, Pb, Hg, Ni, Zn). Monitoring wells soon to be put around unlined lagoons (2 lagoons).

☐ G. CONTAMINATION OF SURFACE WATER

Continue On Reverse

Continued From Front

VIII. HAZARD DESCRIPTION *(continued)*

☐ H. DAMAGE TO FLORA/FAUNA

☐ I. FISH KILL

☐ J. CONTAMINATION OF AIR

☐ K. NOTICEABLE ODORS

☐ L. CONTAMINATION OF SOIL

☐ M. PROPERTY DAMAGE

Continue On Page 7

Continued From Page 6

VIII. HAZARD DESCRIPTION *(continued)*

☐ N. FIRE OR EXPLOSION

☐ O. SPILLS/LEAKING CONTAINERS/RUNOFF/STANDING LIQUID

☐ P. SEWER, STORM DRAIN PROBLEMS

☐ Q. EROSION PROBLEMS

☐ R. INADEQUATE SECURITY

☐ S. INCOMPATIBLE WASTES

Continue On Reverse

VIII. HAZARD DESCRIPTION *(continued)*

☐ T. MIDNIGHT DUMPING

☐ U. OTHER *(specify)*:

IX. POPULATION DIRECTLY AFFECTED BY SITE

A. LOCATION OF POPULATION	B. APPROX. NO. OF PEOPLE AFFECTED	C. APPROX. NO. OF PEOPLE AFFECTED WITHIN UNIT AREA	D. APPROX. NO. OF BUILDINGS AFFECTED	E. DISTANCE TO SITE *(specify units)*
1. IN RESIDENTIAL AREAS				
2. IN COMMERCIAL OR INDUSTRIAL AREAS				
3. IN PUBLICLY TRAVELLED AREAS				
4. PUBLIC USE AREAS *(parks, schools, etc.)*				

X. WATER AND HYDROLOGICAL DATA

A. DEPTH TO GROUNDWATER *(specify unit)*	B. DIRECTION OF FLOW	C. GROUNDWATER USE IN VICINITY
about 60' to limestone aquifer		
D. POTENTIAL YIELD OF AQUIFER	**E. DISTANCE TO DRINKING WATER SUPPLY** *(specify unit of measure)*	**F. DIRECTION TO DRINKING WATER SUPPLY**
	100' NE & SE ~~of plant~~ on site	NE 100' SE 100'

G. TYPE OF DRINKING WATER SUPPLY

☒ 1. NON-COMMUNITY < 15 CONNECTIONS*

☐ 2. COMMUNITY *(specify town)*: > 15 CONNECTIONS

☐ 3. SURFACE WATER

☒ 4. WELL

Continue On Page 9

Continued From Page 8

X. WATER AND HYDROLOGICAL DATA (continued)

H. LIST ALL DRINKING WATER WELLS WITHIN A 1/4 MILE RADIUS OF SITE

1. WELL	2. DEPTH (specify unit)	3. LOCATION (proximity to population/buildings)	4. NON-COMMUNITY (mark 'X')	5. COMMUNITY (mark 'X')
1	300'	100' NE Production Bldg.	X	
1	300'	100' SE production Bldg.	X	

I. RECEIVING WATER

1. NAME

☐ 2. SEWERS ☐ 3. STREAMS/RIVERS

☐ 4. LAKES/RESERVOIRS ☒ 5. OTHER (specify): Sanitary waste to treatment facility

6. SPECIFY USE AND CLASSIFICATION OF RECEIVING WATERS

NPDES discharge at high out tide.

XI. SOIL AND VEGITATION DATA

LOCATION OF SITE IS IN:

☐ A. KNOWN FAULT ZONE ☐ B. KARST ZONE ☐ C. 100 YEAR FLOOD PLAIN ☐ D. WETLAND

☐ E. A REGULATED FLOODWAY ☐ F. CRITICAL HABITAT ☐ G. RECHARGE ZONE OR SOLE SOURCE AQUIFER

XII. TYPE OF GEOLOGICAL MATERIAL OBSERVED

Mark 'X' to indicate the type(s) of geological material observed and specify where necessary, the component parts.

'X'	A. OVERBURDEN	'X'	B. BEDROCK (specify below)	'X'	C. OTHER (specify below)
X	1. SAND				
	2. CLAY				
	3. GRAVEL				

XIII. SOIL PERMEABILITY

☐ A. UNKNOWN ☐ B. VERY HIGH (100,000 to 1000 cm/sec.) ☐ C. HIGH (1000 to 10 cm/sec.)

☐ D. MODERATE (10 to .1 cm/sec.) ☐ E. LOW (.1 to .001 cm/sec.) ☐ F. VERY LOW (.001 to .00001 cm/sec.)

G. RECHARGE AREA

☐ 1. YES ☐ 2. NO 3. COMMENTS:

H. DISCHARGE AREA

☐ 1. YES ☐ 2. NO 3. COMMENTS:

I. SLOPE

1. ESTIMATE % OF SLOPE: 5%

2. SPECIFY DIRECTION OF SLOPE, CONDITION OF SLOPE, ETC.: South

J. OTHER GEOLOGICAL DATA

Sandy soil in tidal area.
High ground water.

Continued From Front

XIV. PERMIT INFORMATION

List all applicable permits held by the site and provide the related information.

A. PERMIT TYPE (e.g.,RCRA,State,NPDES,etc.)	B. ISSUING AGENCY	C. PERMIT NUMBER	D. DATE ISSUED (mo.,day,&yr.)	E. EXPIRATION DATE (mo.,day,&yr.)	F. IN COMPLIANCE (mark 'X') 1. YES	2. NO	3. UNKNOWN
NPDES		SC0000914			X		

XV. PAST REGULATORY OR ENFORCEMENT ACTIONS

☐ NONE ☒ YES (summarize in this space)

NPDES Permit. Monitoring wells soon to be installed.

NOTE: Based on the information in Sections III through XV, fill out the Tentative Disposition *(Section II)* information on the first page of this form.

EPA

POTENTIAL HAZARDOUS WASTE SITE
TENTATIVE DISPOSITION

REGION	SITE NUMBER
IV	SCD046507018

File this form in the regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System, Hazardous Waste Enforcement Task Force *(EN-335)*, 401 M St., SW, Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME	B. STREET	
American Color + Chemical	SC Hwy 38	
C. CITY	**D. STATE**	**E. ZIP CODE**
Lobeco	SC	

II. TENTATIVE DISPOSITION

Indicate the recommended action(s) and agency(ies) that should be involved by marking 'X' in the appropriate boxes.

RECOMMENDATION	MARK 'X'	ACTION AGENCY: EPA	STATE	LOCAL	PRIVATE
A. NO ACTION NEEDED -- NO HAZARD					
B. INVESTIGATIVE ACTION(S) NEEDED *(If yes, complete Section III.)*	X	X			
C. REMEDIAL ACTION NEEDED *(If yes, complete Section IV.)*					
D. ENFORCEMENT ACTION NEEDED *(if yes, specify in Part E whether the case will be primarily managed by the EPA or the State and what type of enforcement action is anticipated.)*					

E. RATIONALE FOR DISPOSITION

This site is active. Probably RCRA; however, State PA did not say. Groundwater release observed (organics)

F. INDICATE THE ESTIMATED DATE OF FINAL DISPOSITION *(mo., day, & yr.)*	G. IF A CASE DEVELOPMENT PLAN IS NECESSARY, INDICATE THE ESTIMATED DATE ON WHICH THE PLAN WILL BE DEVELOPED *(mo., day, & yr.)*

H. PREPARER INFORMATION

1. NAME	2. TELEPHONE NUMBER	3. DATE *(mo., day, & yr.)*

III. INVESTIGATIVE ACTIVITY NEEDED

A. IDENTIFY ADDITIONAL INFORMATION NEEDED TO ACHIEVE A FINAL DISPOSITION.

Check RCRA compliance

B. PROPOSED INVESTIGATIVE ACTIVITY *(Detailed Information)*

1. METHOD FOR OBTAINING NEEDED ADDITIONAL INFO.	2. SCHEDULED DATE OF ACTION *(mo.,day, & yr.)*	3. TO BE PERFORMED BY *(EPA, Contractor, State, etc.)*	4. ESTIMATED MANHOURS	5. REMARKS
a. TYPE OF SITE INSPECTION				
(1)				
(2)				
(3)				
b. TYPE OF MONITORING				
(1)				
(2)				
c. TYPE OF SAMPLING				
(1)				
(2)				

Continued From Front

III. INVESTIGATIVE ACTIVITIES NEEDED and PART B - PROPOSED INVESTIGATIVE ACTIVITY *(Continued)*

d. TYPE OF LAB ANALYSIS				
(1)				
(2)				
e. OTHER *(specify)*				
(1)				
(2)				

C. ELABORATE ON ANY OF THE INFORMATION PROVIDED IN PART B *(on front & above)* AS NEEDED TO IDENTIFY ADDITIONAL INVESTIGATIVE WORK.

D. ESTIMATED MANHOURS BY ACTION AGENCY

1. ACTION AGENCY	2. TOTAL ESTIMATED MANHOURS FOR INVESTIGATIVE ACTIVITIES	1. ACTION AGENCY	2. TOTAL ESTIMATED MANHOURS FOR INVESTIGATIVE ACTIVITIES
a. EPA		b. STATE	
c. EPA CONTRACTOR		d. OTHER *(specify)*	

IV. REMEDIAL ACTIONS

A. SHORT TERM EMERGENCY STRATEGY *(On Site & Off-Site)* List all emergency actions needed to bring site under immediate control, e.g., restrict access, provide alternate water supply, etc. See instructions for a list of Key Words for each of the actions to be used in the space below.

1. ACTION	2. EST. START DATE *(mo,day,& yr)*	3. EST. END DATE *(mo,day,& yr)*	4. ACTION AGENCY *(EPA, State, Private Party)*	5. ESTIMATED COST	6. SPECIFY 311 OR OTHER ACTION; INDICATE THE MAGNITUDE OF THE WORK REQUIRED
				$	
				$	
				$	
				$	
				$	
				$	

B. LONG TERM STRATEGY *(On Site & Off-Site)* List all long term solutions, e.g., excavation, removal, ground water monitoring wells, etc. See instructions for a list of Key Words for each of the actions to be used in the spaces below.

1. ACTION	2. EST. START DATE *(mo,day,& yr)*	3. EST. END DATE *(mo,day,& yr)*	4. ACTION AGENCY *(EPA, State Private Party)*	5. ESTIMATED COST	6. SPECIFY 311 OR OTHER ACTION; INDICATE THE MAGNITUDE OF THE WORK REQUIRED
				$	
				$	
				$	
				$	
				$	
				$	

C. ESTIMATED MANHOURS AND COST BY ACTION AGENCY

1. ACTION AGENCY	2. TOTAL EST. MANHOURS FOR REMEDIAL ACTIVITIES	3. TOTAL EST. COST FOR REMEDIAL ACTIVITIES	1. ACTION AGENCY	2. TOTAL EST. MANHOURS FOR REMEDIAL ACTIVITIES	3. TOTAL EST. COST FOR REMEDIAL ACTIVITIES
a. EPA			b. STATE		
c. PRIVATE PARTIES			d. OTHER *(specify)*		

American Color & Chemical Corporation

P.O. Box 88
Mt Vernon Street
Lock Haven, Pa. 17745
Telephone (717) 748-6747

January 28, 1981

Mr. Robert G. Gross, P.E.
Director, Industrial Wastewater Division
Bureau of Wastewater Control
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201

Re: NPDES SC0000914
Lobeco, Beaufort County

Dear Mr. Gross:

I am enclosing for your information and file the analysis on our final effluent for priority pollutants.

For reference, we are also including sample locations, collection field data sheets and analysis on raw water and mixed effluent.

Note that no pesticides have been found. The reports are self-explanatory.

Should you have any questions, please call.

Very truly yours,

J. F. Jacobetz

J. F. Jacobetz, Director
Safety & Environmental Services

JFJ/hew

RECEIVED
FEB 2 1981
...AGRICULTU...
WASTEWATER DIVISION

This paper has been dyed with American Color & Chemical Corporation dyes

JAN 2 C 1981

Davis & Floyd, Inc.

CONSULTING ENGINEERS

POST OFFICE DRAWER 428

GREENWOOD, SOUTH CAROLINA 29646

January 21, 1981
ECB-20-81

Mr. John Meeks
American Color & Chemical Corporation
S. C. Highway No. 38
Lobeco, SC 29931

RE: Priority Pollutant Sampling and Analyses

Dear Mr. Meeks:

In October, 1980, a priority pollutant sampling and analysis program was conducted at American Color & Chemical Corporation at Lobeco, South Carolina. This program was conducted by Davis & Floyd, Inc., Greenwood, South Carolina.

The sampling program was conducted in accordance with the EPA protocol presented in the EPA publication, "Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants." During this sampling program, one 72 hour composite sample was collected from each of three sampling locations as follows:

Sample Point No. 1 - raw water, taken just after the well water storage tank.

Sample Point No. 2 - main pump station, collected after the industrial and domestic wastewaters are combined.

Sample Point No. 3 - final effluent, collected at the manhole in front of the effluent sump.

VOA grab samples were collected twice daily at each sampling point during the 72 hour sampling period.

After the sampling period was completed, a portion of each composite sample was taken for traditional analyses which were performed by the Davis & Floyd, Inc. laboratory. The remaining composite sample and VOA grabs were shipped to Southern Research Institute in Birmingham, Alabama, for priority pollutant analyses.

Southern Research Institute

2000 NINTH AVENUE SOUTH
BIRMINGHAM, ALABAMA 35255
TELEPHONE 205-323-6592

December 16, 1980

Mr. E. Carl Burrell
Davis and Floyd Engineers, Inc.
P. O. Drawer 428
Greenwood, South Carolina 29646

Dear Carl:

Enclosed as an attachment to this letter are the results of our analyses for the "Priority Pollutants" in the samples from American Color and Chemical Corporation, Labeco, S.C., received on October 17, 1980.

The samples were analyzed for metals in accordance with the EPA protocol described in "Methods for Chemical Analysis of Water and Wastes", EPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, March 1979. The organics in the samples were analyzed in accordance with the EPA protocol described in "Methods for Organic Compounds in Municipal and Industrial Wastewater", EPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, April 1979. The samples were analyzed for pesticides by GC/EC; none were detected in these samples.

If there are any questions or if we can be of any further assistance, please call us.

Very truly yours,

David W. Mason

David W. Mason
Associate Chemist

Ruby H. James

Ruby H. James
Head, Environmental Analytical Chemistry Section

Approved by:

H C Miller

Herbert C. Miller
Head, Analytical and Physical Chemistry Division

SORI-EAS-80-966
Project 4628-I
(3:15)

American Color & Chemical Corporation

South Carolina Highway #38
P. O. Box 815
Lobeco, S. C. 29931
Telephone (803) 846-8171

July 9, 1980

Mr. Hartsill Truesdale, Director
Solid & Hazardous Waste
Management Division
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Dear Mr. Truesdale,

This letter confirms our telephone conversation of June 27, 1980 covering filing of notification as a generator of hazardous waste in compliance with "HAZARDOUS WASTE MANAGEMENT REGULATIONS" dated March 31, 1980. As I indicated in our phone conversation, these Regulations were not distributed to American Color & Chemical Corporation, Lobeco, S. C. until your forwarded copy was received on July 1, 1980.

In compliance with these Regulations, a Notification of Hazardous Waste Activity is enclosed herewith, (DHEC-1986, DHEC-1987). Hazard classification is based on R.61-79.1B (1)(b), Corrosive Waste, since the pH of this material is ± 0.1.

It is the opinion of American Color & Chemical Corporation and requested herewith, that this material be exempted from the Hazardous Waste Classification as described in R.61-79.1A (2)(f). This spent sulfuric acid is formed as a by-product in this manufacturing facility. This by-product, ranging in strength from 35-60% Sulfuric Acid, is sold to the following customers:

1. Greenwood Mills, Inc., P.O. Dr. 1726, Orangeburg, S.C. 29511
2. Allied Products Corp; Fabric America Group, Kerr Finishing, Travelers Rest, S.C. 29690
3. Magnolia Finishing Company; Blacksburg, S.C. 29702

This spent Sulfuric Acid is used in all cases, to neutralize alkaline effluent streams as part of the customers' wastewater treatment plants. The customers are operating their wastewater treatment facilities under NPDES permits.

With the Sulfuric Acid eliminated from the Hazardous Waste Classification, the notification, DHEC-1986, covering lubricating oils would also be eliminated based on volume of 2,000 pounds per year.

Please feel free to call if there are questions concerning this letter or enclosures.

Your consideration of the recommended classifications is appreciated.

Sincerely,

AMERICAN COLOR & CHEMICAL CORPORATION

Joseph F. Jacobetz
Director, Environmental Engineering

JFJ:jda

Encl.

The customers, as listed below, are operating their wastewater treatment facilities under NPDES Permits.

1. Greenwood Mills, Inc.
   P. O. Drawer 1726
   Orangeburg, S.C. 29911

2. Allied Products Corp.
   Fabric America Group
   Kerr Finishing Plant
   Travelers Rest, S.C. 29690

3. Magnolia Finishing Company

   Blacksburg, S.C. 29702

American Color & Chemical Corporation

South Carolina Highway # 38
P. O. Box 815
Lobeco, S. C. 29931
Telephone (803) 846-8171

RECEIVED
APR 9 1980
INDUSTRIAL & AGRICULTURAL WASTEWATER DIVISION

April 7, 1980

District Director
Low Country District
S. C. Department of Health &
Environmental Control
149 Ribaut Square
Beaufort, South Carolina 29902

Attn: Mr. Marshall Dixon

Dear Mr. Dixon:

Enclosed herewith please find copies of analyses for heavy metals on effluent discharged from American Color & Chemical Corporation plant in Lobeco on February 21 and March 7, 1980. Also included in report for March 7, 1980, are analyses of waters taken from Campbell's Creek, both upstream and downstream, during the afternoon discharge on that date.

The samples taken March 7, 1980 are a portion of those samples which were split with your department. As indicated on the date of sampling, a copy of these analyses as determined by your department, would be appreciated.

Please feel free to call if there are questions on any of the above, of the material enclosed herewith.

Sincerely,

John M. Meeks
Plant Manager

JMM:jda

cc: Mr. J. F. Jacobetz - AC&CC - Lock Haven
Mr. F. Jordan - AC&CC - Charlotte
Mr. Bob Gross - SCDHEC - Columbia
Mr. Andy Yasinsac - SCDHEC - Columbia

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

DISCHARGE MONITORING REPORT

MERICAN COLOR & CHEMICAL
N J F JACOBETZ/DIR ENVIR SERV
M COLOR & CHEM-PO BOX 38
OCK HAVEN PA 17745

13 1 0131-1 F

NPDES NO.	PIPE NO.	REPORTING PERIOD (YR MO DA TO YR MO DA)
SC0002914	001	80/ 12/01 TO 80 / 12/31

PARAMETER & NUMBER	MIN	AVG	MAX	UNITS		FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
FLOW	.050	.097	.215			1/1	CT		
50050	******	******	******	MGD		1/1	CT		
PH	7.1	7.3	7.5			1/1	GR		
00400	6	******	9	SU		1/1	GR		
	******	******	******	*****		*****	*****		
	******	******	******	*****		*****	*****		
FEC COLI	10	30	78			2/7	GR		
74055	******	200	400	#/100ml		2/7	GR		

PARAMETER & NUMBER		QUANTITY DA AVG	QUANTITY DA MAX		UNITS	CONCENTRATION DA AVG	CONCENTRATION DA MAX		UNITS	% R	FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
OD	Reported	5.9	11.1			5.7	6.6				2/7	12		
0034	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
ISP SOLID	Reported	19.8	33.7			23	35.6				2/7	24		
290	Permit Cond.	333	500	******	#/DAY						2/7	24		
13	Reported	9.3	17.4			10.9	12.8				2/7	12		
.10	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
OD	Reported	55.4	95											
020	Permit Cond.	******	600	******	#/DAY									
C	Reported													
406	Permit Cond.					******	RR	******	MG/L			CT		
AD	Reported			.05				0.62			1/30	CT		
01051	Permit Cond.	NOTE: Plant Shutdown 12/20/80-12/28/80							MG/L					

Name of Principal Executive Officer	Title of Officer	Year	Mo	Day
Jacobetz, Joseph F.	Director, Environmental Services	81	01	15

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief such information is true, complete, and accurate.

Signature of Principal Executive Officer or Authorized Agent

DHEC FORM 1977-1

DISCHARGE MONITORING REPORT

MERICAN COLOR & CHEMICAL
R J F JACOBETZ/DIR ENVIR SERV
M COLOR & CHEM-PO BOX 8R
OCK HAVEN PA 17745

13 1 0131-1 F

NPDES NO.	PIPE NO.	REPORTING PERIOD
SC0007914	C01	YR MO DA 80/11/01 TO YR MO DA 80/11/30

PARAMETER & NUMBER	MIN	AVG	MAX	UNITS		FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
FLOW	.066	.084	.092			1/1	CT		
50050	******	******	******	MGD		1/1	CT		
PH	6.5	6.7	7.0			1/1	GR		
00400	6	******	9	SU		1/1	GR		
	******	******	******	*****		*****	*****		
	******	******	******	*****		*****	*****		
FEC COLI	20	94	295			2/7	GR		
74055	******	200	400	#/100ml		2/7	GR		

PARAMETER & NUMBER		QUANTITY DA AVG	QUANTITY DA MAX		UNITS	CONCENTRATION DA AVG	CONCENTRATION DA MAX		UNITS	% R	FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
UD	Reported	3.7	5.2			5.2	6.8				2/7	12		
0064	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
USP SOLID	Reported	12.4	15.4			17.6	20				2/7	24		
0299	Permit Cond.	333	500	******	#/DAY						2/7	24		
H3	Reported	3.1	4.2			4.4	5.5				2/7	12		
10	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
UD	Reported	19.5	25.1											
0029	Permit Cond.	******	600	******	#/DAY									
TC	Reported													
1406	Permit Cond.					******	RR	******	MG/L			CT		
LEAD	Reported	Below detectable limits of Instrument		N/A				< .5			1/30	CT		
01051	Permit Cond.								MG/L					

Name of Principal Executive Officer	Title of Officer	Year	Mo	Day
Jacobetz, Joseph F.	Director, Environmental Services	81	01	15

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief such information is true, complete, and accurate.

Joseph F. Jacobetz

Signature of Principal Executive Officer or Authorized Agent

NPDES FORM 1977-1

SOUTH CAROLINA DEPARTMENT OF HEAL[illegible]

DISCHARGE MONITORING REPORT

ERICAN COLOR & CHEMICAL
R J F JACOBETZ/DIR ENVIR SERV
AM COLOR & CHEM-PO BOX 88
LOCK HAVEN PA 17745

013 1 0131-1 F

NPDES NO.	PIPE NO.	REPORTING PERIOD
SC00[illegible]914	C01	YR MO DA 80 10 / 01 TO YR MO DA 80 / 10 / 31

PARAMETER & NUMBER	MIN	AVG	MAX	UNITS		FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
FLOW	.068	.089	.112			1/1	CT		
50050	******	******	******	MGD		1/1	CT		
PH	6.6	6.8	7.2			1/1	GR		
00400	6	******	9	SU		1/1	GR		
	******	********	*******	*****		*****	*****		
	******	********	*******	*****		*****	*****		
FEC COLI	50	156	295			2/7	GR		
74055	******	200	400	#/100ml		2/7	GR		

PARAMETER & NUMBER		QUANTITY DA AVG	DA MAX		UNITS	CONCENTRATION DA AVG	DA MAX		UNITS	% R	FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
BOD	Reported	9.9	32.8			10.6	35.1				2/7	12		
5UC64	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
SUSP SOLID	Reported	13.7	32.7			17.8	35				2/7	24		
70299	Permit Cond.	333	500	******	#/DAY						2/7	24		
[illegible]H3	Reported	2.4	3.3			3.3	4.2				2/7	12		
[illegible]10	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
UOD	Reported	25.7	59.6											
80029	Permit Cond.	******	600	******	#/DAY									
FTC	Reported													
[illegible]1400	Permit Cond.					******	RR	******	MG/L			CT		
LEAD	Reported			.09				1.2			1/30	CT NNNN		
01051	Permit Cond.				#/DAY				MG/L					

BUREAU OF WASTEWATER & STREAM QUALITY CONTROL

Name of Principal Executive Officer	Title of Officer	Year	Mo	Day
Jacobetz, Joseph F.	Director, Environmental Services	8 1	0 1	1 5

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief such information is true, complete, and accurate.

Signature of Principal Executive Officer or Authorized Agent

NPDES FORM 1977-1

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

EQC District Laboratory Report Form for Stream and Facility Data

STREAM: Primary ( ) Secondary ( ) COUNTY Beaufort

Facility Ayer [illegible] Type ______ Samples Split EPA (1) Owner(2) None(3)

NPDES No: SC0000914 Receiving Stream Whale Creek Basin ______

DATE: From 80 5 29 (Yr Mo Day) To 80 5 30 (Yr Mo Day) Collector Williams Weather Code: Fair 01, Clear 0?, Cloudy 02, Rain 22

		[illegible]	Bacti	F.T.	Phenol				
Sample (Sta. No.)		001	001	001	001	-	-	-	-
Lab No. (H		2808	2809	~~2810~~	2810				
Time Collected	In	1350							
(Military)	Out	1340	1340	1340	1340				
SAMPLE TYPE		Gr.	Gr	Gr	Gr.				
Weather	00041	00	00						
Air Temp. (°C)	00021								
% From RB	00002								
Depth (ft)	72015								
Tape Down/Staff Gage(ft)									
Field pH	00400			7.0					
Field D.O. (mg/l)	00300								
Temp. (°C), Water	00010			20					
Chlorine, Tot. Res. (mg/l)	50060								
Salinity (ppth)	00480								
Conductivity	00094								
Flow, Stream (cfs)	00061								
Flow, Facility (MGD)	50050								
Lab pH	00403								
Phth Alk(mg/l)(pH 8.3)	00415								
Tot. Alk(mg/l)(pH 4.5)	00410								
Color (c.u.)	00080								
Turbidity (NTU)	00076								
BOD_5 (mg/l)	00310	8.6							
COD(mg/l)-Low(5-50)	00335								
COD(mg/l)-High(15-2000)	00340	610							
Residue Set. (ml/l)	50086								
Residue Sus. (mg/l)	00530	62							
Residue Total (mg/l)	00500								
Fecal Coli/100ml (MFC)	31616								
Fecal Coli/100ml (MPN)	31615		9						
Phenols (µg/l)	32730				190				
Oil & Grease (mg/l)	00556								
Cyanide (mg/l)	00720								
Metals / Nutrients / Pesticides / TOC	(✓) If Req.	✓		✓					

Comments ______

Samples Received By W. Jennings Date Received 5-30-80

Data Released By WJ Verified By WJ Release Date 6-6-80

EQC/ASD:21 White-Central Office; Canary & Pink-District Lab

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

EQC District Laboratory Report Form for Stream and Facility Data

STREAM: Primary ( ), Secondary ( ) COUNTY Beaufort

Facility Hase Colony Plant Type ______ Samples Split EPA (1) Owner(2) None(3)

NPDES No: SC000C917 Receiving Stream White Creek Basin Marine

DATE: From 80 5 28 (Yr Mo Day) To 80 5 29 (Yr Mo Day) Collector M Williams Weather Code: Fair 01, Clear 00, Cloudy 02, Rain 22

Sample (Sta. No.)		001	001	001	-	-	-	-	-
Lab No. CH-		2780	2781						
Time Collected	In	1410							
(Military)	Out	1350	1356	1350					
SAMPLE TYPE		Comp	Gr	Gr					
Weather	00041	00	00	00					
Air Temp. (°C)	00021								
% From RB	00002								
Depth (ft)	72015								
Tape Down/Staff Gage(ft)									
Field pH	00400			7.0					
Field D.O. (mg/l)	00300								
Temp. (°C), Water	00010			21.0					
Chlorine, Tot. Res. (mg/l)	50060								
Salinity (ppth)	00480								
Conductivity	00094								
Flow, Stream (cfs)	00061								
Flow, Facility (MGD)	50050								
Lab pH	00403								
Phth Alk(mg/l)(pH 8.3)	00415								
Tot. Alk(mg/l)(pH 4.5)	00410								
Color (c.u.)	00080								
Turbidity (NTU)	00076								
BOD_5 (mg/l)	00310	14							
COD(mg/l)-Low(5-50)	00335								
COD(mg/l)-High(15-2000)	00340	560							
Residue Set. (ml/l)	50086								
Residue Sus. (mg/l)	00530	50							
Residue Total (mg/l)	00500								
Fecal Coli/100ml (MFC)	31616								
Fecal Coli/100ml (MPN)	31615		33						
Phenols (µg/l)	32730								
Oil & Grease (mg/l)	00556								
Cyanide (mg/l)	00720								
Metals / Nutrients / Pesticides / TOC	(✓) If Req.	✓							

Comments [illegible]

Samples Received By W. Jennings Date Received 5-29-80

Data Released By WWE Verified By WWE Release Date 6-6-80

EQC/ASD:21 White-Central Office; Canary & Pink-District Lab

CA NA Sheet No.

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Bureau of Field and Analytical Services
Analytical Services Data Sheet for Streams and Wastewater

Facility Amer Color & Chem Type ______ County Beaufort
Permit No. SC0000914 Receiving Stream Whale Branch Basin ______
Date 5-30-80 Collected By Williams District Chas

Pipe No.															
Station No.			001												
Lab No. CH-			2811												
Time Collected															
NH_3-N, mg/l	00610	X	*												
NO_3/NO_2-N, mg/l	00630														
TKN, mg/l	00625														
T-Ortho-P, mg/l	70507														
T-P, mg/l	00665														
Cl mg/l	00940														
SO_4 mg/l	00945														
As ug/l	01002														
Cd ug/l	01027														
Cr ug/l	01034														
Cu ug/l	01042														
Fe ug/l	01045														
Pb ug/l	01051														
Mg mg/l	00927														
Mn ug/l	01055														
Hg ug/l	71900	X	0.5												
Ni ug/l	01067														
Zn ug/l	01092														
Pesticides	74053														
TOC mg/l	00680														

An "X" in the small column indicates test required. rcvd 5-30-80, W. Janning

Date Released from Regional Laboratory 6-2-80 By W. Janning

Received in Central Laboratory By [illegible] Date Received 6-3-80

Date Released from Analytical Services Central Laboratory 6/20/80

Released By C K[illegible]

* lab error

BF&AS:49

Sheet No.

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Bureau of Field and Analytical Services
Analytical Services Data Sheet for Streams and Wastewater

Facility Amer. Colors Chem. Type ____ County Beaufort

Permit No. SC0000214 Receiving Stream Whale Branch Basin Marine

Date 5-29-80 Collected By M. Williams District Charleston

Pipe No.																	
Station No.			001														
Lab No. CH			2782														
Time Collected			1350														
NH_3-N, mg/l	00610	/	☆														
NO_3/NO_2-N, mg/l	00630																
TKN, mg/l	00625																
T-Ortho-P, mg/l	70507																
T-P, mg/l	00665																
Cl mg/l	00940																
SO_4 mg/l	00945																
As ug/l	01002																
Cd ug/l	01027																
Cr ug/l	01034																
Cu ug/l	01042																
Fe ug/l	01045																
Pb ug/l	01051																
Mg mg/l	00927																
Mn ug/l	01055																
Hg ug/l	71900																
Ni ug/l	01067																
Zn ug/l	01092																
Pesticides	74053																
TOC mg/l	00680																

An "X" in the small column indicates test required. Rcvd 5-29-80, W. Jamison

Date Released from Regional Laboratory 6-2-80 By W. Jamison

Received in Central Laboratory By [illegible] Date Received 6-3-80

Date Released from Analytical Services Central Laboratory 6/20/80

Released By C. Rohr [illegible]

☆ lab error

BF&AS:49

ENVIRONMENTAL SERVICES DIVISION
POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA

LABORATORY ANALYSIS

FOR: AMERICAN COLOR/CHEMICAL
LOCATION: LOBECO S. C.
JOB NUMBER: 2200-6

SAMPLE DATE: 3-~~14~~ 7-80
REPORT DATE: 3-27-80

PARAMETER	A	B	C
CADMIUM(TOTAL)	.013	.011	.011
CHROMIUM(TOTAL)	.090	.030	.050
COPPER(TOTAL)	.060	.040	.030
IRON (TOTAL)	16.200	2.520	1.460
LEAD(TOTAL)	.460	.170	.150
MANGANESE(TOTAL)	.180	.100	.120
MAGNESIUM(TOTAL)	9.100	527.000	468.000
MERCURY(TOTAL)	.500	<0.2	<0.2
NICKEL(TOTAL)	.240	.090	.100
ZINC	.135	.035	.027

SAMPLE A IS EFFLUENT DISCHARGE
SAMPLE B IS DOWNSTREAM
SAMPLE C IS UPSTREAM

NOTES:

1. ALL ANALYSES ARE IN MG/L UNLESS OTHERWISE NOTED.
2. MERCURY IS GIVEN IN MICROGRAMS/LITER
3. FOR ANALYSES HAVING THE LESS THEN (<) NOTATION THE VALUE PRESENTED IS THE LOWER LIMIT OF DETECTION FOR THE METHOD AND/OR INSTRUMENT.

SAMPLED BY ACCC

ANALYSIS BY MPG

CHECKED BY John H. McCord Jr.
JOHN H. MCCORD JR.

APPROVED BY E. Carl Burrell Jr.
E. CARL BURRELL JR.

DAVIS AND FLOYD ENGINEERS, INC.
ENVIRONMENTAL SERVICES DIVISION
POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA

LABORATORY ANALYSIS

FOR: AMERICAN COLOR/CHEMICAL
LOCATION: LOBECO S. C.
JOB NUMBER: 2200-6

SAMPLE DATE: 2-~~27~~ 21-80
REPORT DATE: 3-27-80

PARAMETER	A
CADMIUM (TOTAL)	.007
CHROMIUM (TOTAL)	.050
COPPER (TOTAL)	.050
IRON (TOTAL)	13.200
LEAD (TOTAL)	.160
MANGANESE (TOTAL)	.140
MAGNESIUM (TOTAL)	9.300
MERCURY (TOTAL)	.300
NICKEL (TOTAL)	.120
ZINC	.101

SAMPLE A IS COMPOSITE DISCHARGE SAMPLE
NOTES:
1. ALL ANALYSES ARE IN MG/L UNLESS OTHERWISE NOTED.
2. MERCURY IS GIVEN IN MICROGRAMS/LITER

SAMPLED BY ACCC

ANALYSIS BY MPG

CHECKED BY John H. McCord Jr.
JOHN H. MCCORD JR.

APPROVED BY E. Carl Burrell Jr.
E. CARL BURRELL JR.

Table 1. Metals Data

Element	Concentration, μg/L: ISCO Blanks 6173	ISCO Blanks 6174	ISCO Blanks 6175	Composite Samples: Raw Water 6173	Mixed Influent 6174	Final Effluent 6175
Antimony	<10	<10	<10	<10	AI	AI
Arsenic	<10	<10	<10	<10	105	61
Beryllium	<5	<5	<5	<5	<5	<5
Cadmium	<1	<1	<1	1	1	1
Chromium	<10	<10	10	<10	124	36
Copper	<5	<5	<5	<5	72	102
Lead	<5	<5	15	<5	17	250
Mercury	<1.0	<1.0	<1.0	<1.0	1.0	<1.0
Nickel	<10	<10	<10	<10	110	84
Selenium	<5	<5	<5	<5	84	77
Silver	<1	<1	<1	<1	<2	<2
Thallium	<3	<3	<3	<3	<10	<10
Zinc	53	<5	799	<5	109	85

AI = Analytical Interferences; determination not possible under these conditions.

Table 2. Metals Spike Recovery Data*

Element	Spike Recovery, % Mixed Influent 6174	Final Effluent 6175
Antimony	29	33
Arsenic	81	79
Beryllium	77	73
Cadmium	82	90
Chromium	102	92
Copper	93	94
Lead	108	62
Mercury	83	95
Nickel	100	103
Selenium	93	66
Silver	100	93
Thallium	30	41
Zinc	-	-

* = Method of additions spikes

- = Not spiked

Table 3. Purgeable Organics Data

Compound	Raw Water, 6173 Not Preserved			Mixed Influent, 6174 Not Preserved			Final Effluent, 6175 Not Preserved			Final Effluent, 6175 Preserved		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1#	Day 2	Day 3	Day 1	Day 2	Day 3
Methylene chloride*	10	70	68	80	92	72	54	64	56	68	63	60
1,1-Dichloroethylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trans-1,2-dichloroethylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	[illegible]
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<10	<10	<10	180	16	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trans-1,3-dichloropropene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	520	75	<10	<10	<10	<10	<10	<10	<10
Cis-1,3-dichloropropene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	840	400	130	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Concentration, μg/L

* Possible inhouse contamination

\# Final effluent values are the mean of duplicate analyses.

South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201
Phone: (803) 758-5681

001

DHEC USE ONLY:
I.D.# _ _/_ _ _/_ _ _ _/_
Waste Code_ _ _ _

Instructions for completing this Form on reverse side.

HAZARDOUS WASTE INFORMATION

(1) Name of generator: American Color & Chemical Corporation

(2) Place of generation: Beaufort County, S.C.

(3) General description of hazardous waste, including process producing waste: Waste is sulfuric acid, varying in strength from 35-60% H_2SO_4. This acid is generated through chemical reactions in production of organic dye intermediates. Spent acid is isolated from product, collected and sold as neutralizing media for alkaline effluent streams.

(4) Description of the hazardous waste:
Sulfuric Acid, ranging in strength from 35-60% H_2SO_4

(5) Check the hazardous waste characteristics the waste exhibits as identified in Section C of the Emergency Hazardous Waste Regulation; or if the waste is listed as a hazardous waste, check "Listed"; or if the waste has been declared hazardous by the generator, check the hazardous waste characteristic(s) as identified in Section C of the Emergency Hazardous Waste Regulation the generator suspects the waste to exhibit.

- (a) Ignitable ☐
- (b) Corrosive ☒
- (c) Reactive ☐
- (d) Toxic ☐
- (e) Listed ☐

(6) Attach any information obtained from the testing of the waste performed to determine their hazard. If the generator declares the waste to be hazardous attach information on what basis the decision to declare the waste hazardous was made.
pH of material is ± 0.1

(7) Estimated amount of the waste produced per year in pounds (pounds/waste):
6,000,000 pounds/year

(8) Describe the method(s) by which this waste is currently being sold including the name and address of any facility to which the waste is being sent.
See attachment

(9) Certification: I hereby certify (or declare) that the information provided herein is complete and correct to the best of my knowledge. I understand that all information on this Form may be made available to the public except those portions entitled to confidentiality as provided by Section 6B of the South Carolina Hazardous Waste Management Act. I am authorized to sign official documents for the generator named in (1) above.

J. F. Jacobetz [signature] — Signature
J. F. Jacobetz, Dir. Env. Eng. — Name and Title
7/9/80 — Date

NOTE: Additional copies of this Form may be reproduced locally as needed.

DHEC 1-86(9/14/79)

South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201
Phone: (803) 758-5681

002

DHEC USE ONLY:
I.D.# _ / _ _ / _ _ _ / _
Waste Code _ _ _ _

Instructions for completing this form on reverse side.

HAZARDOUS WASTE INFORMATION

(1) Name of generator: American Color & Chemical Corporation

(2) Place of generation: Beaufort County, S.C.

(3) General description of hazardous waste, including process producing waste:

Waste lubricating oils from lubricating production equipment and transportation vehicles.

(4) Description of the hazardous waste:

Miscellaneous used oils from lubricating production equipment and transportation vehicles.

(5) Check the hazardous waste characteristics the waste exhibits as identified in Section C of the Emergency Hazardous Waste Regulation; or if the waste is listed as a hazardous waste, check "Listed"; or if the waste has been declared hazardous by the generator, check the hazardous waste characteristic(s) as identified in Section C of the Emergency Hazardous Waste Regulation the generator suspects the waste to exhibit.

(a) Ignitable ☐
(b) Corrosive ☐
(c) Reactive ☐
(d) Toxic ☐
(e) Listed ☒

(6) Attach any information obtained from the testing of the waste performed to determine their hazard. If the generator declares the waste to be hazardous attach information on what basis the decision to declare the waste hazardous was made.

(7) Estimated amount of the waste produced per year in pounds (pounds/waste):

2,000 pounds

(8) Describe the method(s) by which this waste is currently being treated, stored, or disposed, including the name and address of any facility to which the waste is being sent.

Oil presently being picked up by C&M Oil Industries; 1020 Wappoo Rd.; Charleston, S.C. 29406, for re-refinement.

(9) Certification: I hereby certify (or declare) that the information provided herein is complete and correct to the best of my knowledge. I understand that all information on this Form may be made available to the public except those portions entitled to confidentiality as provided by Section 6B of the South Carolina Hazardous Waste Management Act. I am authorized to sign official documents for the generator named in (1) above.

Signature	Name and Title	Date
Jeffrey Jacobetz	J. F. Jacobetz, Dir. Env. Engr.	7/9/80

NOTE: Additional copies of this Form may be reproduced locally as needed.

General Instructions

1. This Hazardous Waste Information Form is to be used when designated by the Department. A separate Form shall be completed for each hazardous waste.

2. All definitions contained in the Hazardous Waste Management Act (Section 44-56-10 et seq. of the 1976 S.C. Code of Laws) and the Emergency Hazardous Waste Regulation shall apply to this Form.

3. If a question arises as to how to complete a particular item of this Form or additional copies of this Form are needed, please contact the Solid Waste Management Division at the telephone number or address given on the front of this Form.

4. If additional space is needed to complete any item, attach a separate sheet to complete the item. Clearly identify on the separate sheet which item is being continued on that sheet.

5. Type or print in ink all items of this Form except the signature required in item (9), which must be signed in ink.

Specific Instructions

(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) A description of the hazardous waste handled by general type and specific contents using the best available information.
(5) Self-explanatory.
(6) Self-explanatory.
(7) Give estimated amount of the waste produced per year based upon the best available information. The generator may be required by the Department to produce information as to the basis of this estimation.
(8) Self-explanatory.
(9) Certification. An individual authorized to sign official documents for the organization or person identified in (1) shall enter his signature, name, title, and date. The signature shall be in ink.

South Carolina Department of Health
and Environmental Control
Solid Waste Management Division
2600 Bull Street
Columbia, SC 29201
Phone: (803) 758-5681

0011136

DHEC USE ONLY:
I.D.# __/__/____/

Instructions for completing this Form on reverse side.

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

A. General.

(1) Identification.

(a) Name of person or organization conducting hazardous waste activities: American Color & Chemical Corporation

(b) Mailing Address: P.O. Box 815
Lobeco, S.C. 29931

(c) Phone Number: 803-846-8171

(2) Principal technical contacts (Name(s), mailing address(es) and phone number(s)): John M. Meeks, Plant Manager, P.O. Box 815; Lobeco, S.C. 29931
Joseph F. Jacobetz, Director, Environmental Engineering,
P.O. Box 88, Lock Haven, Pa. 17745

(3) Types of hazardous waste activities person or organization conducts within the State: (Check all applicable boxes.)

(a) Generation of hazardous waste [X]

(b) Transportation of hazardous waste (other than on-site of generation or on-site of treatment, storage or disposal facility) [ ]

(c) Treatment, storage, or disposal of hazardous waste at a facility owned or operated by the person or organization [ ]

(4) Certification: I hereby certify (or declare) that the information provided herein is complete and correct to the best of my knowledge. I understand that all information on this form may be made available to the public unless otherwise noted as provided under (5) below. I am authorized to sign official documents for the organization or person identified in (1) (a) above.

Joseph F. Jacobetz	J. F. Jacobetz Dir. Environmental Engr.	7/9/80
Signature	Name and Title	Date

(5) Confidentiality.

Information reported to the Department in this Notification may be claimed as confidential, and therefore exempt from public disclosure under Section 6B of the South Carolina Hazardous Waste Management Act, which reads:

> Information obtained by the department under this chapter shall be available to the public, unless the department certifies such information as being proprietary. The department may make such certification where any person shows, to the satisfaction of the department, that the information, or parts thereof, if made public, would divulge methods, production rates, processes, or other confidential information entitled to protection. Nothing in this subsection shall be construed as limiting the disclosure of information by the department to any officer, employee or authorized representative of the State concerned with effecting this chapter, providing such person respects the proprietary nature of the information.

In order for information to be considered for confidentiality, the Department must be supplied with a detailed list of exactly what information is claimed as confidential and on what basis the claim of confidentiality is made, including facts and information to support such claim. Upon receiving such claim, the Department will make a determination as to whether or not the information is entitled to confidentiality. A determination by the Department that a portion of the Notification will be considered confidential does not serve as a determination that the entire Notification will be considered confidential.

(6) Warning: Section 12 of the Hazardous Waste Management Act provided for significant penalties for violations of the Act; the rules and regulations promulgated pursuant to the Act; or orders issued by the Board, Commissioner, or the Department. No hazardous waste as defined under Section C , shall be generated, stored, transported, or disposed within the State unless

General Instructions

(1) This Notification Form is to be used by all persons required to file a Notification Form with the Department by Section D of the Emergency Hazardous Waste Regulation.

(2) All definitions contained in the Hazardous Waste Management Act (Section 44-56-10 et seq. of the 1976 S.C. Code of Laws) and Section A of the Emergency Hazardous Waste Regulation shall apply to this Form.

(3) Generators of hazardous waste shall complete Parts A and B of this Form. A separate Notification Form shall be completed for each place of generation if the generator produces hazardous waste at more than one location within the State.

(4) Transporters of hazardous waste shall complete Parts A and C of this Form. A person who transports hazardous waste solely on the site of generation or solely on the site of a hazardous waste facility is not considered a transporter for this Notification.

(5) Owner(s)/Operator(s) of hazardous waste treatment, storage, or disposal facilities shall complete Parts A and D of this Form. A separate Notification Form shall be completed for each separate facility (if the owner/operator has more than one location within the State at which hazardous waste is treated, stored, or disposed.)

(6) If a question arises as to how to complete a particular item of this Form or additional copies of this Form are needed, please contact the Solid Waste Management Division at the telephone number or address given on the front of this Form.

(7) If additional space is needed to complete any item, attach a separate sheet to complete the item. Clearly identify on the separate sheet which item is being continued on that sheet.

(8) Type or print in ink all items of this Form except the signature in item A(4), which must be signed in ink.

Specific Instructions

A. General.
(1) Self-explanatory.
(2) Principal Technical Contacts. Enter the name, address, and telephone number of an individual or individuals whom the Department may contact for clarification of information submitted on this Form.
(3) Self-explanatory.
(4) Certification. An individual authorized to sign official documents for the organization or person identified in A(1)(a) shall enter his signature, name, title, and date. The signature shall be in ink.
(5) Self-explanatory.
(6) Self-explanatory.

B. Generator
(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) Give the county in which place of generation is located. If place of generation is located in more than one county, give the county in which the place of generation is primarily located.
(5) Self-explanatory.
(6) Types of hazardous waste(s) generated at location:
    (a) Ignitable waste - the waste meets the ignitable characteristics of Section C of the Emergency Hazardous Waste Regulation.
    (b) Corrosive waste - the waste meets the corrosive characteristics of Section C of the Emergency Hazardous Waste Regulation.
    (c) Reactive waste - the waste meets the reactive characteristics of Section C of the Emergency Hazardous Waste Regulation.
    (d) Toxic waste - the waste meets the toxic characteristics Section C of the Emergency Hazardous Waste Regulation.

notification of hazardous waste activity has been submitted to the Department according to the regulations promulgated under the Act.

B. Generator.

(1) Mailing address of place of generation: American Color & Chemical Corp.
P. O. Box 815, Lobeco, S.C. 29931

(2) Location of place of generation: S.C. Hiway 38, Lobeco, S.C.

(3) Phone number at place of generation: 803-846-8171

(4) County in which place of generation is located: Beaufort

(5) General Description of generator's operations at the location of generation: Plant is a manufacturer of organic chemical intermediates utilized principally in dye manufacture elsewhere. SIC 2865. The intermediates are produced in small batch sizes. Due to the cyclical nature of the dye business, where color preferences and demand levels change, the production schedule of organic chemical intermediates at the plant changes significantly from month to month.

(6) Types of hazardous waste(s) generated at location: (Check all applicable boxes.)

(a) Ignitable ☐
(b) Corrosive ☒
(c) Reactive ☐
(d) Toxic ☐
(e) Listed ☒

~~[illegible]~~ 6,000,000

(7) Estimated amount of hazardous waste generated at location annually in pounds (pounds/year): 6,000,000 pounds/year.

(8) For each hazardous waste produced at the location submit a completed Hazardous Waste Information Form (DHEC Form No. 1986).

C. Transporter.

(1) General description of kind of transportation transporter is engaged in: ______

(2) State and county in which the transporter has his principal place of business: ______ State ______ County

(3) Location, mailing address, and phone number of all terminals or other transportation facilities the transporter maintains within the State: ______

(4) Identification code(s) if transporter has previously been assigned a hazardous waste identification code by the Federal Environmental Protection Agency or any other state. Also include source of I.D. Code and by whom such codes were assigned: ______

(5) Interstate Commerce Commission Number or South Carolina Public Service Commission Number (state whether number is ICC or PSC): ______

(6) Types of hazardous wastes handled by the transporter: (Check all applicable boxes.)

(a) Ignitable ☐
(b) Corrosive ☐
(c) Reactive ☐
(d) Toxic ☐
(e) Listed ☐

DHEC 1987 (9/14/79)

(e) Listed waste - the waste is listed as a hazardous waste under Section C of the Emergency Hazardous Waste Regulation.
(7) Give estimated amount of hazardous waste producted per year at the location based upon the best available information. The generator may be required by the Department to produce information as to the basis of this estimation.
(8) Self-explanatory.

C. Transporter.
(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) Self-explanatory.
(5) If transporter has not been assigned either a ICC or PSC number, state "None".
(6) Types of hazardous wastes handled by the transporter:
(a) Ignitable waste - the waste meets the ignitable characteristics of Section C of the Emergency Hazardous Waste Regulation.
(b) Corrosive waste - the waste meets the corrosive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(c) Reactive waste - the waste meets the reactive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(d) Toxic waste - the waste meets the toxic characteristics of Section C of the Emergency Hazardous Waste Regulation.
(e) Listed waste - the waste is listed as a hazardous waste under Section C of the Emergency Hazardous Waste Regulation.
(7) Give estimated amount of hazardous waste transported by the transporter annually based upon the best available information. The transporter may be required by the Department to produce information as to the basis of this estimation.

D. Hazardous Waste Facilities.
(1) Self-explanatory.
(2) Self-explanatory.
(3) Self-explanatory.
(4) Self-explanatory.
(5) Give the county in which the facility is located. If the facility is located in more than one county give the county in which the facility is primarily located.
(6) Before answering this question, be sure to read the definitions of "treatment", "storage", and "disposal" contained in the Emergency Hazardous Waste Regulation.
(7) Self-explanatory.
(8) Types of hazardous wastes handled by facility:
(a) Ignitable waste - the waste meets the ignitable characteristics of Section C of the Emergency Hazardous Waste Regulation.
(b) Corrosive waste - the waste meets the corrosive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(c) Reactive waste - the waste meets the reactive characteristics of Section C of the Emergency Hazardous Waste Regulation.
(d) Toxic waste - the waste meets the toxic characteristics of Section C of the Emergency Hazardous Waste Regulation.
(e) Listed waste - the waste is listed as a hazardous waste under Section C of the Emergency Hazardous Waste Regulation.
(9) Give estimated amount of hazardous waste handled by the facility annually based upon the best available information. The generator may be required by the Department to produce information as to the basis of this estimation.

(7) Estimated amount of hazardous wastes handled annually by transporter in pounds (pounds/year): ____________

D. Hazardous Waste Facilities.

(1) Name of facility: ____________

(2) Mailing address of facility: ____________

(3) Location of facility: ____________

(4) Phone number of facility: ____________

(5) County in which facility is located: ____________

(6) Type of operations conducted at the facility: (Check all applicable boxes).

- (a) Treatment of hazardous waste ☐
- (b) Storage of hazardous waste ☐
- (c) Disposal of hazardous waste ☐

(7) Submit on a separate sheet of paper a description of the hazardous waste activities conducted at the facility.

(8) Types of hazardous wastes handled at the facility: (Check all applicable boxes.)

- (a) Ignitable ☐
- (b) Corrosive ☐
- (c) Reactive ☐
- (d) Toxic ☐
- (e) Listed ☐

(9) Estimated amount of hazardous waste treated, stored, or disposed annually at the facility in pounds (pounds/year): ____________

American Color & Chemical Corporation

South Carolina Highway #38
P. O. Box 815
Lobeco, S. C. 29931
Telephone (803) 846-8171

Andy

RECEIVED
APR 9 1980
INDUSTRIAL & AGRICULTURAL WASTEWATER DIVISION

April 7, 1980

District Director
Low Country District
S. C. Department of Health &
Environmental Control
149 Ribaut Square
Beaufort, South Carolina 29902

Attn: Mr. Marshall Dixon

Dear Mr. Dixon:

Enclosed herewith please find copies of analyses for heavy metals on effluent discharged from American Color & Chemical Corporation plant in Lobeco on February 21 and March 7, 1980. Also included in report for March 7, 1980, are analyses of waters taken from Campbell's Creek, both upstream and downstream, during the afternoon discharge on that date.

The samples taken March 7, 1980 are a portion of those samples which were split with your department. As indicated on the date of sampling, a copy of these analyses as determined by your department, would be appreciated.

Please feel free to call if there are questions on any of the above, of the material enclosed herewith.

Sincerely,

John M. Meeks
Plant Manager

JMM:jda

cc: Mr. J. F. Jacobetz - AC&CC - Lock Haven
Mr. F. Jordan - AC&CC - Charlotte
Mr. Bob Gross - SCDHEC - Columbia
Mr. Andy Yasinsac - SCDHEC - Columbia

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

DISCHARGE MONITORING REPORT

AMERICAN COLOR & CHEMICAL
MR J F JACOBETZ/DIR ENVIR SERV
AM COLOR & CHEM-PO BOX 38
LOCK HAVEN PA 17745

013 1 0131-1 F

NPDES NO.	PIPE NO.	REPORTING PERIOD (YR MO DA TO YR MO DA)
SC0000914	C01	80/ 12/01 TO 80 / 12/31

PARAMETER & NUMBER	MIN	AVG	MAX	UNITS		FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
FLOW	.050	.097	.215			1/1	CT		
50050	******	******	******	MGD		1/1	CT		
PH	7.1	7.3	7.5			1/1	GR		
00400	6	******	9	SU		1/1	GR		
	******	*******	*******	*****		*****	*****		
	******	*******	*******	*****		*****	*****		
FEC COLI	10	30	78			2/7	GR		
74055	******	200	400	#/100ml		2/7	GR		

PARAMETER & NUMBER		QUANTITY DA AVG	QUANTITY DA MAX		UNITS	CONCENTRATION DA AVG	CONCENTRATION DA MAX		UNITS	% R	FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
BOD	Reported	5.9	11.1			5.7	6.6				2/7	12		
50084	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
SUSP SOLID	Reported	19.8	33.7			23	35.6				2/7	24		
70299	Permit Cond.	333	500	******	#/DAY						2/7	24		
NH3	Reported	9.3	17.4			10.9	12.8				2/7	12		
00610	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
UOD	Reported	55.4	95											
90029	Permit Cond.	******	600	******	#/DAY									
FTC	Reported													
61406	Permit Cond.					******	RR	******	MG/L			CT		
LEAD	Reported			.05				0.62			1/30	CT		
01051	Permit Cond.	NOTE: Plant Shutdown 12/20/80-12/28/80							MG/L					

Name of Principal Executive Officer / Title of Officer	Year	Mo	Day
Jacobetz, Joseph F. Director, Environmental Services	81	01	15

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief such information is true, complete, and accurate.

Signature of Principal Executive Officer or Authorized Agent

NPDES FORM 1977-1

SOUTH CAROLINA DEP...

DISCHARGE MONITORING REPORT

PAGE 1

AMERICAN COLOR & CHEMICAL
MR J F JACOBETZ/DIR ENVIR SERV
AM COLOR & CHEM-PO BOX 88
LOCK HAVEN PA 17745

013 1 0131-1 F

NPDES NO.	PIPE NO.	REPORTING PERIOD
SC0000914	C01	YR MO DA 80/11/01 TO YR MO DA 80/11/30

PARAMETER & NUMBER	MIN	AVG	MAX	UNITS		FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
FLOW	.066	.084	.092			1/1	CT		
50050	******	******	******	MGD		1/1	CT		
PH	6.5	6.7	7.0			1/1	GR		
00400	6	******	9	SU		1/1	GR		
	******	******	******	*****		*****	*****		
	******	******	******	*****		*****	*****		
FEC COLI	20	94	295			2/7	GR		
74055	******	200	400	#/100ml		2/7	GR		

PARAMETER & NUMBER		QUANTITY DA AVG	QUANTITY DA MAX		UNITS	CONCENTRATION DA AVG	CONCENTRATION DA MAX		UNITS	% R	FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
BOD	Reported	3.7	5.2			5.2	6.8				2/7	12		
50084	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
SUSP SOLID	Reported	12.4	15.4			17.6	20				2/7	24		
70299	Permit Cond.	333	500	******	#/DAY						2/7	24		
NH3	Reported	3.1	4.2			4.4	5.5				2/7	12		
[illegible]10	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
UOD	Reported	19.5	25.1											
90029	Permit Cond.	******	600	******	#/DAY									
FTC	Reported													
01406	Permit Cond.					******	RR	******	MG/L			CT		
LEAD	Reported	Below detectable limits of Instrument		N/A				< .5			1/30	CT		
01051	Permit Cond.								MG/L					

Name of Principal Executive Officer	Title of Officer	Year	Mo	Day
Jacobetz, Joseph F.	Director, Environmental Services	81	01	15

Last First

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief such information is true, complete, and accurate.

Joseph F. Jacobetz

Signature of Principal Executive Officer or Authorized Agent

NPDES FORM 1977-1

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

DISCHARGE MONITORING REPORT

AMERICAN COLOR & CHEMICAL
MR J F JACOBETZ/DIR ENVIR SERV
AM COLOR & CHEM-PO BOX 88
LOCK HAVEN PA 17745

013 1 0131-1 F

NPDES NO.	PIPE NO.	REPORTING PERIOD YR MO DA TO YR MO DA
SC0000914	001	80/10/01 TO 80/10/31

PARAMETER & NUMBER	MIN	AVG	MAX	UNITS		FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
FLOW	.068	.089	.112			1/1	CT		
50050	******	******	******	MGD		1/1	CT		
PH	6.6	6.8	7.2			1/1	GR		
00400	6	******	9	SU		1/1	GR		
	******	******	******	*****		*****	*****		
	******	******	******	*****		*****	*****		
FEC COLI	50	156	295			2/7	GR		
74055	******	200	400	#/100ml		2/7	GR		

PARAMETER & NUMBER		QUANTITY DA AVG	DA MAX		UNITS	CONCENTRATION DA AVG	DA MAX		UNITS	% R	FREQ. OF ANAL.	SAMPLE TYPE	NO EX	C
BOD	Reported	9.9	32.8			10.6	35.1				2/7	12		
50084	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
SUSP SOLID	Reported	13.7	32.7			17.8	35				2/7	24		
70299	Permit Cond.	333	500	******	#/DAY						2/7	24		
NH3	Reported	2.4	3.3			3.3	4.2				2/7	12		
71-10	Permit Cond.				#/DAY	******	RR	******	MG/L		2/7	12		
UOD	Reported	25.7	59.6											
90029	Permit Cond.	******	600	******	#/DAY									
FTC	Reported													
71406	Permit Cond.					******	RR	******	MG/L			CT		
LEAD	Reported			.09				1.2			1/30	CT NRRN		
01051	Permit Cond.				#/DAY				MG/L					

BUREAU OF WASTEWATER & STREAM QUALITY CONTROL

Name of Principal Executive Officer	Title of Officer	Year	Mo	Day
Jacobetz, Joseph F. (Last, First)	Director, Environmental Services	81	01	15

I certify that I am familiar with the information contained in this report and that to the best of my knowledge and belief such information is true, complete, and accurate.

Joseph F. Jacobetz

Signature of Principal Executive Officer or Authorized Agent

NPDES FORM 1977-1

Sheet No. ______

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

EQC District Laboratory Report Form for Stream and Facility Data

STREAM: Primary ( ) Secondary ( ) COUNTY Beaufort

Facility Amer. Color & Chem Type ______ Samples Split EPA (1) Owner(2) None(3)

NPDES No: SC0000914 Receiving Stream Whale Branch Basin ______

DATE: From 80 5 29 (Yr Mo Day) To 80 5 30 (Yr Mo Day) Collector Williams Weather Code: Fair 01, Clear 00, Cloudy 02, Rain 22

		Reg	Bact	F.T.	Phenol				
Sample (Sta. No.)		001	001	001	001	-	-	-	-
Lab No. CH		2808	2809	~~2810~~	2810				
Time Collected	In	1350							
(Military)	Out	1340	1340	1340	1340				
SAMPLE TYPE		Gr.	Gr	Gr	Gr.				
Weather	00041	00	00						
Air Temp. (°C)	00021								
% From RB	00002								
Depth (ft)	72015								
Tape Down/Staff Gage(ft)									
Field pH	00400			7.0					
Field D.O. (mg/l)	00300								
Temp. (°C), Water	00010			20					
Chlorine, Tot. Res. (mg/l)	50060								
Salinity (ppth)	00480								
Conductivity	00094								
Flow, Stream (cfs)	00061								
Flow, Facility (MGD)	50050								
Lab pH	00403								
Phth Alk(mg/l)(pH 8.3)	00415								
Tot. Alk(mg/l)(pH 4.5)	00410								
Color (c.u.)	00080								
Turbidity (NTU)	00076								
BOD_5 (mg/l)	00310	8.6							
COD(mg/l)-Low(5-50)	00335								
COD(mg/l)-High(15-2000)	00340	610							
Residue Set. (ml/l)	50086								
Residue Sus. (mg/l)	00530	62							
Residue Total (mg/l)	00500								
Fecal Coli/100ml (MFC)	31616								
Fecal Coli/100ml (MPN)	31615		9						
Phenols (µg/l)	32730				190				
Oil & Grease (mg/l)	00556								
Cyanide (mg/l)	00720								
Metals / Nutrients / Pesticides / TOC	(✓) If Req.	✓		✓					

Comments ______

Samples Received By W. Jennings Date Received 5-30-80

Data Released By WJB Verified By WJB Release Date 6-6-80

EQC/ASD:21 White-Central Office; Canary & Pink-District Lab

Sheet No. ____________

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

EQC District Laboratory Report Form for Stream and Facility Data

STREAM: Primary ( ) Secondary ( ) COUNTY Beaufort

Facility Aver Color Plant Type ____ Samples Split EPA (1) Owner(2) None(3)

NPDES No: SC0000914 Receiving Stream Whale Branch Basin Marine

DATE: From 80 5 28 (Yr Mo Day) To 80 5 29 (Yr Mo Day) Collector M. Williams Weather Code: Fair 01, Clear 00, Cloudy 02, Rain 22

		Inf	Comp.	Fin					
Sample (Sta. No.)		001	001	001	-	-	-	-	-
Lab No.	iH-	2780	2781						
Time Collected (Military) In	In	1410							
Time Collected (Military) Out	Out	1350	1356	1350					
SAMPLE TYPE		Comp.	Gr	Gr					
Weather	00041	00	00	00					
Air Temp. (°C)	00021								
% From RB	00002								
Depth (ft)	72015								
Tape Down/Staff Gage(ft)									
Field pH	00400			7.0					
Field D.O. (mg/l)	00300								
Temp. (°C), Water	00010			21.0					
Chlorine, Tot. Res. (mg/l)	50060								
Salinity (ppth)	00480								
Conductivity	00094								
Flow, Stream (cfs)	00061								
Flow, Facility (MGD)	50050								
Lab pH	00403								
Phth Alk(mg/l)(pH 8.3)	00415								
Tot. Alk(mg/l)(pH 4.5)	00410								
Color (c.u.)	00080								
Turbidity (NTU)	00076								
BOD_5 (mg/l)	00310	14							
COD(mg/l)-Low(5-50)	00335								
COD(mg/l)-High(15-2000)	00340	560							
Residue Set. (ml/l)	50086								
Residue Sus. (mg/l)	00530	50							
Residue Total (mg/l)	00500								
Fecal Coli/100ml (MFC)	31616								
Fecal Coli/100ml (MPN)	31615		33						
Phenols (µg/l)	32730								
Oil & Grease (mg/l)	00556								
Cyanide (mg/l)	00720								
Metals / Nutrients / Pesticides / TOC	(✓) If Req.	✓							

Comments [illegible]

Samples Received By W. Jennings Date Received 5-29-80

Data Released By WRF Verified By WRF Release Date 6-6-80

EQC/ASD:21 White-Central Office; Canary & Pink-District Lab

CA NA NTI NTR Sheet No.

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Bureau of Field and Analytical Services
Analytical Services Data Sheet for Streams and Wastewater

Facility Amer Color & Chem Type ______ County Beaufort

Permit No. SC0000914 Receiving Stream Whale Branch Basin ______

Date 5-30-80 Collected By Williams District Chas

Pipe No.														
Station No.			001											
Lab No. CH-			2811											
Time Collected														
NH_3-N, mg/l	00610	X	*											
NO_3/NO_2-N, mg/l	00630													
TKN, mg/l	00625													
T-Ortho-P, mg/l	70507													
T-P, mg/l	00665													
Cl mg/l	00940													
SO_4 mg/l	00945													
As ug/l	01002													
Cd ug/l	01027													
Cr ug/l	01034													
Cu ug/l	01042													
Fe ug/l	01045													
Pb ug/l	01051													
Mg mg/l	00927													
Mn ug/l	01055													
Hg ug/l	71900	X	0.5											
Ni ug/l	01067													
Zn ug/l	01092													
Pesticides	74053													
TOC mg/l	00680													

An "X" in the small column indicates test required. Rcvd 5-30-80, W. Janning

Date Released from Regional Laboratory 6-2-80 By W. Janning

Received in Central Laboratory By FCC Date Received 6-3-80

Date Released from Analytical Services Central Laboratory 6/20/80

Released By CKahn

* lab error

BF&AS:49

Sheet No.

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Bureau of Field and Analytical Services
Analytical Services Data Sheet for Streams and Wastewater

Facility Amer. Colors & Chem. Type County Beaufort
Permit No. SC0000914 Receiving Stream Whale Branch Basin Marine
Date 5-29-80 Collected By M. Williams District Charleston

Pipe No.										
Station No.			001							
Lab No. CH			2782							
Time Collected			1350							
NH_3-N, mg/l	00610		☆							
NO_3/NO_2-N, mg/l	00630									
TKN, mg/l	00625									
T-Ortho-P, mg/l	70507									
T-P, mg/l	00665									
Cl mg/l	00940									
SO_4 mg/l	00945									
As ug/l	01002									
Cd ug/l	01027									
Cr ug/l	01034									
Cu ug/l	01042									
Fe ug/l	01045									
Pb ug/l	01051									
Mg mg/l	00927									
Mn ug/l	01055									
Hg ug/l	71900									
Ni ug/l	01067									
Zn ug/l	01092									
Pesticides	74053									
TOC mg/l	00680									

An "X" in the small column indicates test required. Rcvd 5-29-80, W. Jennings

Date Released from Regional Laboratory 6-2-80 By W. Jennings

Received in Central Laboratory By [illegible] Date Received 6-3-80

Date Released from Analytical Services Central Laboratory 6/26/80

Released By C. Kohler

☆ lab error

BF&AS:49

DAVIS AND FLOYD ENGINEERS, INC
ENVIRONMENTAL SERVICES DIVISION
POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA

LABORATORY ANALYSIS

FOR: AMERICAN COLOR/CHEMICAL
LOCATION: LOBECO S. C.
JOB NUMBER: 2200-6

SAMPLE DATE: 3-~~14~~ 7-80
REPORT DATE: 3-27-80

PARAMETER	A	B	C
CADMIUM(TOTAL)	.013	.011	.011
CHROMIUM(TOTAL)	.090	.030	.050
COPPER(TOTAL)	.060	.040	.030
IRON (TOTAL)	16.200	2.520	1.460
LEAD(TOTAL)	.460	.170	.150
MANGANESE(TOTAL)	.180	.100	.120
MAGNESIUM(TOTAL)	9.100	527.000	468.000
MERCURY(TOTAL)	.500	<0.2	<0.2
NICKEL(TOTAL)	.240	.090	.100
ZINC	.135	.035	.027

SAMPLE A IS EFFLUENT DISCHARGE
SAMPLE B IS DOWNSTREAM
SAMPLE C IS UPSTREAM

NOTES:
1. ALL ANALYSES ARE IN MG/L UNLESS OTHERWISE NOTED.
2. MERCURY IS GIVEN IN MICROGRAMS/LITER
3. FOR ANALYSES HAVING THE LESS THEN (<) NOTATION THE VALUE PRESENTED IS THE LOWER LIMIT OF DETECTION FOR THE METHOD AND/OR INSTRUMENT.

SAMPLED BY ACCC

ANALYSIS BY MPG

CHECKED BY John H. McCord Jr.
JOHN H. MCCORD JR.

APPROVED BY E. Carl Burrell Jr.
E. CARL BURRELL JR.

DAVIS AND FLOYD ENGINEERS, INC.
ENVIRONMENTAL SERVICES DIVISION
POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA

LABORATORY ANALYSIS

FOR: AMERICAN COLOR/CHEMICAL
LOCATION: LOBECO S. C.
JOB NUMBER: 2200-6

SAMPLE DATE: 2-~~27~~ 21-80
REPORT DATE: 3-27-80

PARAMETER	A
CADMIUM (TOTAL)	.007
CHROMIUM (TOTAL)	.050
COPPER (TOTAL)	.050
IRON (TOTAL)	13.200
LEAD (TOTAL)	.160
MANGANESE (TOTAL)	.140
MAGNESIUM (TOTAL)	9.300
MERCURY (TOTAL)	.300
NICKEL (TOTAL)	.120
ZINC	.101

SAMPLE A IS COMPOSITE DISCHARGE SAMPLE

NOTES:

1. ALL ANALYSES ARE IN MG/L UNLESS OTHERWISE NOTED.
2. MERCURY IS GIVEN IN MICROGRAMS/LITER

SAMPLED BY ACCC

ANALYSIS BY MPG

CHECKED BY John H. McCord Jr.
JOHN H. MCCORD JR.

APPROVED BY E. Carl Burrell Jr.
E. CARL BURRELL JR.

Table 1. Metals Data

Element	Concentration, μg/L ISCO Blanks 6173	6174	6175	Composite Samples Raw Water 6173	Mixed Influent 6174	Final Effluent 6175
Antimony	<10	<10	<10	<10	AI	AI
Arsenic	<10	<10	<10	<10	105	61
Beryllium	<5	<5	<5	<5	<5	<5
Cadmium	<1	<1	<1	1	1	1
Chromium	<10	<10	10	<10	124	36
Copper	<5	<5	<5	<5	72	102
Lead	<5	<5	15	<5	17	250
Mercury	<1.0	<1.0	<1.0	<1.0	1.0	<1.0
Nickel	<10	<10	<10	<10	110	84
Selenium	<5	<5	<5	<5	84	77
Silver	<1	<1	<1	<1	<2	<2
Thallium	<3	<3	<3	<3	<10	<10
Zinc	53	<5	799	<5	109	85

AI = Analytical Interferences; determination not possible under these conditions.

Table 2. Metals Spike Recovery Data*

Element	Spike Recovery, % Mixed Influent 6174	Final Effluent 6175
Antimony	29	33
Arsenic	81	79
Beryllium	77	73
Cadmium	82	90
Chromium	102	92
Copper	93	94
Lead	108	62
Mercury	83	95
Nickel	100	103
Selenium	93	66
Silver	100	93
Thallium	30	41
Zinc	-	-

* = Method of additions spikes

\- = Not spiked

Table 3. Purgeable Organics Data

Compound	Raw Water, 6173 Not Preserved			Mixed Influent, 6174 Not Preserved			Final Effluent, 6175 Not Preserved			Final Effluent, 6175 Preserved		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1#	Day 2	Day 3	Day 1	Day 2	Day 3
Methylene chloride*	10	70	68	80	92	72	54	64	56	68	63	60
1,1-Dichlorcethylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trans-1,2-dichloroethylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroform	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<10	<10	<10	180	16	<10	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trans-1,3-dichloropropene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Trichloroethylene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibromochloromethane	<10	<10	<10	520	75	<10	<10	<10	<10	<10	<10	<10
Cis-1,3-dichloropropene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	840	400	130	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Toluene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chlorobenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Concentration, µg/L

* Possible inhouse contamination

\# Final effluent values are the mean of duplicate analyses.

Toxicity Tests
American Color and Chemical Corporation
Lobeco, South Carolina

Investigation

During January 7-14, 1977, W. H. Peltier and D. R. Smith, U. S. Environmental Protection Agency (EPA) conducted toxicity tests on wastewater being discharged by the subject plant into Campbell's Creek. Investigators were met by Mr. Barry Page, Plant Manager, who provided the necessary assistance in locating the mobile trailer adjacent to the wastewater outfall.

Plant Operation

American Colors was operating approximately Monday through Saturday noon with the resultant wastewater flowing to a retention lagoon. Wastewater was discharged for a four-hour period during each insuing outgoing tide.

The wastewater discharge times and volumes during the test were provided by Mr. Page and are as follows:

Date	Start Discharge	End Discharge	Volume (Gallons)
1/11	1:25 pm	5:35 pm	204,750
1/12	2:05 am	6:00 am	197,400
1/12	2:40 pm	6:25 pm	198,450
1/13	3:00 am	7:15 am	227,588
1/13	4:30 pm	7:35 pm	151,515
1/14	4:10 am	8:15 am	205,800

Toxicity Methods and Test Organisms

The publication "Methods for Acute Toxicity Tests for Fish, Macroinvertebrates, and Amphibians," EPA Ecological Research Series (EPA-660/3-75-009), was used as a guide in conducting the test. Results of the test are reported as an LC50 value, which is defined as the concentration at which 50 percent of the test organisms die. For this study, the value was determined by using the probit analysis. The following information is provided on the test organisms used in the 96-hour flow-through toxicity test: (1) sheepshead minnow (Cyprinodon variegatus) approximately 7 days old and 10mm in length, (2) mysid shrimp (Mysidopsis) adult stage, and grass shrimp (Palaemonetes pugio) adult stage.

During the test the cycling time of the diluter system was approximately 5 minutes, which provided a complete volume change in the test aquaria every 1 hour and 15 minutes.

Sampling Procedure

Wastewater was pumped continuously to the diluter system from the wastewater retention basin. Grab samples for chemical analyses were collected periodically from the 100 percent wastewater and dilution water. Dilution water was collected daily by grab method from Whale Branch on the south side of U. S. Highway 21.

Results

Data from Table 1 was used to calculate the LC50 value for the Sheepshead minnow. This value was as follows:

Sheepshead minnow 96 hr LC50 8.5 percent

The LC50 value for mysid shrimp could not be calculated due to 100 percent mortality in the lowest test concentration of 5.6% at the end of 96 hours exposure.

Chemical analyses of dilution water and 100 percent wastewater resulted in metal concentrations as follows:

Date	% Wastewater	Zn ug/ℓ	Cu ug/ℓ	Cr ug/ℓ	Cd ug/ℓ	Pb ug/ℓ
1/12	0	42	40	<50	12	152
1/12	100	156	203	<50	23	249
1/13	100	75	79	<50	10	50
1/14	100	28	87	<50	<10	50
1/14	0	52	29	<50	20	158

Organic scan analyses resulted in the identification and quantification of 20 compounds (Table 2). Of the 20 compounds, "six" are on the NRDC concent decree priority pollutants list. Only tribromomethane (59 ug/ℓ) and Norbutoxy ethanol (6.8 ug/ℓ) were tentatively identified and quantified as being in the diluter water.

TABLE 1

Percent Wastewater Volume, Number of Sheepshead Minnows and Live Mysid Shrimp, and Other Parameters as Recorded During the 96-hour Acute Flow-Through Toxicity Study at American Colors, Lobeco, SC January 7-14, 1977.

% Wastewater	No. of Live Minnows 0 hr	24 hr	48 hr	72 hr	96 hr	No. of Live Mysid Shrimp 0 hr	24 hr	48 hr	72 hr	96 hr	Dissolved Oxygen mg/l 0 hr	24 hr	48 hr	72 hr	96 hr	pH 0 hr	24 hr	48 hr	72 hr	96 hr	Total Alkalinity (mg/l $CaCO_3$) 0 hr	24 hr	48 hr	72 hr	96 hr	Salinity 0 hr	24 hr	48 hr	72 hr	96 hr
0.0	30	30	30	30	28	25	25	25	25	25	9.4	10.2	9.7	10.4	9.5	7.6		7.6	7.6	7.4	56		58	59	62	14	14	13	12	
0.0	30	30	30	30	30	25	25	25	24	24	9.4	10.2	9.5	10.4	9.3	7.6	7.7	7.6		7.4	56	61	59		61	14	14	13	12	
5.6	30	30	30	30	26	25	23	19	18	0	9.3	9.8	9.1	8.7	4.3	6.9		7.3	7.3	7.1	51		66	78	75	14	15	12	11	
5.6	30	30	28	27	19	25	24	17	14	0	9.2	9.9	9.0	8.8	4.3	6.9	7.7	7.3		7.2	51	117	66		75	14	15	12	11	
10.0	30	30	28	27	19	25	12	2	1	0	9.2	9.6	8.8	8.9	4.9	6.7		7.1	7.2	7.1	48		77	79	85	12	16	12	10	
10.0	30	30	20	11	7	25	11	2	1	1	9.2	9.2	8.6	9.8	5.5	6.7	7.7	7.1		7.2	48	157	77		85	12	16	12	10	
18.0	30	29	2	2	1	25	1	0	-	-	9.1	9.5	8.6	9.6	7.3	6.3		7.0	7.2	7.5	43		89	91	95	12	16	12	10	
18.0	30	28	0	-	-	25	1	0	-	-	9.0	9.2	9.4	-	-	6.3	7.7	7.0		7.5	43	250	89		95	12	16	12	10	
32.0	30	2	0	-	-	25	0	-	-	-	8.8	8.2	8.8	-	-	5.8		6.8	7.1	7.7	33		115	135	140	10	17	12	9	
32.0	30	11	0	-	-	25	-	-	-	-	8.7	8.2	8.8	-	-	5.8	7.7	6.8		7.7	33	295	115		140	10	17	12	9	
56.0	30	0	-	-	-	25	0	-	-	-	8.2	6.5	-	-	-	4.9		6.5	7.1	7.8	12		176	175	175	5	20	10	8	
56.0	30	0	-	-	-	25	0	-	-	-	8.2	6.2	-	-	-	4.9	7.8	6.5		7.8	12	503	176		175	6	20	10	8	

TABLE !

Organic Compounds Identified and Quantified from a 100 percent Wastewater Sample collected by Grab Method on January 14, 1977 during Toxicity Test at American Colors, Tobeco, South Carolina

Dibromochloromethane 2/	18
Dibromoethane 1/	8.5
Tribromomethane 2/	59
Tetramethylbutane 1/	13
Toluene 2/	1.0
Chloroaniline	56
Anthraquinone	58
Acetone	1.6
Tetrahydrofuran	1.0
2-Butanone	1.0
Dibromonethane 1/	1.0
1, 4-Dioxane	1.2
Bromodichloromethane 2/	4.2
Tricholorethylene 1/, 2/	1.9
Aminoanthraquinone	8.0
Norbutoxyethanol 1/	17.0
Toluidine	200.0
Aniline	12.0
Methyl 10-heptadecanoate 1/	19.0
Dimethylphahalate 2/	

1/ Tentative identification

2/ ON NRDC concent decree priority pollutants list.

Not for Publ Info. until final report is releas

Venture File

3. CONCLUSIONS

1. Sixty-six (66) different organic chemical compounds were detected in oyster tissue, sediment and effluent during this assessment. A toal of 71 compounds were actually detected but five of these were found in both oyster tissue and sediment. Thirty-four compounds (27 aliphatics and seven aromatics) were detected in oyster tissue; 29 compounds (13 aliphatics and 16 aromatics) were detected in sediment; and, eight compounds (one aliphatic and seven aromatics) were detected in the effluent. Due to the nature of these compounds, their often intimate use in organic synthesis/dye production reaction and their occurrence/distribution pattern over the assessment area, the source of the vast majority of these constituents was determined to be the Venture Chemicals C ompany wastewater treatment facility effluent. These compounds reflected only those that were recovered in the analytical procedure employed and did not preclude the existence of ~~the~~ other chemical constituents in sediment, tissue or effluent.
2. Several of the compounds detected as noted in Conclusion No. 1 would be expected to exert some toxic or narcotic effects on a portion or all of the biological community in Campbell Creek. The occurrence of benzene, toluene, chlorinated benzenes, chlorinted phenols and other hydrocarbon compounds presented the potential for potent toxicological responses in the aquatic biological community. Likewise, some of the compounds detected are considered definite (benzene) or likely (chloroform) carcinogens. Compounds closely related but not structurally equivalent to other such potential/likely carcinogens were also detected in the assessment area. The ultimate significance of the presence of these known/likely carcinogens is not known at this time given the disparity between the animal systems used for

carcinogenicity testing and those of the estuarine environment and, also, duet to the lack of analytical quantitative data for most of these compounds. Nevertheless, the detection of these constituent, as well as the otherwise myriad of compounds is certainly basis fro concern.

3. The expected toxicological effects due to the mixture of synthetic organic chemicals was, in fact, manifested in the macroinvertebrate community in Campbell Creek. The community structure of both the hard substrate and soft substrate fauna in Campbell Creek had been deleteriously altered relative to other stations in the assessment area. A significant reduction in the numbers of decapod crustaceans and concomitant increase in numbers of other organisms filling this vacated niche reflected the perturbation of the aquatic community in Campbell Creek.

4. Fewer total numbers of oysters were observed in Campbell Creek relative to other stations in the assessment area. Perhaps more important, however, was the identification of significantly ($p<.05$) fewer juvenile ($\leq$11mm) oysters in Campbell Creek than at any of the other assessment stations. Whether those adult oysters currently present in Campbell Creek have been inhibited from or otherwise impacted to preclude spawning by the constituents in the wastewater or whether spawning has occurred and the resultant larvae have experienced lethal toxicity due to those constituents was not determined during this assessment. Nevertheless, it was apparent that moderate to severe impact had occurred in the aquatic macroinvertebrate community in Campbell Creek due to the discharge of wastewater from the Venture Chemicals Company wastewater treatment facility.

5. The biological degradation and apparent toxic effects of the wastewater was essentially limited to Campbell Creek and did not extend into Whale Branch. The satisfactory number of both juvenile and adult oysters at those stations

outside of Campbell Creek indicated ongoing spawning activities and general healthy functioning of the system. With an apparent satisfactory level of spawning ongoing in Whale Branch, some amount of larval recruitment into Campbell Creek would be reasonably expected. The aforementioned diminution of juvenile oysters in Campbell Creek even with reasonable expectation of larval recruitment from outside areas would suggest that constituents discharged to Campbell Creek from the wastewater treatment facility did, in fact, exert toxic effects on the oyster community there.

6. There was no significant accumulations of polynuclear aromatic hydrocarbons in either oyster tissue or sediment at any of the stations in the assessment area. The few compounds detected and the low levels at which they were measured actually indicated by comparison the significance of the occurrence/concentration of these compounds recently found around three marinas in Beaufort County and one marina in Georgetown County.
7. There was no significant accumulation of selected heavy metals in either oyster tissue or sediment at any of the stations in the assessment area. All discrete concentrations in oyster tissue were within the respective ranges observed in other South Carolina oysters. There was no significant differencies ($p>.05$) between the mean concentrations for any of the metals at all stations.
8. There were no contraventions of the Class SA quality standards for dissolved oxygen, pH and temperature in the assessment area. A limited amount of fecal coliform bacteria data from oyster tissue indicated potential violations of the State shellfish standards at some points in the assessment area although these could not be related directly to the presence of the Venture Chemical Company wastewater treatment facility discharge. There was some evidence of alteration in the bacteriological composition of Campbell Creek due to the discharge of wastewater and was apparently related to the

intermittent chlorination procedure employed at the facility, the nature of the influent waste stream/treatment process and the use of fecal coliform bacteria as the indicator organism group for this effluent instead of total coliform bacteria.

9. As noted in Conclusion No. 8, the bacteriological indicator group of choice to be used as an NPDES permit limit for the treatment facility would be the total coliform bacteria group (significantly, 70/100 ml) since the effluent does go to Class SA shellfishing waters. These waters employ total coliform bacteria are retained as the indicator group for permit compliance, the absolute maximum allowable limit should be reduced to 14/100 ml to coincide with the Federal criterion for quality shellfishing waters. In addition, the chosen bacteriological limit should be incorporated into the second phase of the NPDES permit. Currently, when the second phase of the permit becomes effective (i.e., when effluent flow increases beyond 180,000 gallons per day), there is no effluent limitation on bacteria.

10. There is an inconsistency in terminology in the NPDES permit as related to the definition of tidal cycle such that the ultimate oxygen demand cannot be calculated accurately. The ultimate oxygen demand permit specification requires that this parameter be reported in pounds per tidal cycle and is computed from the measured biochemical oxygen demand and ammonia nitrogen loadings. The sample type requirement for these two measured parameters is set at one to 12 hour composite sample. Since this facility discharges only on ebbing tide and since the complete exchange from ebb slack to ebb slack tide constitutes a tidal cycle; 12 hour composite sample could result in two different situations. In one instance, sampling could be conducted for 12 consecutive hours even though the discharge of wastewater occurred for only six of those hours with no sample being collected over the other six hours. Conversely, if two consecutive discharges are sampled, this would constitute two different

tidal cycles and, therefore, the ultimate oxygen demand level would not be reported correctly as per the permit requirements. A six hour composite sample under the sample type requirement would correct this monitoring/data reporting problem.

11. There were no apparent violations of the NPDES permit conditions as a result of the compliance sampling inspection during this assessment period. Even though the facility was sampled according to permit requirements, the ultimate oxygen demand could not be accurately computed or reported as per Conclusion No. 10.

12. Given the specialty chemical nature of the Venture Chemicals Company manufacturing process and the concomitant variations in the influent waste stream characteristics, it is questionable as to whether the biological treatment process can be expected to efficiently and consistently treat the raw waste. While biological systems are not automatically discounted for treating specific and consistent synthetic organic chemical wastes. The wide variations in the influent waste characteristics does not allow for the biological flora to become acclimated to the waste stream such that consistently efficient treatment is obtained.

13. Given the highly synthetic organic chemical nature of the wastewater which appears usually to contain a significant portion of aromatic compounds, disinfection of the effluent by chlorination must be examined carefully. The chlorination, or halogenation, of the effluent may, in some cases, actually increase the toxicity of some of the chemical constituents. Moreover, the discharge of chlorine containing effluent to estuarine waters itself presents the potential for toxicity to aquatic macroinvertebrates. This is but another aspect to the problem of the suitability of estuarine waters such as Campbell Creek to receive and assimulate such complex, synthetic organic chemical wastes as discharged from the Venture Chemicals Company.

WATER USAGE DATA - VENTURE CHEMICAL (DATA SUPPLIED BY SCWRC

	WELL # 2766-g2	WELL # 2766-g5	TOTAL
1983			
JAN.	2.396 MG	2.272 MG	4.668 MG
FEB.	2.529 MG	2.272 MG	4.801 MG
MAR.	2.883 MG	2.603 MG	5.486 MG
APR.	1.073 MG	1.207 MG	2.280 MG
MAY	2.378 MG	3.443 MG	5.821 MG
JUN	2.364 MG	3.799 MG	6.163 MG
JUL	2.690 MG	2.430 MG	5.120 MG
AUG.	3.110 MG	3.730 MG	6.840 MG
SEP	1.090 MG	1.570 MG	2.660 MG
OCT	0	6.420 MG	6.420 MG
NOV	0.660 MG	5.340 MG	6.000 MG
DEC	1.980 MG	6.200 MG	8.180 MG
1984			
JAN	3.590 MG	5.095	8.685 MG
FEB	3.187 MG	3.053	6.240 MG
MAR	4.040 MG	4.692	8.732 MG

NOTE: THESE FIGURES DO NOT INCLUDE WATER FOR PUBLIC SUPPLY
1983 TOTAL USAGE = 64.44 MG = 5.37 MG/MONTH = 256,000 GPD (21 WORKDAYS)
1984 (1ST QUARTER USAGE) = 23.66 MG = 7.89 MG/MONTH = 376,000 GPD (")

WHILE NOT TRYING TO SAY THAT WATER USAGE EQUALS DISCHARGE FLOWS, THESE NUMBERS TRANSLATE TO AN APPROXIMATE 50 % INCREASE IN WATER USAGE. DISCHARGE FLOWS SHOULD BE ROUGHLY PROPORTIONAL AND IMPACT CAN BE ASSUMED TO BE INCREASED, CONSEQUENTIALLY.

ME/ADDRESS (Include
Location if different)
LOBECO PRODUCTS INC
LOBECO PROD-PO BOX 815
LOBECO SC 29931

FACILITY LOBECO PRODUCTS INC
LOCATION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

(2-16)	(17-19)
SC0000914	001
PERMIT NUMBER	DISCHARGE NUMBER

M 13 LC 07/01/85 F

Form Approved
OMB No. 2040-0004
Expires 2-29-84

	MONITORING PERIOD					
	YEAR	MO	DAY		YEAR	MO	DAY
FROM	89	06	01	TO	89	06	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
00310 LAB ID:07554 BOD 5 Day - MG/L	SAMPLE MEASUREMENT		40	LBS/			55.4		0	02/07	MLOC-
	PERMIT REQUIREMENT		RR	XXXX TIDE			120	MG/L		02/07	12
004 1 LAB ID:07554 pH	SAMPLE MEASUREMENT				7.3		7.7		0	01/01	MLOC=
	PERMIT REQUIREMENT				6.0		9.0	SU		01/01	GR
00530 LAB ID:07554 Total Suspended Solids (TSS) MG/L	SAMPLE MEASUREMENT	41	116	LBS/					0	02/07	MLOC-
	PERMIT REQUIREMENT	200	400	DAY						02/07	24
00610 LAB ID:07554 Ammonia-Nitrogen Total MG/L as N	SAMPLE MEASUREMENT		37.5	LBS/			29.5		0	02/07	MLOC=
	PERMIT REQUIREMENT		RR	XXXX TIDE			RR	MG/L		02/07	12
01002 LAB ID:26103 Arsenic, Total UG/L as AS	SAMPLE MEASUREMENT						<2		0	01/90	MLOC=
	PERMIT REQUIREMENT						RR	UG/L		01/90	GR
01027 LAB ID:26103 Cadmium, Total UG/L as Cd	SAMPLE MEASUREMENT						.17		0	01/90	MLOC=
	PERMIT REQUIREMENT						RR	UG/L		01/90	GR
01042 LAB ID:26103 Copper, Total UG/L as Cu	SAMPLE MEASUREMENT						234		0	01/90	MLOC-
	PERMIT REQUIREMENT						RR	UG/L		01/90	GR

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WATER
DIVISION

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Victor M. Granquist Environmental Manager	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)		803	846-8171	89	07	25
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

D = 1.5 X BOD + 4.5 NH3   LB LIMIT: PER TIDAL CYCLE

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TDD No. F4- 8904-54

Site Name: American Color and Chemical / Ventura Chemical

Your Name: Jim Miller

File Subsection (check one):

___ Project Plans ___ References

✓ Field Data Records

___ Reports ___ Misc.

___ Correspondence/Proj. Notes

Correspondence/Report No: ______________

Description: data tables on disc

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