Lake Pontchartrain Basin Foundation

Comprehensive Management Plan

Phase III

SAVE OUR LAKE

October 17, 1995

Funded by EPA Grant # X-006710-01-4

Acknowledgments

The Lake Pontchartrain Basin Foundation wishes to express its sincere appreciation to the legions of individuals who helped to develop Pontchartrain's Comprehensive Management Plan (CMP). These individuals include members of the CMP's Interagency Working Group and Advisory Group representing area universities; local, state, and federal agencies; elected officials; the business community; sportsmen's associations; civic associations; agricultural associations; commercial and recreational fishermen, and countless Pontchartrain Basin citizens.

In particular, we wish to note the assistance of the chairmen of the three technical committees whose reports are presented in this document:

Dr. Al Knecht, Sewage and Agricultural Runoff
Dr. Don Barbe' and Dr. Mike Barber, *Stormwater Runoff*
Mr. John Lopez, Saltwater Intrusion/Wetland Loss

These gentlemen and the members of their committees volunteered thousands of hours investigating and identifying Basin problems, formulating and evaluating solutions, and developing recommendations to address the identified problems. The assistance of the chairmen and the committee members has been invaluable.

We would also like to thank Mr. Myron Knudson, Mrs. Karen Young, and the EPA Region VI staff for their advice and timely assistance throughout the three phases of the Pontchartrain CMP process.

Thanks also to the entire Lake Pontchartrain Basin Foundation staff and Board of Directors for *their input and assistance. Especially Ms. Charlene Gardebled,* Mr. Clifford Kenwood and Mrs. Sheila Schayot for the innumerable revisions of draft documents they produced to get the CMP Phase III document in its final form.

Lastly but most significantly we wish to recognize the tireless efforts of Dr. Steve Gorin, Lake Pontchartrain Basin Foundation Program Director. Under Dr. Gorin's guidance, the CMP process was conceived, initiated, and is currently being finalized. Dr. Gorin's foresight, his expertise in planning, engineering, and management; and his diplomacy and tact assured the Pontchartrain's CMP would be a professional, nationally accepted, implementable restoration plan which was completed within budget and in a timely manner. Truly, Dr. Gorin is the father of Pontchartrain's Comprehensive Management Plan.

Carlton Dufrechou
Executive Director

EXECUTIVE SUMMARY

Lake Pontchartrain Basin Foundation
Comprehensive Management Plan
Phase III

This document constitutes the third and final phase of the Lake Pontchartrain Basin Comprehensive Management Planning process. It presents three reports developed by technical specialists to address major environmental challenges in the Basin: sewage and agricultural runoff; stormwater runoff; and saltwater intrusion/wetland loss. Specific projects recommended by the specialists are listed in the individual reports. The recommendations of the Lake Pontchartrain Basin Foundation are listed in the final section.

I. SEWAGE AND AGRICULTURAL RUNOFF REPORT

Sewage and agricultural runoff are major sources of pollution in the Basin. Elevated fecal coliform bacteria levels have led to restrictions on basin waterbodies. Potential sources of high bacteria counts in these waterbodies include: community sewage treatment plants, stormwater runoff from urbanized areas, sewage by-passes, broken sewer lines, dairies and cattle farms, and wildlife.

Management options or solutions to sewage and agricultural runoff contamination problems must be addressed individually. Solutions to problems in the north section of the Basin will be different from those in the south section because of the differing sources of pollution. **Agricultural runoff** from dairy cows, cattle, and horses must be managed on a site by site basis. In many cases, ponds can be constructed to collect the runoff and to provide some degree of treatment before being discharged. **Individual home systems** are generally a problem due to lack of maintenance, mechanical failures or poor design. Maintenance and homeowner education are the keys to effective operation of individual home systems. Another source of pollution related to the individual home system is disposal of septate. Facilities should be developed to handle this type of waste.

Community systems often suffer from lack of maintenance or overload because the system was underdesigned for the population it now serves. The obvious solutions are proper design and operation. Unfortunately, most of the communities or companies that operate these system are underfunded. There are some areas along the south shore where unsewered homes and camps discharge waste into Lake Pontchartrain or bayous. Proper planning at the parish level with emphasis on larger, more centralized systems is the best long term solution to the basin's sewage problems.

II. STORMWATER RUNOFF REPORT

Stormwater runoff, a form of non-point source (NPS) pollution, is the largest single source of pollution in Lake Pontchartrain. Stormwater runoff occurs when rainfall--which can scour litter, animal droppings, particulates, and other contaminants that have settled on the ground, roofs or paved areas and carry them into the drainage system--is pumped into Lake Pontchartrain. Major pollutants in stormwater include: sediments, nutrients, bacteria (pathogens), organics, metals, and pesticides.

Metropolitan New Orleans has an annual precipitation of approximately 60 inches. Since the city is below sea level and surrounded by a levee system, stormwater must be pumped into Lake Pontchartrain, the Mississippi River, the Intracoastal Waterway, or the Inner Harbor Navigation Canal to prevent flooding. The frequent need to pump out large quantities of stormwater in a relatively short period of time makes treatment extremely difficult.

Stormwater runoff is currently the major source of fecal coliform bacteria along the south shore of the Lake. Due to age and soil conditions, the municipal sewerage systems of Orleans and Jefferson parishes have developed countless breaks and failures resulting in infiltration and inflow problems throughout the area. During periods of heavy rain, many areas tend to flood and raw sewage mixes with the stormwater and ultimately enters the Lake. Additional water quality concerns from stormwater in Lake Pontchartrain include oil and grease, nutrients, and metals. Sediments, pesticides, and organic enrichment do not appear to be serious problems.

Recommendations for alleviating the problem of stormwater runoff are as varied as the problem. **Stormwater system investigation and repairs** are required throughout the south shore to eliminate line breaks, to locate cross-connections between sewerage and stormwater systems and to find illegal discharges to the stormwater system. **The flow balancing method**, a method whereby a temporary holding "tank" is constructed to contain polluted stormwater for later treatment, should be investigated. **Stormwater Treatment** through wetlands could be an extremely effective method of cleansing stormwater. **Bioremediation**, the introduction of microorganisms to destroy pollutants, should be considered for use in drainage canals. **Public education and participation** programs are the most cost-effective method of reducing pollution from urban runoff and should be expanded.

Finally, **planning to reopen swimming areas**, is required. The south shore could be swimmable within five years. A master plan should be prepared for increased use of south shore swimming areas.

III. SALTWATER INTRUSION/WETLAND LOSS REPORT

Wetland loss and saltwater intrusion are major problems in the Basin. Saltwater intrusion and wetland loss are usually the result of a combination of natural and human-induced causes. Some of the natural causes are: subsidence, or "settling," of wetlands; sea level rise; the Mississippi River levee network; and natural abandonment of former deltas of the Mississippi. Human-induced causes include: canal construction; alterations to the natural surface hydrology; saltwater intrusion; shoreline erosion; and dredging. Human-induced causes appear to account for most of the loss experienced since 1932.

Altered Hydrology

The natural salinity balance in the basin has changed for four major reasons: 1) Mississippi River levees prevent the regular influx of freshwater and sediment into the basin's wetlands; 2) the Mississippi River-Gulf Outlet (MRGO) allows saline water to push further into the Basin; 3) subsidence, combined with sea level rise, allows saltwater into Basin wetlands; and 4) a network of dredged canals and channels also allow saltwater inflow.

Elevated salinity resulting from construction of the Mississippi River-Gulf Outlet (MRGO), destroyed all the swamp in St. Bernard Parish, caused the loss of over 4,000 acres of marsh, and converted over 30,000 acres of marsh to less productive saline type. The MRGO has also allowed saline waters into Lake Pontchartrain through the Industrial Canal, stressing wetlands around the perimeter of the lake. Closing the MRGO is believed to be the best solution to the significant problems associated with the waterway. Container port facilities on the MRGO will have to be relocated to the Mississippi River. Until the MRGO is closed, dredged material from channel maintenance can be used to replenish nearby areas experiencing wetland loss.

Smaller projects designed to restore areas to a more natural hydrology have been proposed throughout the basin. Many of these projects take maximum advantage of existing water control methods/mechanisms and construction costs are relatively low. Each project should be evaluated on its individual merits.

Shoreline Erosion

Shoreline erosion is another cause of wetland loss in the basin. These losses are due to natural and man-induced factors. Some erosion is naturally occurring and part of the life cycle of a deltaic system. Ship traffic, particularly in the MRGO, is a major human-induced contributor to erosion. Several projects propose armoring eroding shorelines in the basin. These projects deserve high priority, but must be developed into a unified plan. Alternative approaches to simply placing rip-rap on the shoreline should be evaluated. Shorelines stabilized by armoring or rip-rap could be detrimental to SAV beds. Because of uncertain technology and possible detrimental effects, only project sites where erosion threatens "blowout" of marsh should be actively supported. Offshore structures, beach replenishment, and oyster reefs are alternative methods to combat shoreline erosion that should be evaluated.

Dredging

Loss from canal dredging accounted for approximately 16-17 percent of the total land loss in the basin since 1932. Most of this loss occurred prior to 1974. It is expected that the rate of loss from dredging will decrease.

Freshwater Diversions

Marshes in the basin experience subsidence rates of up to 3.2 feet per century. Since introduction of Mississippi River sediments as been virtually eliminated because of the levee system.

Marsh accretion is unable to keep pace with relative subsidence and sea level rise. The Mississippi River is now depositing most of its sediment load off of the continental shelf.

Diversion of nutrient and sediment-rich Mississippi River water could provide some of these sediments to wetlands. Multiple freshwater diversions have been proposed in the Lake Pontchartrain Basin. The proposed Bonnet Carre' diversion project is being reanalyzed, due to water quality concerns. Currently the Caernarvon Diversion is the subject of a $100 million suit filed against the state by oyster fishermen due to closure of oyster beds from high fecal coliform counts. A broader plan for integrating diversions and other inter-related projects should be developed.

Management Plans

Current restoration efforts are designed to best manage many small projects whereas some portions of the Basin are in need of more general management plans. Proposed methods to address wetland loss or saltwater intrusion are often untested or have low predictability of success. Although these methods have potential positive outcomes in theory, very often complications arise due to implementation problems or degree of certainty of results. Management plans will have to balance these concerns with the long-term ecological health of the basin.

IV. CONCLUSION

The CMP process has developed a road map for the restoration of the Lake Pontchartrain Basin. Partnerships and alliances between the public and private sectors has led to implementation of many of our targeted goals and objectives. However, strategies to restore the Lake and Basin are constantly being shaped and reshaped by the intentions and commitments of those involved. These strategies are also tempered by social, economic, and political forces. Our restoration efforts must adapt to these forces. The success of the effort to restore the Lake Pontchartrain Basin is ultimately founded in the public's hard work and the confidence they place in the Lake Pontchartrain Basin Foundation.

TABLE OF CONTENTS

Subcommittee Report: Saltwater Intrusion/Wetlands Loss

Lake Pontchartrain Basin Foundation Recommendations and Conclusions

Appedix A:

FIGURES

Sewage and Agricultural Runoff

Stormwater Runoff

Saltwater Intrusion/Wetlands Loss

TABLES

Sewage and Agricultural Runoff

Stormwater Runoff

ACRONYM KEY

Though all acronyms are spelled out at their first usage, this list is provided for the convienience of readers.

CMP	Lake Pontchartrain Basin Comprehensive Management Plan
COE	U.S. Army Corps of Engineers
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
DEQ	Louisiana Department of Environmental Quality
DHH	Louisiana Department of Health and Hospitals
DWF	Louisiana Department of Wildlife & Fisheries
EPA	U.S. Environmental Protection Agency
GIWW	Gulf Intracoastal Waterway
IHNC	Inner Harbor Navigation Canal
LPBF	Lake Pontchartrain Basin Foundation
LCES	Louisiana Cooperative Extension Service
LSU	Louisiana State University
MRGO	Mississippi River-Gulf Outlet
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	National Resource Conservation Service (Formerly Soil Conservation Service)
NURP	National Urban Runoff Program
NWR	National Wildlife Refuge
S&WB	New Orleans Sewerage & Water Board
SAV	Submerged Aquatic Vegetation
SIWLC	Saltwater Intrusion & Wetland Loss Committee
UWMRC	University of New Orleans Urban Waste Management Research Center

INTRODUCTION

1.0 About this document

This document constitutes the third and final phase of the Lake Pontchartrain Basin Comprehensive Management Planning process. It presents three reports that provide recommendations and strategies to implement projects that address major environmental challenges in the Basin. The views and recommendations presented are those of the majority of the subcommittee members and reflect the makeup of the membership of the committees. These views may not necessarily be the same as those of all the diverse organizations and individuals participating in the planning process. Recognizing this diversity, the Lake Pontchartrain Basin Comprehensive Management Plan (CMP) attempts to balance the needs of the Basin's environmental resources with those who utilize these limited resources.

1.1 About the Lake Pontchartrain Basin Foundation

The Lake Pontchartrain Basin Foundation, a membership-based citizens' organization, is the public's independent voice dedicated to restoring and preserving the Lake Pontchartrain Basin. Through coordination of restoration activities, education, advocacy, monitoring of the regulatory process, and citizen action, the Lake Pontchartrain Basin Foundation works in partnership with all segments of the community to reclaim the waters of the Basin for this and future generations.

The Foundation, a non-profit citizens organization, was created by the Louisiana Legislature in 1989 to organize and coordinate the clean-up, restoration, and preservation of Lake Pontchartrain and the Pontchartrain Basin. The Foundation was formed in response to a consensus among concerned citizens that the Lake was being seriously degraded and irreversibly damaged by pollution and habitat destruction. Something had to be done to save it! The CMP will provide the "road map" to SAVE OUR LAKE.

Ten of the Foundation's 14 board members are elected from the Foundation's broad-based membership. The remaining four positions are filled by representatives of the Louisiana Departments of Environmental Quality, Health & Hospitals, Natural Resources, and Wildlife & Fisheries.

1.2 The Comprehensive Management Planning Process

Phase I

Phase I in the development of the Comprehensive Management Plan began with four public meetings in October, 1991. During the meetings, citizens were asked to give their opinions on the conditions and needs of the Pontchartrain Basin. Citizens' concerns, desires, goals and visions for the Basin's restoration and preservation were grouped into five categories: (1) Education/Outreach; (2) Renewable Resources; (3) Uses; (4) Pollution; and, (5) Institutional.

Phase II

Phase II began in March, 1992. Monthly workshops were held to develop alternatives addressing the five categories identified in Phase I. Two groups participated in the workshops: an Interagency Working Group made up of delegates from local, state, and federal agencies with regulatory authority in the Basin, and an Advisory Group made up of delegates from civic, business, university, farming, fishing, environmental, industrial, and other interested organizations. Five subcommittees corresponding to the five categories were created.

Five subcommittee reports were presented to the Interagency Working Group in July, 1992. Phase II synthesized these reports into four summary sections: (1) Plan Implementation; (2) Water Quality; (3) Essential Habitat; and (4) Education/Public Participation. Each section contains a series of goals, objectives, and action plans. The goals set the desired condition for the Basin. Objectives are specific, short-term targets for attaining the goals. Objectives are obtainable through the implementation of action plans established on the basis of preferred uses, standards, and permit activities in order to improve water quality and habitat. The final step in Phase II was to hold seven public meetings to describe the progress made on the plan to the public. The meetings began in June

1993. The meetings were held in: Metairie, Destrehan, Hammond, Mandeville, Amite, Chalmette, and New Orleans.

Several of the restoration alternatives identified in Phase II are presently being implemented. These projects include education and public awareness programs, animal waste retention lagoon construction and cleanout programs, a regional sludge disposal facility construction program, water quality monitoring and planning programs, seagrass restoration programs, and stormwater treatment programs. The CMP Phase II report is summarized in *Report to the People of the Lake Pontchartrain Basin*. The document also provides a summary of environmental problems in the Basin.

Phase III

This third and final phase, is a technical document addressing the Basin's major environmental challenges: Sewage and Agricultural Runoff, Stormwater Runoff, and Saltwater Intrusion/Wetland Loss. Committees of technical specialists were formed to investigate and recommend implementation of strategies and projects for each of the challenges. Each committee was assigned the following tasks:

1. **PROBLEM IDENTIFICATION** - investigate and identify specific problems associated with the challenge;

2. **RESPONSIBILITY** (Agencies/Groups) - determine agencies or groups with existing regulatory responsibility associated with identified problems and/or agencies or groups with abilities to implement solutions for identified problems; and

3. **ALTERNATIVE SOLUTIONS** (Projects/Managements) - formulate, evaluate, and recommend tentative projects and management practices to correct, resolve, or reduce the identified problems associated with each challenge.

The following three sections of this report detail the findings and recommendations developed by the committees. Each section was edited for uniformity of format, continuity, and the elimination of redundancy in the combined Phase III document.

Subcommittee Report:

SEWAGE AND AGRICULTURAL RUNOFF

Chairman: Al Knecht, Ph.D.

5/12/95

2.0 INTRODUCTION

Sewage and agricultural runoff represent major sources of pollution in the Lake Pontchartrain Basin. To facilitate management strategies for addressing the problem areas, the Basin was divided to northern and southern sections. The northern section of the Basin, often referred to as the Florida Parishes, is comprised of elevated pine forested uplands drained by rivers flowing into Lake Pontchartrain and Lake Maurepas. These rivers represent major recreational, residential, economic, and aesthetic resources, and are designated for "primary contact recreation" by the Louisiana Department of Environmental Quality (DEQ). Large sections of these rivers have been designated "natural and scenic rivers" by the Louisiana Department of Wildlife and Fisheries (DWF).

The southern section of the Basin extends east from the Mississippi River across a series of lakes to the Chandeleur Islands in the Gulf of Mexico. This section is primarily open water, wetlands, and marshes. It is also home to the City of New Orleans and the suburbs of the south shore. While the entire Basin is home for approximately 1.9 million people, the majority of the population is located in this southern section. It is interesting to note that while the banks of the Mississippi River between New Orleans and Baton Rouge River are highly industrialized, industrial discharges from these facilities have a minimal impact on water quality within the Basin's boundaries.

The northern section of the Basin consists of a number of rivers which drain large upland areas either directly into Lake Pontchartrain or indirectly through Lake Maurepas. These rivers carry runoff water from timberland, farms, ranches, municipalities, wetlands and industries into the Lake and ultimately into the Gulf of Mexico. Before man entered the picture, the rivers carried natural runoff containing soil, wild animal wastes and decaying organic matter from the forest and wetlands into the Lake. Now, these rivers carry increased soil, wastes and other contaminants from human and agricultural sources. The following is a brief description of the major rivers in the Basin, their hydrology, and their potential for becoming polluted from human activities.

Amite River

The Amite River originates in the State of Mississippi and flows southward along the boundary between East Feliciana and St. Helena Parishes of Louisiana. It continues along the common borders of East Baton Rouge, Livingston and Ascension Parishes and then breaks into distributaries in Livingston Parish, which empty into Lake Maurepas. River discharges range from a minimum of 248 cubic feet per second (cfs) to a maximum of 6,030 cfs with the average being 857 cfs. Major potential sources of pollution along the river include: runoff or drainage from septic tanks and agricultural activities; and sand and gravel mining.

Tickfaw River

The Tickfaw River originates in southern Mississippi and flows southward through St. Helena and Livingston Parishes, emptying into Lake Maurepas. River discharges range from a minimum of 106 cfs to a maximum of 390 cfs with the average being 213 cfs. Major potential sources of pollution along the river include: septic tanks and runoff from agricultural activities.

Tchefuncte River

The Tchefuncte River originates in the northeastern quadrant of the Florida Parishes and flows southward, through Washington and St. Tammany Parishes. The Tchefuncte merges with the Bogue Falaya River north of Covington, then flows into Lake Pontchartrain. River discharges range from a minimum of 31 cfs to a maximum of 190 cfs with the average being 77.7 cfs. Major potential sources of pollution along the river include: discharges from numerous small community and commercial sewage treatment plants; home septic and mechanical systems; runoff from dairy farms, cattle ranches, and nurseries; and construction sites.

Tangipahoa River

The Tangipahoa River originates in the State of Mississippi and flows southward through Tangipahoa Parish, emptying into Lake Pontchartrain. River discharges range from a minimum of 366 cfs to a maximum of 4,063 cfs with an average of 844 cfs. Major potential sources of pollution along the river include: discharges from unsewered or poorly sewered municipalities; minor industries, including sand and gravel mining; unsewered rural residences and/or camps; and runoff from pasture land and dairy farms.

West Pearl River

The West Pearl River originates near the Pearl River Navigational Canal levee, draining much of the remote wooded marsh that surrounds it by way of Crier Slough, Wilson Slough, and Bradley Slough. Downstream, a succession of tributaries and distributaries flowing into and out of West Pearl River drain the surrounding intermediate submerged marsh. The West Pearl River ultimately empties into the Rigolets and Little Lake. Major potential sources of pollution include: runoff from unsewered or poorly sewered areas; poorly maintained mechanical sewage systems and drainage from septic tanks.

2.1 PROBLEM IDENTIFICATION

Sewage and agricultural runoff represent the major sources of pollution in the Basin. For the purposes of this plan, pollution levels from sewage and agricultural runoff are measured by the presence of fecal coliform bacteria rather than Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS) or ammonia nitrogen. Fecal coliform bacteria are commonly used as indicators of pollution from human and animal wastes, and the possible presence of pathogens or disease causing organisms. Because the numbers of pathogenic organisms present in wastes and polluted waters are few and difficult to isolate and identify, the fecal coliform organisms, which are more numerous and easily tested for, are used as indicators. Unfortunately, members of the fecal coliform group are also common to all warm blooded animals. Some common soil bacteria also fall into this group further complicating interpretation of the data, sometimes making it difficult to determine source of the organisms.

The DEQ and Louisiana Department of Health and Hospitals (DHH) currently use fecal coliform test results to classify water bodies for primary and secondary recreation activities. They are also able to use the test to determine the sources of sewage and animal waste pollution in the Basin by testing potential point sources.

TABLE 2.1

Location and Date of Restrictions

Location	Date of DEQ/DHH Advisory
Lake Pontchartrain, south shore	1/1/82*
Mouth of Tchefuncte River	1/1/82
Tchefuncte River	2/4/91
Tangipahoa River	3/22/88
Bogue Falaya River	2/4/91
Bayou Bonfouca	11/24/87 (Creosote Spill)

* See comment, Appendix A, Letter 1

Fecal coliform bacteria are used by the DHH as a basis for restricting use of waters for recreational uses and shellfish farming and harvesting. At the present time, sections of three rivers on the north shore, and an area along the south shore of Lake Pontchartrain have restrictions due to high coliform counts. State regulations for primary contact recreation are based on a minimum of not less than 5 water samples taken over not more than a 30-day period with the fecal coliform content not exceeding a log mean of 200/100 mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 400/100 mL. If the mean exceeds this standard, an advisory is issued restricting primary contact recreational activities.

Areas of the Basin currently under DHH advisories restricting use for primary contact recreational purposes are identified in Figure 2.1. Table 2.1 gives the dates advisories were issued and the locations.

North Section of Basin

Fecal coliform bacteria responsible for the restrictions in this section of the Basin apparently enter the rivers from many sources, including:

- individual home systems,
- community and business systems,
- dairy and cattle farms, and
- wildlife.

Community and some business systems discharge directly into waterways. Individual home systems, dairy and cattle farms discharge to land or ditches which ultimately drain into the waterways. To further complicate the sewage problem, most of the soil in this section is not suitable for effective septic tank filter bed operation. As a result, many individual homes in rural and unsewered communities have installed septic tank systems that do not operate effectively and are poorly maintained. Also, some community systems in sewered areas are overloaded and/or poorly maintained. A number of older communities on the north shore have collection systems of questionable integrity due to age, subsidence and inappropriate connections. Infiltration of these sewerage systems during periods of heavy rain exceed the capacity of lift stations and/or the sewage treatment plant and can thus result in the discharge of untreated or inadequately treated sewage into receiving waters. Broken sewer lines can cause raw sewage to enter stormwater systems or to drain directly into open ditches.

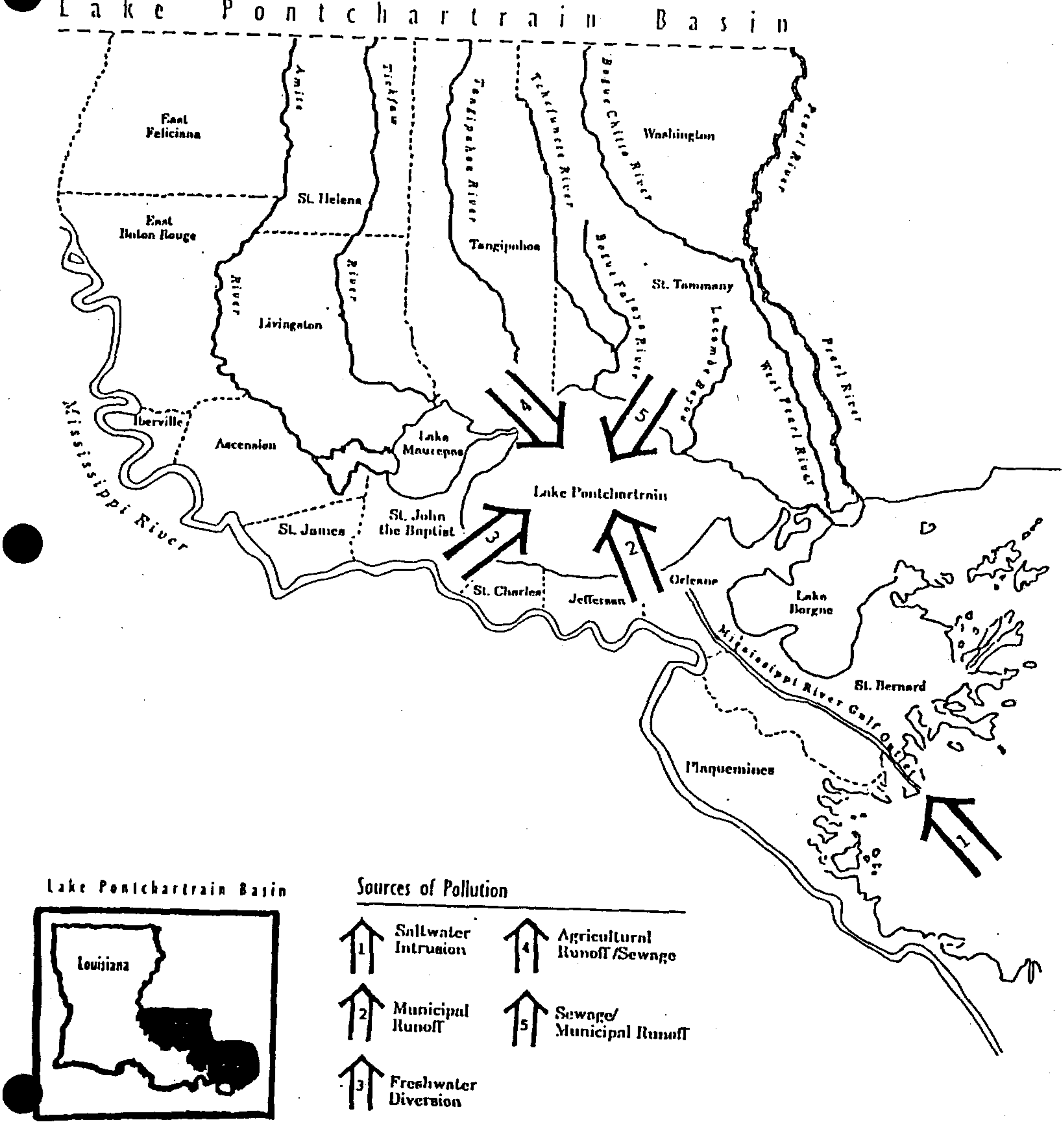


Figure 2.1 Advisory Areas

TABLE 2.2

ESTIMATED NUMBER OF INDIVIDUAL HOME SYSTEMS AND COMMUNITY SEWAGE TREATMENT SYSTEMS IN EACH PARISH

Parish	Number of Individual Home Systems	Number of Community Systems
North Section		
Ascension	*	*
East Baton Rouge	**	2
East Feliciana	1,097	17
Iberville	*	*
Livingston	6,000	5
St. Tammany	13,300	300
Tangipahoa	6,787	222
Washington	7,170	*
Subtotal	**34,354**	**548**
South Section		
Jefferson (East Bank)	24	5
Orleans (East Bank)	1,100	1
St. Bernard	*	*
St. Charles	127	21
St. James	838	38
St. John the Baptist	115	12
Subtotal	**2204**	**77**
GRAND TOTAL	**36,558**	**131**

* *Data not available.*

** Small community systems in the parish have been tied into the central plants. However, there are still a number of homes in unsewered areas with individual home systems.

TABLE 2.3

ESTIMATED NUMBER OF CATTLE AND HORSES IN EACH PARISH

Parish	Population*	Cattle**	Dairy Cows**	Horses**
North Section				
Ascension	58,214	11,250	-	350
East Baton Rouge	380,105	11,500	1,382 (10)	1,330
East Feliciana	19,211	18,200	-	-
Iberville	31,049	6,250	-	267
Livingston	70,526	9,157	505 (6)	500
St. Helena	9,874	2,585	7,560 (72)	136
St. Tammany	144,508	6,500	630 (7)	1,250
Tangipahoa	85,709	7,000	30,500 (269)	270
Washington	43,185	10,000	18,500 (186)	150
Subtotal	**842,381**	**82,442**	**59,077 (550)**	**4,253**
South Section				
Jefferson (EB)	448,306	125	-	115
Orleans (EB)	496,938	-	-	385
Plaquemines (EB)	25,575	7,500	-	-
St. Bernard	66,631	550	-	50
St. Charles	42,437	3,200	-	750
St. James	20,879	418	-	159
St. John	39,996	410	-	-
Subtotal	**1,140,762**	**12,203**	-	**1,459**
GRAND TOTAL	**1,983,143**	**94,645**	**59,077 (550)**	**5,712**

*1990 Census
**1993 Louisiana Summary Agriculture & Natural Resources, Louisiana State University Agricultural Center
() Indicates number of dairy farms in parish.

The amount of contamination entering the waterways and ultimately the Lake is related to the number of potential sources of fecal coliform bacteria in each parish. Table 2.2 lists the estimated number of individual home and community systems in Basin parishes. Since the other major source of waste containing fecal coliform bacteria is from cattle and horses, an attempt was made to estimate the number of animals in each parish (Table 2.3).

A review of available fecal coliform bacteria data obtained on the major rivers in the northern section of the Basin indicates that the counts vary considerably during the year. Since the number of people and cattle remain relatively constant, researchers have investigated roles of seasonal and weather changes on fecal coliform bacteria levels.

The climate of the area is characterized by different precipitation/runoff mechanisms for the summer and winter seasons. Because of the combined effects of precipitation, evaporation, and transpiration, runoff is greater in the winter season. Studies by Higginbotham, et. al., 1991, Anderson, et. al., 1992, and Arunachalam, 1992, indicate that precipitation is a contributing factor on the Tickfaw and Tchefuncte Rivers. Higginbotham, et. al. 1991 and Arunachalam, 1992, found that fecal coliform counts are directly related to the high river discharge rates. While river discharge levels are related to precipitation events, precipitation data do not correlate strongly with fecal coliform levels in these rivers.

Arunachalam, 1992, showed that the correlation was strongest when the precipitation data were divided and analyzed on a seasonal basis. Discharge rates are higher in the winter season resulting in higher fecal coliform counts. Discharge rates are lower in the summer season with commensurate lower fecal coliform counts. It should be noted that the data used to impose restrictions on the rivers was obtained during the winter season and periods of high flow.

Because of the similarity of drainage areas, it is not unreasonable to assume that similar relationships exist between fecal coliform bacteria counts and Tangipahoa and Amite river flows. It should be noted that recent analysis of data on the Bogue Falaya River showed a strong correlation between fecal coliform bacteria counts and precipitation (Gunta, 1990). The Bogue Falaya is a relatively small, shallow river and runoff represents a greater portion of the total volume of water than in the other larger and deeper rivers. Thus, the counts reflect the runoff which is virtually undiluted by the relatively small amount of river water. While these observations explain why the rivers have high fecal coliform counts, the source of the bacteria will depend on the specific area. It is possible that in some areas, runoff from dairy farms and ranches is the main source, while in other areas individual home systems may be the main source. The data in Table 2.3 shows that the parishes in the Basin have a population of about 1.9 million people and an animal population (cattle, dairy cows and horses) of approximately 159,434.

The North Shore has a population of 842,381 humans and a total of 145,772 farm animals. The sewage equivalent for each animal is equal to 15 humans (Anderson, et al., 1992), or a total population equivalent of 2,186,580. The total resulting sewage load is equivalent to 3 million people on the North Shore alone. More than two-thirds of this waste goes virtually untreated, and is discharged into the rivers as runoff during rain storms.

Animal wastes and effluent from septic tanks tend to accumulate on the land and in ditches during dry periods and are washed into the rivers by heavy rains. Effluent from septic tanks and small community systems continually drain into the rivers but it may take several days to get there during dry weather. Thus, their impact on water quality during dry periods does not appear to be a problem since the coliform counts in the rivers are low during these periods. However, it should be noted that the discharge of inadequately treated sewage into ditches could represent a significant local health hazard and should be reported to local authorities.

Animal wastes and to some extent septic tanks appear to be the primary source of coliform bacteria reaching the rivers during periods of heavy rain. Some community treatment systems are also contributors. Having identified the main sources of fecal coliform bacteria on the north shore, one can now direct attention to the responsible agencies, and address solutions to the problems.

It should be noted that using fecal coliform bacteria as the indicator of sewage and agricultural runoff, the other contaminants associated with these pollution sources are also present in relative concentrations. BOD, TSS and ammonia nitrogen levels should track the bacterial levels. Consequently, efforts to eliminate the bacteria will also reduce the amount of other pollutants entering the rivers and lakes.

South Section of Basin

The source of fecal coliform bacteria in this section of the Basin is primarily from community treatment plants, stormwater runoff from urbanized areas, sewage by-passes, and broken sewer lines. Individual home systems, cattle ranches and dairy farms are minor contributors. Since 1985, treated sewage from the large treatment plants on the East Bank of New Orleans and East Bank of Jefferson Parish have been discharged directly into the Mississippi River. These plants discharge treated or partially treated sewage into the drainage canal system during emergency situations due to excessive storm water infiltration. (See comment, Appendix A, Letter 1.) Efforts are underway to reduce infiltration and to minimize the problem through special management options.

St. Charles Parish has 4 community systems which discharge into bayous and marshes that ultimately drain into the Lake. The other Parishes in the southern section of the Basin have both community and individual home systems which discharge into bayous and wetlands, and ultimately into the lakes. However, due to their relatively small populations, the impact on the Basin is not considered significant and is masked by the discharges from the Metropolitan New Orleans area.

Precipitation (60 inches per year or 12.9 billion cubic feet) in Orleans and Jefferson Parishes is collected in a series of canals and pumped into the Lake. In Orleans Parish alone there are over 170 miles of canals and 17 pumping stations with a combined capacity of over 20 billion gallons per day.

Stormwater collected in the system contains fecal coliform bacteria (Englande, 1994). Sections of the collection system in Orleans Parish were constructed in the late 1800s. Because of the age of the system and subsidence problems in the area, stormwater can be contaminated with raw sewage. Also, there are undoubtedly numerous cross-connections which remain undetected. Jefferson Parish has similar problems even though the system is relatively new.

Jefferson Parish has made major improvements in the last 10 years with the construction of a new sewage treatment plant and improvements in the sewerage system. Several treatment plants that discharged poorly treated sewage into the drainage canal system for years were closed. Coliform counts in the Bonnabel canal have dropped from an average of 34,000/100 mL with a range of 50 - 720,000/100 mL, to 6,000/100 mL and a range of 100 - 33,000/100 mL after plant closure, based on data collected by the Parish between 1982 and 1989. These latter numbers are comparable to counts obtained on other canals not impacted directly by treatment plant discharges. It would appear that these levels represent the background contamination in the canals from various sources, including animal wastes (birds, nutria, and pets), illicit cross connections, broken sewage pipes due to subsidence, etc.

An analysis of historical fecal coliform bacteria data on Lake Pontchartrain, collected from 1982 to 1992, revealed a definite correlation between rainfall and fecal coliform bacteria counts (Seenappa, 1994). It has been suggested that this relationship could be used by the DHH to predict when the rivers and Lake are suitable for swimming. DHH has observed a similar relationship between fecal coliform bacteria counts and rainfall in their oyster bed monitoring program. Monitoring efforts initiated by the LPBF and DHH in 1994 will be analyzed to determine if there is a relationship between fecal coliform bacteria counts and rainfall in Lake Pontchartrain.

2.2 RESPONSIBILITY (Agencies/Groups)

DEQ and DHH share the major regulatory responsibilities for sewage treatment and management in the Basin. Some parish governments also have established administrative units and ordinances to manage sewage treatment at the local level, primarily individual home systems. State regulations set discharge limits for community plants. Plants treating over 1 million gallons per day (gpd) are required to monitor on a daily basis and meet the following limits.

	Daily Average	Monthly Average
Total Suspended Solids (TSS)	15 mg/L	23 mg/L
Fecal Coliform Bacteria	200/100 mL	400/100 mL

Smaller community plants are required to meet these same limits in some areas but with less frequent sampling, annually in some cases. DEQ and DHH sample the smaller plants on a random basis. A number of plants within the Basin have been found to be in non-compliance and fined. (See comment, Appendix A, Letter 1.)

Community Systems

The main problem with many community systems is the lack of maintenance and inexperienced operators. In some cases, developers have installed treatment plants and have simply "walked away" from them, turning the systems over to homeowner associations. In most cases, DEQ has attempted to work with the associations and other system operators to improve operations. Usually funds are not available to make even minor repairs or to purchase needed equipment.

To address sewage problems in St. Tammany Parish, the State Legislature established the St. Tammany Environmental Services Commission. The Commission has developed ordinances covering community treatment plants and individual home systems. Community systems with design capacities greater than 10,000 gpd must meet the above limits. The objective is to require proper operation and maintenance of these systems.

Individual Home Systems

To prevent treated wastewater from leaving private property, St. Tammany Parish has also developed an ordinance requiring new installations of individual treatment systems on lots of 22,500 sq. ft or greater. Spray irrigation, oxidation ponds, rock filters, and evapotranspiration systems have been approved as alternatives to the required septic tank/absorption field systems.

Individual home systems are currently regulated by the DHH and the parish sanitarians are required to inspect installations and monitor operation. However, like most state agencies their resources are limited, thus they basically respond to complaints rather than monitor or inspect system operation. The Louisiana Cooperative Extension Service (LCES) has an active educational program on individual home systems. They have developed informational material which is widely distributed in unincorporated rural areas. (See comment, Appendix A, Letter 1.)

Agricultural Runoff

The LCES and the Natural Resources Conservation Service (NRCS - formerly the Soil Conservation Service) are currently implementing a plan to assist ranchers and dairy operators in controlling and treating runoff. Supplemental funding for this program was obtained with the assistance of the LPBF. While DEQ's non-point source section is responsible for managing runoff, their regulation for compliance has been minimal or non-existent. (See comment, Appendix A, Letter 1.)

Urban Runoff

DEQ's non-point source section is responsible for enforcing regulations on urban runoff. Large municipalities are required by the EPA to develop management plans and apply for storm water permits under the National Pollution Discharge Elimination System (NPDES). New Orleans and Jefferson Parish have submitted permit applications to EPA. Urban runoff is addressed in greater detail in the stormwater section of this report.

2.3 ALTERNATIVE SOLUTIONS (Projects/Managements)

Management options or solutions to the fecal coliform bacteria or sewage and agricultural runoff contamination problems must be addressed individually. Solutions to problems in the north section of the Basin will be different from those in the south section because of the sources of pollution.

North Section General

There are three basic sources of "sewage" pollution in the north section of the Basin, agricultural runoff, individual home systems and community systems.

Agricultural runoff from dairy cows, cattle, and horses must be managed on a site by site basis. In many cases, ponds can be constructed to collect the runoff and to provide some degree of treatment before being discharged. In other situations, proper contouring of the land can minimize runoff, reduce soil erosion and provide some treatment for the removal of fecal coliform bacteria. The NRCS can provide the expertise to develop the best solution for each situation. Federal funds are available from the Consolidated Farm Service Administration (formerly ASCS), NRCS, and LPBF in the form of cost sharing and grants to assist the farmer.

Individual home systems are regulated by the DHH and are generally a problem due to lack of maintenance, mechanical failures or simply poor design. Also, some homeowners will turn off or disconnect the pump to their small mechanical systems to save money on electricity. Many of the systems are old and in need of repair or replacement. New parish ordinances will require upgrades to many of these systems if the property is sold or if the homeowner hires a contractor to repair the system. Maintenance is the key to the effective operation of individual home systems. The material provided by the LCES provides basic information on the operation and maintenance of these systems.

Another source of pollution related to the individual home system is disposal of septate removed by vacuum truck. In the past this waste was accepted at local sewage treatment plants. Most facilities will no longer accept this waste material. Parishes should develop facilities to handle this type of waste either by providing a special treatment plant or by employing controlled land application techniques. Tangipahoa Parish is now building a regional septic tank waste treatment facility in a cost share arrangement with LPBF. (See comment, Appendix A, Letter 1.)

Community systems are regulated by DEQ and must produce an effluent that meets standards defined in their permit. The problems associated with these systems are usually lack of maintenance or overload because the system was underdesigned for the population it now serves. Operation of the systems may also be a factor when inexperienced personnel are employed. The obvious solutions, therefore, are to properly design and operate the treatment plants with properly trained personnel. Unfortunately, most of the communities or companies that operate these system are underfunded.

Enforcement of existing regulations by parishes and DEQ should force compliance and elimination of the problem. However, in some cases new systems will have to be constructed. Proper planning at the parish level with emphasis on larger more centralized systems is the best long term solution. St. Tammany Parish, in a cost share arrangement with LPBF, is now developing a comprehensive water quality management plan and new ordinances to address widespread rapid growth problems. Construction cost for sewerage systems is the primary deterrent to more centralized systems.

South Section General

The sources of fecal coliform bacteria or sewage from the south section of the Basin are primarily related to urban runoff. Due to age and poor soil conditions, the municipal sewerage systems, of Orleans and Jefferson parishes, have developed countless breaks/failures resulting in infiltration and inflow problems throughout the area. There are some areas along the south shore where unsewered homes and camps discharge waste into Lake Pontchartrain or bayous. While these homes and camps represent a local health hazard, they do not represent a major source of pollution in the Lake. There are also areas of St. Bernard and Plaquemines utilizing individual home systems. During periods of heavy rain, many areas tend to flood and raw sewage mixes with the storm water and ultimately enters the Lake. Again, these are local health hazards but do not represent a major continuing source of contamination in the Lake.

Urban runoff is currently the major source of fecal coliform bacteria along the south shore of the Lake. The obvious solution to the problem is to find the sources of sewage and take the appropriate actions to eliminate the problem. Due to the age of the sewerage system in New Orleans, this is probably a long term project. In Jefferson Parish, similar problems exists and can be addressed with a dedicated effort. Due to subsidence problems, many of the failures are in the yards of home owners. Proper inspection and an effective educational program directed at the homeowner should correct this situation.

Several options are being considered for treating stormwater in Orleans and Jefferson parishes before it enters the Lake. The volumes of water to be treated could be large. See stormwater section of this report for additional detail.

EXISTING AND PROPOSED PROJECTS

Currently, a number of projects and programs have been started or are being considered to reduce sewage and agricultural runoff throughout the Basin.

North Shore Specific

- Tangipahoa Parish septic tank sludge treatment plant near Amite.
- Agricultural assistance program for dairy farmers and cattle ranches
- LCES septic tank education program.
- St. Tammany Environmental Services and University of New Orleans Urban Waste Management and Research Center (UWMRC), water quality testing laboratory for north shore.
- St. Tammany Environmental Services Commission, design and construction of gravity system for Reno Hills area (Mandeville).
- UWMRC project on modeling and monitoring non-point source pollution in Lake Pontchartrain from agricultural areas.
- UWMRC evaluation of individual home sewage system performance in old and new sections of St. Tammany Parish. A study of the Reno Hills would provide the basis for requesting a block

grant to design and construct a sewage collection system for the area. (See comment, Appendix A, Letter 1.)

South Shore Specific

- LPBF pilot St. Bernard natural wetlands system.
- Orleans Levee District wetlands treatment project, New Orleans East.
- LPBF Lake water monitoring program.
- City of New Orleans and Orleans Sewerage & Water Board's (S&WB) infiltration and inflow analysis of New Orleans Lakeview area.
- City of New Orleans and Orleans Sewerage & Water Board's (S&WB) infiltration and inflow elimination in New Orleans Lakeview area.
- Jefferson Parish project to repair cracks in municipal sewerage lines throughout east bank of parish.
- UWMRC project to evaluate procedures for detecting inappropriate discharges to stormwater drainage.
- UWMRC Lake Pontchartrain urban stormwater runoff treatment demonstration project.

2.4 REFERENCES

Anderson, A. C., J. C. Rice, and A. A. Abdelghani. *Survey of the Bogue Falaya and Tchefuncte Rivers for Microbial Water Quality*, Louisiana Department of Health and Hospitals.

Arunachalam, Amudhavanan. *Seasonal Effect on Fecal Coliform Levels in the Tchefuncte River.* Thesis, University of New Orleans, Department of Civil Engineering, 1992.

Gunta, B. E. *A Study of Fecal Coliform Levels in the Tchefuncte and Bogue Falaya Rivers*. Thesis, University of New Orleans, Department of Civil and Environmental Engineering, December 1994.

Higginbotham, N., K. Bancroft, and G. W. Childers. *Evaluation of the Microbiological Water Quality of the Tickfaw River, a Designated Natural and Scenic Stream in Southeastern Louisiana.* Proc. Louisiana Acad. Sci. 54:46-54, 1991.

Houck, O. A., Fritz Wagner, and John B. Elstrott. *To Restore Lake Pontchartrain*, A report to the Greater New Orleans Expressway Commission on the sources, remedies, and economic impacts of pollution in the Lake Pontchartrain Basin, April 28, 1989.

Louisiana Coastal Wetlands Conservation and Restoration Task Force. *Louisiana Coastal Wetlands Restoration Plan, Pontchartrain Basin Appendix A.*, November 1993

Louisiana Department of Environmental Quality. *State of Louisiana Water Quality Management Plan*, Vol. 5, Section 305(b), Water Quality Inventory, 1992.

Louisiana Department of Environmental Quality. *State of Louisiana Water Quality Management Plan*, Vol. 5, Part B, Water Quality Inventory, 1994.

Louisiana State University Agricultural Center, Louisiana Cooperative Extension Service. *1993 Louisiana Summary Agriculture and Natural Resources.*

Seenappa, S. D. *Modeling of Microbial Concentrations in Lake Pontchartrain*. Thesis, University of New Orleans, September 1994.

Seenappa, S. D., D. E. Barbe, and J. C. Francis, *Seasonal Variations of Fecal Coliform Concentrations in Lake Pontchartrain*. American Water Resources Association, S. D. June 1994.

U.S. Geological Survey. *The Lake Pontchartrain Basin, Louisiana's Troubled Urban Estuary*, April 1993.

Subcommittee Report:
STORMWATER RUNOFF
Chairman: Donald E. Barbe', Ph.D.
5/12/95

3.0 INTRODUCTION

Non-point Source Pollution and Urban Runoff

Traditionally, most efforts to control water pollution focused on reducing direct point sources discharging into surface water bodies. Despite the intensive efforts to improve water quality via point source treatment methods, many water bodies still do not comply with several water quality standards. This realization prompted an investigation of other sources of pollution that cause deterioration of surface water quality. In 1989, the EPA identified non-point source (NPS) pollution as the major continuing cause of water quality deterioration in receiving bodies (see Table 3.1).

Several general characteristics distinguish NPS pollution when compared to point source pollution. The first is that non-point source discharges enter surface waters in a diffuse manner and at intermittent intervals typically related to rainfall events. Point source pollution generally enters the surface water through pipes or other elimination systems. Second, the NPS pollution arises over an extensive area of land and is in transit overland before it reaches the receiving water bodies. Third, NPS pollution is difficult or impossible to trace back to the point of origin. Point source pollution enters receiving water bodies at discrete, identifiable locations via direct transport routes, as mentioned above (Novotny and Chesters, 1981).

A 1986 EPA report indicates that for approximately two-thirds of impaired water bodies, NPS pollution is the cause for the depreciated conditions. A recent EPA (1990) report on NPS pollution states that NPS pollution affects 206,179 miles of rivers, 5,300,000 acres of lakes, and

5,800 square miles of estuaries. The primary non-point source is agricultural runoff, followed by urban runoff and construction runoff (see Table 3.2) (Bastian, 1986).

TABLE 3.1

ESTIMATES OF NATIONAL DISCHARGE FROM POINT AND NON-POINT SOURCES, 1972, BEFORE FWPCA*

	5-Day BOD	TSS	TDS	TP	TN
Point sources					
Industrial	8,252	50,355	290,184	353	559
Municipal	5,800	6,000	31,847	101	1,111
Total Point Sources	14,052	56,355	322,031	454	1,670
Non-Point Sources	18,901	3,422,321	1,536,458	2,986	12,480
National Total	**32,953**	**3,478,676**	**1,858,489**	**3,440**	**14,150**
Non-Point Sources as % of total discharges	57%	98%	83%	87%	88%

*in millions of pounds per year
Freeman, 1990

Non-point sources of pollution encompass contaminated runoff from urban and agricultural areas, roadways, abandoned mines, and construction sites. The major NPS pollutants associated with surface water impairment include: sediments, nutrients, pathogens, organics, metals, and pesticides. Major NPS pollutants associated with a particular runoff are often indicative of the runoff sources. For example, lead, cadmium, and oil and gas related hydrocarbons are typical constituents of roadway runoff. While sediment, nutrients (fertilizer), and pesticides are common constituents of agricultural runoff.

TABLE 3.2

PRIMARY NON-POINT SOURCE IN IMPACTED WATERS

	Rivers	Lakes	Estuaries
Agriculture	64%	57%	19%
Urban Runoff	5%	12%	18%
Construction	2%	4%	--

Of particular interest for urban hydrology is the NPS pollution contributed by urban stormwater runoff. Because urban stormwater runoff includes runoff from residential, commercial, industrial, and, potentially, agricultural areas, its pollutant load can be very diverse. Mancini and Plummer (1986) delineate three primary characteristics of urban runoff. The first is the intermittent nature of the pollutant loadings. The loads are usually of a relatively short duration compared to the time separating the storm or loading events. The second characteristic is the variability within and between storm events. Such variability includes rainfall intensity and duration and the length of time since the previous storm event. The last primary characteristic of urban runoff is the comparatively high concentration of suspended solids in the discharges.

National Urban Runoff Program

In 1981 and 1982, the EPA conducted an extensive study of urban stormwater runoff quality. The National Urban Runoff Program (NURP) included data from 81 sites in 22 cities from across the country from more than 2300 different storm events. The EPA published the final report of its NURP investigations in 1983. In addition to analyzing the storm events, the final report discussed potential water quality standards violations and suggestions for best management practices for reducing the pollutant load in stormwater runoff (Stahre and Urbonas, 1993). Because of the vast number of pollutants identified in urban stormwater runoff, the EPA chose a representative population of standard pollutants to characterize urban runoff constituents (see Table 3.3).

TABLE 3.3

STANDARD POLLUTANTS CHARACTERIZING URBAN RUNOFF

Total Suspended Solids	TSS
Biochemical Oxygen Demand	BOD
Chemical Oxygen Demand	COD
Total Phosphorus (as P)	TP
Soluble Phosphorus (as P)	SP
Total Kjeldahl Nitrogen (as N)	TKN
Nitrite (as N)	NO_2
Nitrate (as N)	NO_3
Total Copper	Cu
Total Lead	Pb
Total Zinc	Zn

The basis for selection of the standard pollutants was as follows:

> The list includes pollutants of general interest which are usually examined in both point and non-point source studies and includes representatives of important categories of pollutants--namely, solids, oxygen consuming constituents, nutrients, and heavy metals (1983).

Stahre and Urbonas (1993) provide a generalization of the broad findings reported in the final NURP report. Of particular interest are that:

1) no clear geographic patterns were discovered for Event Mean Concentrations (EMCs) of standard pollutants;

2) no correlation was exhibited between EMCs and runoff volumes, thereby suggesting that the two are independent of each other;
3) land use categories were not statistically significant tools with which to predict differences in EMCs (see Table 3.4); and
4) runoff volume coefficient produced a logarithmic correlation to the total basin imperviousness.

TABLE 3.4

LAND USE CATEGORY MEDIAN EMCS FOR ALL NURP SITES

EMC (mg/L)

Pollutant	Residential	Mixed	Open/ Commercial	Nonurban
TSS	101.000	67.000	69.000	70.000
BOD	10.000	7.800	9.300	---
COD	73.000	65.000	57.000	40.000
TP	0.383	0.263	0.201	0.121
SP	0.143	0.056	0.080	0.026
TKN	1.900	1.290	1.180	0.965
$NO_{2\&3}$	0.736	0.558	0.572	0.543
Cu	0.033	0.027	0.029	---
Pb	0.144	0.114	0.104	0.030
Zn	0.135	0.154	0.226	0.195

EPA, 1983

Table 3.5 indicates that the median urban site EMCs exceeded the EPA (1985) water quality criteria for heavy metals for both copper and lead. The Criterion Maximum Concentration (CMC) for acute exposure to copper ranges from 0.0092 mg/L to 0.034 mg/L, depending on the hardness[1] of the water. The averaging period for the CMC is one hour, the

[1] The levels of multivalent cations, particularly magnesium and calcium, present in water determine the hardness. Hardness is expressed in mg/L as CaCO3, where soft water contains < 50 mg/L; moderately hard water contains 50-150 mg/L; hard water contains 150-300 mg/L, and very hard water contains >300 mg/L (Tchobanoglous and Schroeder, 1987).

same exposure duration in a stormwater context. The CMC for acute exposure to lead ranges from 0.034 mg/L to 0.200 mg/L, again depending on the hardness of the water (EPA, 1983).

TABLE 3.5

STANDARD POLLUTANT CONCENTRATIONS IN URBAN RUNOFF

Pollutant	Site Median EMC --Urban (mg/L)	90th Percentile --Urban (mg/L)
TSS	100.000	300.000
BOD	9.000	15.000
COD	65.000	140.000
TP	0.330	0.700
SP	0.120	0.210
TKN	1.500	3.300
$NO_{2\&3}$	0.680	1.750
Cu	0.034	0.093
Pb	0.144	0.350
Zn	0.160	0.500

EPA, 1983

The chronic exposure criteria, Criteria Continuous Concentration (CCC), for copper ranges from 0.0065 mg/L to 0.021 mg/L, taking into consideration the hardness of the water. The averaging period for CCC measurements is four days, which is also the exposure duration in a stormwater context. The CCC for lead ranges from 0.0013 mg/L to 0.0077 mg/L, considering the hardness of the water.

3.1 PROBLEM IDENTIFICATION

Livingston (1989) describes three characteristics of pollutant types and amounts associated with urban runoff. They are:

1) higher pollutant concentrations are associated with more intensive development and greater imperviousness;
2) construction erosion and sedimentation can result in high loadings of suspended solids; and
3) stormwater pollutant levels are comparable to secondary-treated wastewater effluent.

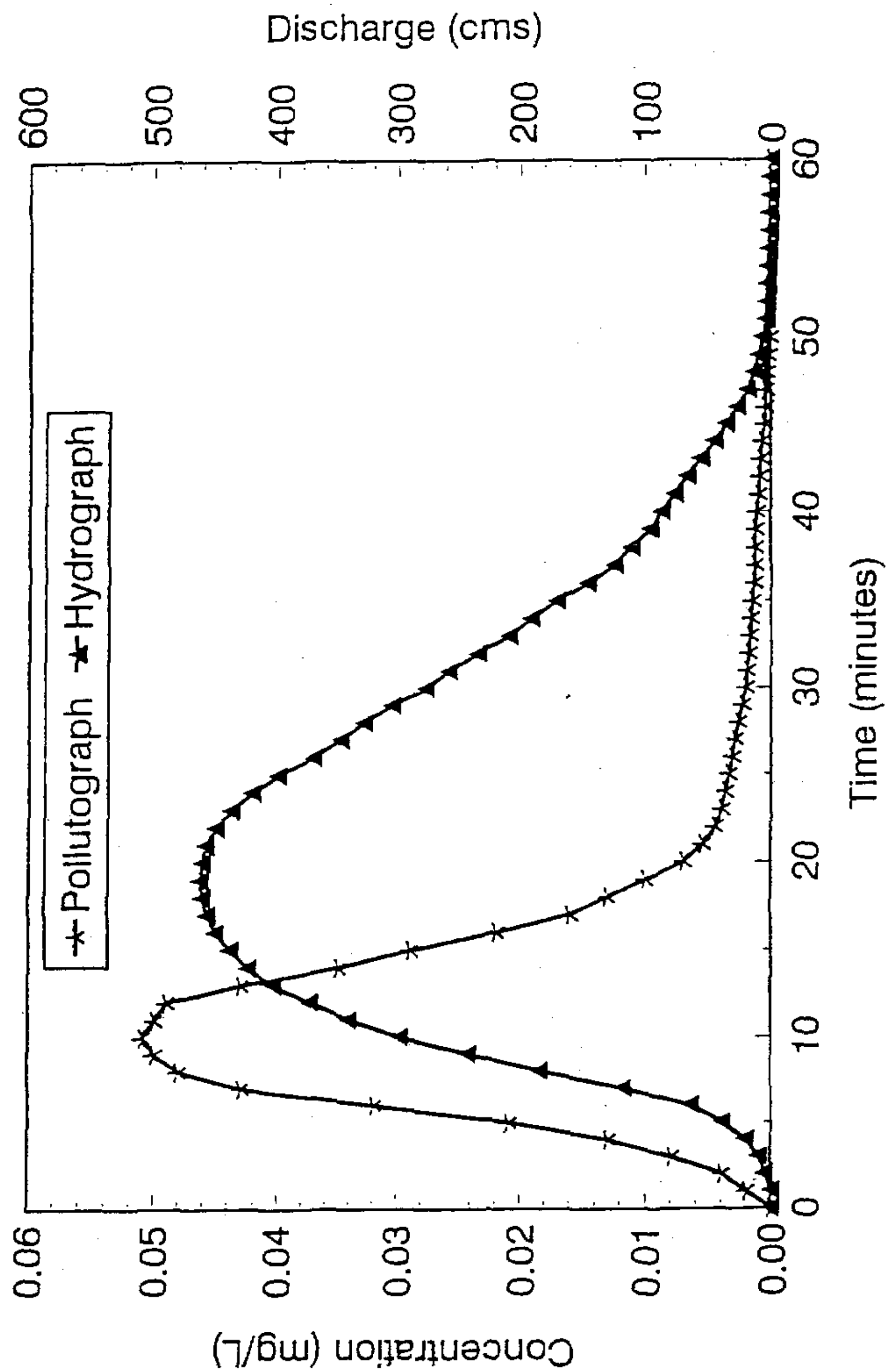
Mancini and Plummer (1986) also describe three types of water quality impacts associated with urban runoff. The first impact is distinguished by short-term changes in water quality during and just after storm events. One such change could be organism fatality due to the increase in toxins concentrations associated with storm events. The second impact is characterized by long-term changes in water quality. These changes can result from contaminants associated with suspended solids settling in the water body or from nutrients that enter a receiving body that has a long retention time. The last impact from urban runoff on water quality relates to scour and resuspension of sediment and associated pollutants. Resuspension essentially reintroduces the pollutants to the receiving body by removing them from a sink source.

During a storm event, high flows along impervious areas have a tendency to scour litter, animal droppings, particulates, and other contaminants that have settled during the preceding periods of low flows and velocities. The contaminants become resuspended and become part of the "first flush", the more polluted portion of the stormwater runoff flows and subsequent discharges. This "first flush" of stormwater can, upon discharging into the receiving water body, carry 90% of the pollutant load for the associated storm event (Miller, 1985).

Figure 3.1 depicts the concept of first flush. The concentration pollutograph exhibits a larger peak at an earlier onset as compared to the discharge hydrograph for the given storm event. In theory, if the first flush of the storm event could be diverted and subsequently treated before release into the receiving water body, the pollutant load on the receiving water would be greatly diminished.

Figure 3.1

Hypothetical Pollutograph/Hydrograph



3.2 RESPONSIBILITY: AGENCIES/GROUPS

Orleans Parish

The New Orleans Sewerage and Water Board (S&WB) and the City of New Orleans share responsibility for the drainage system in Orleans Parish. The Department of Streets of the City of New Orleans is responsible for the installation of all street subsurface drainage while the S&WB is responsible for the maintenance of all subsurface drainage and the maintenance and replacement of all lines 36 inches in diameter and larger. The S&WB is also responsible for the construction, operation and maintenance of all canals and pump stations. The Port Authority of New Orleans and the Orleans Levee District each own properties whose runoff enters the Orleans Parish drainage system.

Jefferson Parish

The Parish of Jefferson is the primary sponsor of the Stormwater Permit Application for Jefferson Parish and will be principally responsible for implementation of its management plan. The Department of Transportation and Development owns and operates the interstate roadway system that traverses both Orleans and Jefferson Parishes. The State of Louisiana, and the Department of Transportation and Development have joined both Jefferson and Orleans Parishes as co-permittee for their Stormwater Permit Applications.

Local Conditions

Metropolitan New Orleans has an annual precipitation of approximately 60 inches (see Table 3.6). The Orleans Parish drainage system, overseen by the S&WB, serves approximately 55,000 acres of industrial, commercial, and residential areas. Figure 3.2 outlines this drainage system which consists of a network of subsurface pipes, open and enclosed canals, and 21 major pumping stations (Army Corps of Engineers, 1992). This system stands in contrast to conventional drainage systems, which rely on gravity discharge.

Figure 3.2

Orleans Drainage System

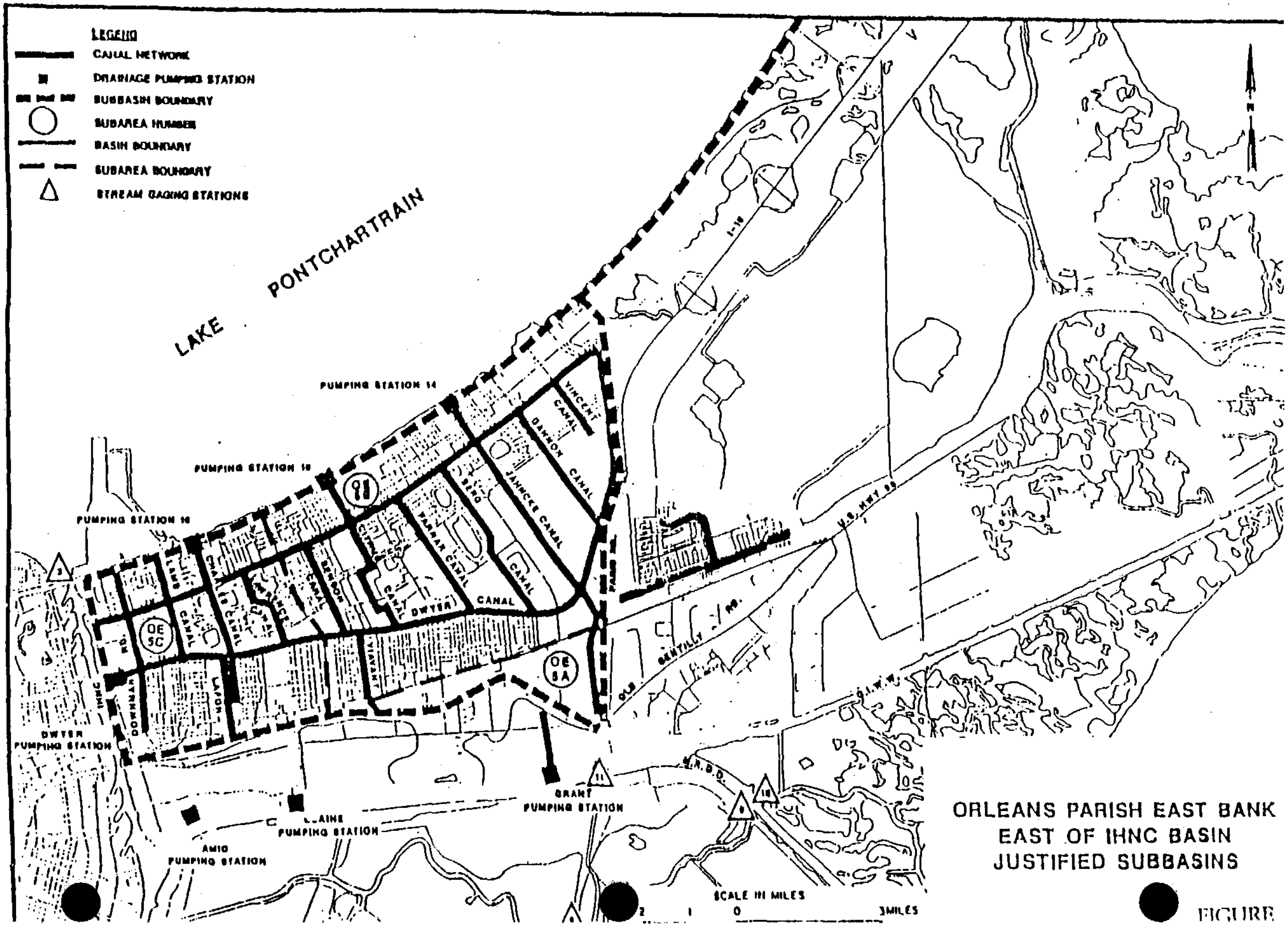


Table 3.6

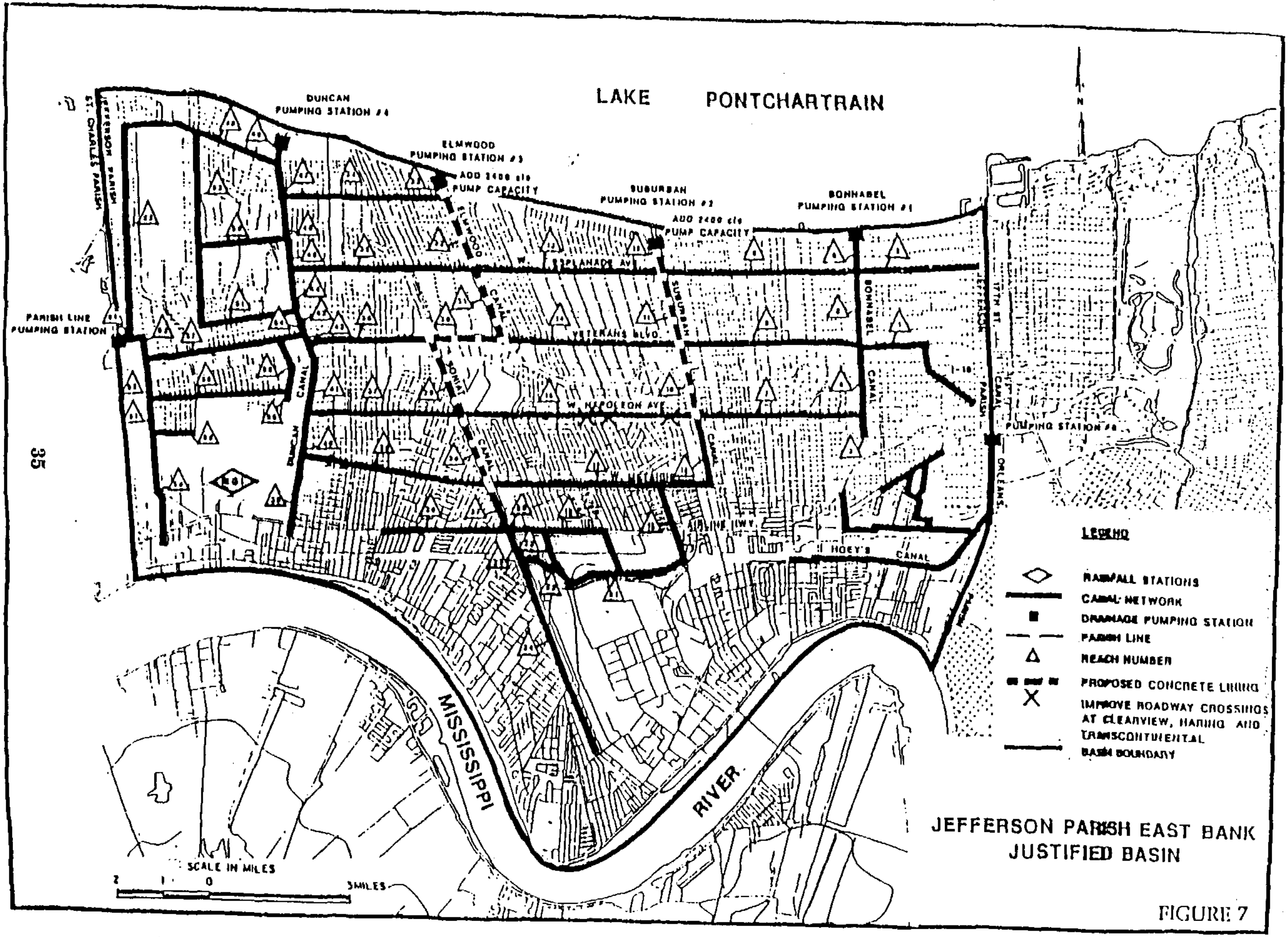
Ten Year Percipitation Record

LPBF Comprehensive Management Plan - Phase III

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1984	4.10	5.27	4.90	1.72	3.54	7.21	3.86	9.51	3.79	2.84	2.80	2.53	52.07
1985	4.83	9.28	7.07	2.11	1.16	4.56	6.92	6.37	5.74	13.20	0.96	4.78	66.98
1986	3.49	2.93	1.88	1.50	1.61	8.87	3.60	6.74	1.42	2.87	7.90	5.05	47.86
1987	8.88	7.38	4.39	2.27	3.46	15.01	6.38	5.05	1.29	0.72	2.92	2.88	60.63
1988	3.74	11.31	8.90	9.25	1.68	11.28	6.78	7.53	5.86	2.87	1.26	3.94	74.40
1989	2.47	0.15	7.14	3.20	3.50	8.22	8.34	3.31	4.53	0.51	19.81	6.28	67.46
1990	7.59	11.45	5.98	4.59	5.87	1.01	2.30	2.45	4.55	2.38	3.21	9.67	61.05
1991	19.25	5.42	6.27	15.29	14.28	10.71	13.15	7.86	3.44	1.88	2.19	2.63	102.37
1992	9.94	8.73	6.69	2.52	0.95	9.52	5.75	9.64	6.63	0.55	15.27	5.68	81.87
1993	6.21	2.34	5.65	6.82	7.23	4.96	5.77	2.26	2.47	3.67		2.90	50.28
1994	3.25	0.54											3.79
Record													
Mean*	5.01	5.21	5.30	4.85	4.75	5.33	6.72	6.08	5.38	3.06	4.48	5.13	61.30

The pumping system is required for discharge because of the city's topography and levee system. The areas near the Mississippi River and Lake Pontchartrain are relatively high, approximately equal to sea level. The interior of the city is relatively low, approximately four feet below sea level. Additionally, the city is surrounded by hurricane protection levees. Therefore, to drain the city after a storm event, the water must be pumped from the interior over the levees to the Mississippi River, Lake Pontchartrain, the Gulf Intracoastal Waterway (GIWW), or the Inner Harbor Navigation Canal (IHNC).

The East Bank of Jefferson Parish has a drainage basin of approximately 30,710 acres. The Jefferson Parish drainage system consists of a network of subsurface culverts, ditches, canals, and pumping stations (see Figure 3.3). As with the Orleans Parish system, this system requires pumping to drain the storm water from the area, since most areas of Jefferson Parish have lower land elevations than the surrounding water surface elevations (COE, 1992). Pumping stations operate to maintain specific water surface elevations. When those elevation levels are exceeded, the pumps are engaged to discharge the surplus water into Lake Pontchartrain. (See comment, Appendix A, Letter 1.)



JEFFERSON PARISH EAST BANK JUSTIFIED BASIN

FIGURE 7

Both Orleans and Jefferson Parishes have conducted storm event sampling and analysis of stormwater from outfalls into drainage canals for their Stormwater Permit Application. The results of this data collection show considerable variation in stormwater quality from site to site and from event to event at the same site. In general, the water quality results were similar to the standard National Urban Runoff Program (NURP) data. Fecal coliform counts were high in several samples indicating the presence of possible overflows, bypasses, inappropriate connections or cross connections to the sanitary sewer system. (See comment, Appendix A, Letter 3.) Total load projections were similar with NURP projections for BOD_5, COD, TKN, and total phosphorus. Load estimates for TSS and lead were significantly lower than NURP projections (Montgomery Watson, 1993).

Based on existing studies, data, and reports, fecal coliform (and attendant pathogens) is the primary constituent of concern. Secondary concerns include oil and grease, nutrients, and metals. Sediments, pesticides, and organic enrichment do not appear to be priority problems.

3.3 *ALTERNATIVE SOLUTIONS* (Projects/Managements)

A. Application of the EPA's "User's Guide" for the elimination of inappropriate connections.

The Storm and combined Sewer Pollution Control Program of the Office of Research and Development, Environmental Protection Agency (EPA), and the NPDES Program Branch have supported the development of a User's Guide (Pitt, et al, 1992) for the investigation of inappropriate entries to storm drainage systems. The User's Guide (Pitt, et al, 1992) is designed to provide information and guidance to local agencies by meeting the following objectives:

1. Identify and describe the most common potential sources of inappropriate pollutant entries into storm drainage systems.

2. Describe a procedure that will allow a user to determine whether significant inappropriate pollutant entries are present in a storm drainage system, and then to identify the type of source, as an aid to the ultimate location of the source.

The User's Guide (Pitt, et al, 1992) was prepared in conjunction with a background study by Pitt and Lalor (EPA, 1983) which examined three categories of non-stormwater outfall discharges:

- pathogenic/toxicant,
- nuisance and aquatic life threatening, and
- clean water.

The most important category is outfall discharges containing pathogenic or toxic pollutants. The most likely sources for this category are sanitary or industrial wastewaters. The outfall analysis procedure described in the User's Guide (Pitt, et al, 1993) has a high probability of identifying all of the outfalls in this most critical category. High probabilities of detection of other contaminated outfalls are also likely when using the procedures. After identification of the contaminated outfalls, their associated drainage areas can then be subjected to a detailed source identification investigation. The identified pollutant sources can then be corrected (Barbe', et al, 1993).

B. Eliminate Infiltration/Inflow, Overflows and Bypasses.

Sewer system overflows and bypasses are a significant source of contamination of receiving waters. This source should be controlled by the expansion of programs that address the problem through major structural controls such as Infiltration/Inflow Abatement Programs, Overflow/Bypass Repair Programs, and Sewer System Capital Improvement Programs. Infiltration/Inflow Analysis and Abatement Programs such as currently undertaken by S&WB and the City of New Orleans and Jefferson Parish should be pursued.

C. Floating skimmers in channel to remove oil/grease and/or the Flow Balancing Method.

An innovative water quality improvement technology that might offer a much lower cost alternative is the flow balancing method. It has over ten years of successful application for stormwater pollution control on freshwater lakes.

The concept of the flow balancing method is to create a temporary holding "tank" for the polluted water within the receiving body of water at the outfall. The tank is formed by a chain of pontoons in the receiving body of water from which is hung a heavy curtain-like material to form the wall of the tank. The stormwater runoff flows into the tank and displaces the clean water that is normally in the tank. After the overflow event has stopped, the polluted water is pumped back to a waste water treatment plant for processing. The tank structure also functions as a natural capturing system for the floatables that are typically carried by the stormwater.

A modification of this technology to address the high flows and pollution problems in Lake Pontchartrain could be effective. The modification is a flow through system with disinfection capability to eliminate the fecal coliform problem in the Lake.

The possible advantages of system compared to other approaches are:

- Lower cost to construct
- Low operation and maintenance costs
- Flexibility
- Fast installation
- Little construction disruption at the site
- Removable, can be moved to another site if problem is solved by pollution prevention activities

D. Eliminate direct connection of roof drains to streets.

Roof drains (and other connections to the storm drainage system) should have a filter strip before connection to the storm drainage system. (See comment, Appendix A, Letter 1.)

A filter strip is a strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and waste water. Its purpose is to remove sediment and other pollutants from runoff or waste water by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization before it enters natural watercourses or man-made channels so that water quality is not degraded.

E. Constructed Wetlands.

Wetlands act as a natural filter for many waterborne pollutants. Wetlands occurring at or near the mouths of rivers, bayous, and streams filter pollutants discharged from these watercourses. Constructing manmade wetlands at the mouths of pumping station discharge canals should be considered for increased filtration.

F. Stormwater Treatment/Diversions.

Diverting stormwater to treatment facilities and subsequent discharge to waterbodies or wetlands more readily able to assimilate pollutants should be considered. Jefferson Parish has undertaken a project to divert a portion of the Parish's east bank stormwater from discharge into Lake Pontchartrain to the Parish's Elmwood treatment facility. After treatment the stormwater will be discharged into the Mississippi River.

G. Bioremediation.

Bioremediation is the introduction of an artificially generated microorganism into a system to destroy a pollutant. Once the pollutant is destroyed (consumed) by the microorganisms, the microorganisms naturally expire. Bioremediation should be considered for introduction into Orleans and Jefferson Parish drainage canals as a means to reduce pollution (particularly pathogens) in urban stormwater.

H. Education.

Public education and public participation programs that increase awareness of existing programs and ordinances and solicit support of the public are important tools for the management and reduction of stormwater runoff pollution. Stormwater education programs currently underway in Orleans and Jefferson Parishes have increased the public's awareness of the value of source controls. These education programs are the most cost effective method to reduce pollution from urban runoff. The programs should be continued and expanded to other Pontchartrain Basin Parishes. (See comment, Appendix A, Letter 1.)

I. Program/Planning to Reopen Historic Lake Swimming Areas.

Recent water quality samples indicate that Lake Pontchartrain's health is improving. With implementation of additional water quality improvement projects and programs, the Lake's south shore could be swimmable within the next five years. In order to reopen the south shore to swimming, a site specific testing and monitoring program should be developed and implemented with DHH. The testing and monitoring program should use DHH criteria for primary contact recreation.

As the Lake's health improves, so will the public's use of the Lake. Significant increased usage will likely result along the densely populated south shore. Existing lakefront facilities may not be adequate to accommodate increased usage. A master plan should be prepared for the anticipated increased use of the south shore. The master plan should identify and address: specific public uses of the Lake, possible sites for facilities (both existing and new), improved access, and possible impacts both to the Lake and surrounding areas. The master plan should be developed with the public, the City of New Orleans, Jefferson Parish, local agencies, and area universities. (See comment, Appendix A, Letter 1.)

3.4 REFERENCES

Army Corps of Engineers. *Jefferson and Orleans Parishes, Louisiana Urban Flood Control and Water Quality Management*. U.S. Army Corps of Engineers, New Orleans District: New Orleans. 1992.

Barbe', D. E., Pitt, R., Lalor, M., Adrian, D., and Field, R., 1993. A Methodology for the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems, *Transportation Research Board Record*, No. 1420, Transportation Research Board, National Research Council, National Academy Press, Washington, D.C., pp. 49-55.

Bastian, R.K. "Potential Impacts on Receiving Waters." In *Urban Runoff Quality--Impact and Quality Enhancement Technology*. Proceedings of an Engineering Foundation Conference. American Society of Civil Engineers: New York. 1986.

EPA (U.S. Environmental Protection Agency). Results of the Nationwide Urban Runoff Program, Water Planning Division, PB 84-185552, Washington, D.C., December 1983.

EPA. "1985 Criteria." *Federal Register*. 50: 145. July 29, 1985.

EPA. *Managing Nonpoint Source Pollution: Final Report to Congress on Section 319 of the Clean Water Act (1989)*. EPA/506/9-90. U.S. Environmental Protection Agency: Washington, D.C. 1990.

EPA. *National Water Quality Inventory: Report to Congress*. U.S. Environmental Protection Agency: Washington, D.C. 1986.

EPA. *Nonpoint Sources: Agenda for the Future*. WH556. U.S. Environmental Protection Agency, Office of Water: Washington, D.C. 1989.

EPA. *Results of the Nationwide Urban Runoff Program*, Final Report. NTIS Accession No. PB84-185552. U.S. Environmental Protection Agency: Washington, D.C., 1983.

Freeman, A.M. III. "Water Pollution Policy." In *Public Policies for Environmental Protection*. Ed. P.R. Portney. Resources for the Future: Washington, D.C. 1990.

Livingston, E.H. "Use of Wetlands for Urban Stormwater Management." in *Constructed Wetlands for Wastewater Treatment: Municipal, Industrial and Agricultural*. Ed.: D.A. Hammer. Lewis Publishers: Chelsea, MI. 1989.

Mancini, J.L. and A.H. Plummer. "Urban Runoff and Water Quality Criteria." In *Urban Runoff Quality--Impact and Quality Enhancement Technology*. Proceedings of an Engineering Foundation Conference. American Society of Civil Engineers: New York. 1986.

Montgomery Watson. NPDES Storm Water Permit - Part 2, Permit Application, Volume A, Jefferson Parish, Louisiana.

Miller, R.A. *Percentage Entrainment of Constituent Loads in Urban Runoff, South Florida.* USGS WRI 84-4319. U.S. Geological Survey: Washington, D.C. 1985.

National Oceanic and Atmospheric Administration. *Local Climatological Data Annual Summary, 1992.*

Novotny, V. and G. Chesters. *Handbook of Nonpoint Pollution: Sources and Management.* Van Nostrand Reinhold: New York. 1981.

Pitt, R., Lalor, M., Barbe', D., Adrian, D., and Field, R. Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - *A User's Guide*, Research Report Number 92-09, Urban Waste Management & Research Center, University of New Orleans, New Orleans, LA, 1992.

Sources and Management. Van Nostrand Reinhold: New York. 1981.

Stahre, P. and B. Urbonas. *Stormwater: Best Management Practices and Detention for Water Quality, Drainage, and CSO Management.* Prentice Hall: Englewood Cliffs, NJ. 1993.

Tchobanoglous, G. and E.D. Schroeder. *Water Quality: Characteristics, Modeling, and Modification.* Addison-Wesley: Reading, MA. 1987.

Subcommittee Report:

SALTWATER INTRUSION/WETLAND LOSS

Chairman: John A. Lopez, M.Sc.

5/12/95

4.0 INTRODUCTION

Saltwater intrusion and wetland loss are intimately related problems and for that reason were addressed together. It is widely accepted that both wetland loss and saltwater intrusion are both occurring within the Basin. Wetland loss has recently been well documented for current and historical rates. This work was completed by one of our committee members, Del Britsch, from the Corps of Engineers (COE). COE unpublished maps of wetland loss were integral to this analysis. In contrast, documentation of saltwater intrusion is less complete and more complex in assessing its impact. Saltwater intrusion information was only used in the general sense of the committee's experience or inferences made from hydrologic principles. Generally, it was assumed that higher salinities have exacerbated the wetland loss in the Basin. However, it was not assumed that the sole means to reduce wetland loss was by reduction of salinities.

It was also recognized by the Saltwater Intrusion and Wetlands Loss Committee (SIWLC) that developed this report that there are at least four intractable causes for salt water intrusion and wetland loss. These intractable causes are:

- subsidence
- sea level rise
- Mississippi River levee network
- natural deltaic abandonment

These causes serve as important reality checks since in some places in the Basin these causes may be so overwhelming that there can be no significant remediation to wetland loss or saltwater intrusion.

Many proposed methods to address wetland loss or saltwater intrusion are untested or at least have low predictability of success. A final major variable is the wetland itself. Because of the great variety of settings in a complex estuarine system, even identical projects could have dramatically different results in different sites within the Basin. In the final analysis, it can be said that all projects are in effect pilot projects and must be evaluated individually. For this reason the SIWLC has not taken general positions on particular types of projects, such as diversions versus hydrologic barriers. Instead we have sub-divided the Basin and attempted to evaluate the local system and the likely results of a particular project to that portion of the Basin. The "value added" of a potential project was weighed against not only the impact on the Basin but also with respect to the Basin users.

To simplify saltwater intrusion and wetland loss investigations the Pontchartrain Basin was divided into three sub-basins (Figure 4.1). The sub-basins are:

A. Upper/Middle Basin - Lake Pontchartrain & Lake Maurepas system (Figs. 4.2, 4.3)
B. Lower Basin: Biloxi Marsh, Lake Borgne, Mississippi & Chandeleur Sounds (Fig. 4.4)
C. Breton Basin - Mississippi River delta (Figs. 4.5, 4.6)

The sub-basin boundaries only differ from the Comprehensive Wetlands Planning, Protection, and Restoration Act (CWPPRA) basin boundaries at the land bridge between Lake Pontchartrain and Borgne where the land bridge is split along Highway 90. (See comment, Appendix A, Letter 1.)

4.1 PROBLEM IDENTIFICATION

The primary sources of information for developing problem statements varied somewhat for the different sub-basins. Past CMP documentation was used for the Upper/Middle Sub-Basin (Emmer, R.E., 1992). A video recording of a public meeting addressing the MRGO was used for the Lower Basin (Harker, 1993). In all the sub-basins, COE unpublished wetland loss maps and statistics

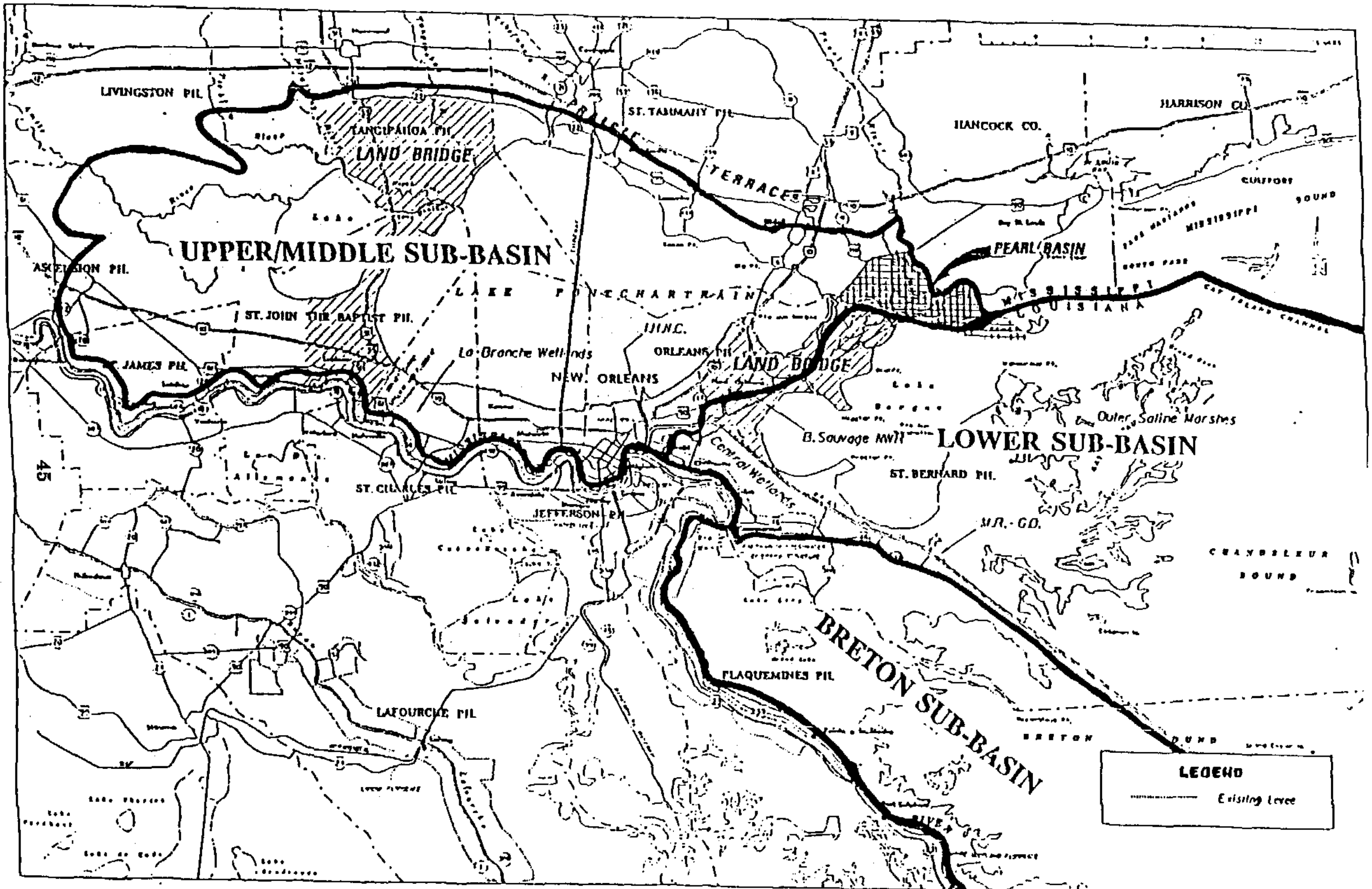


Figure 4.1 Pontchartrain Sub-Basins
Sub-Basin Boundaries

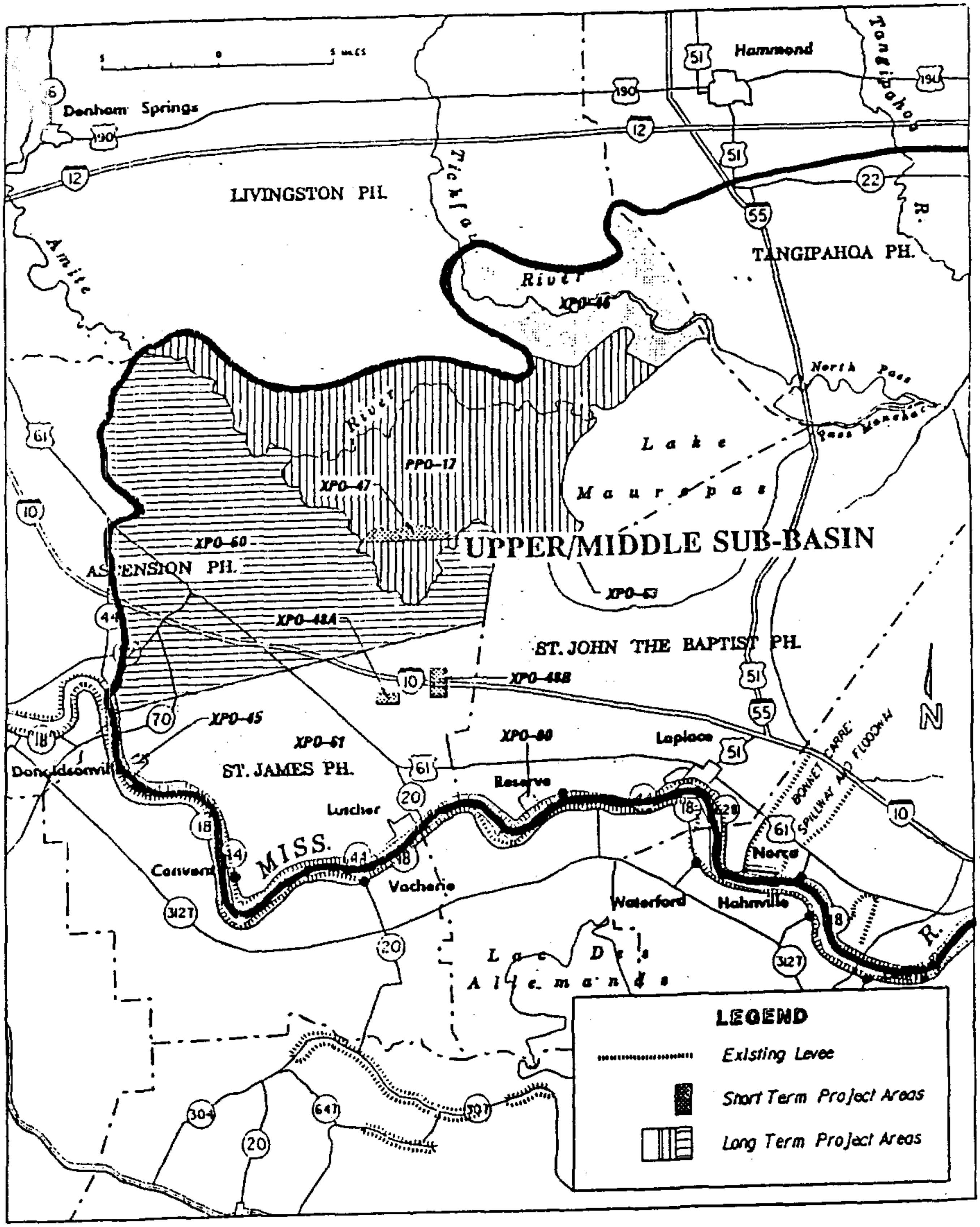


Figure 4.2 Upper/Middle Sub-Basin
Project Locations

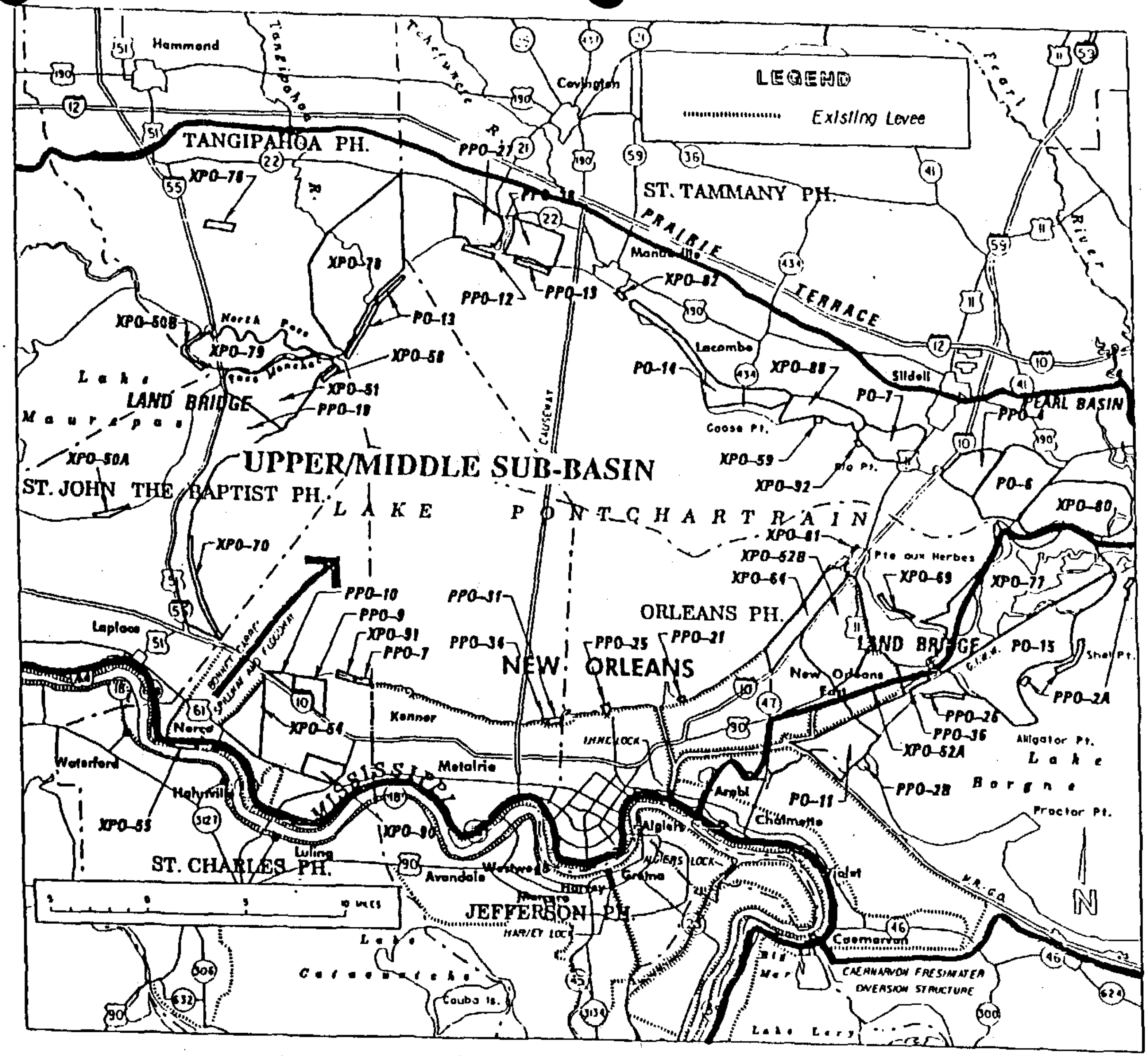


Figure 4.3 Upper/Middle Sub-Basin
Project Locations

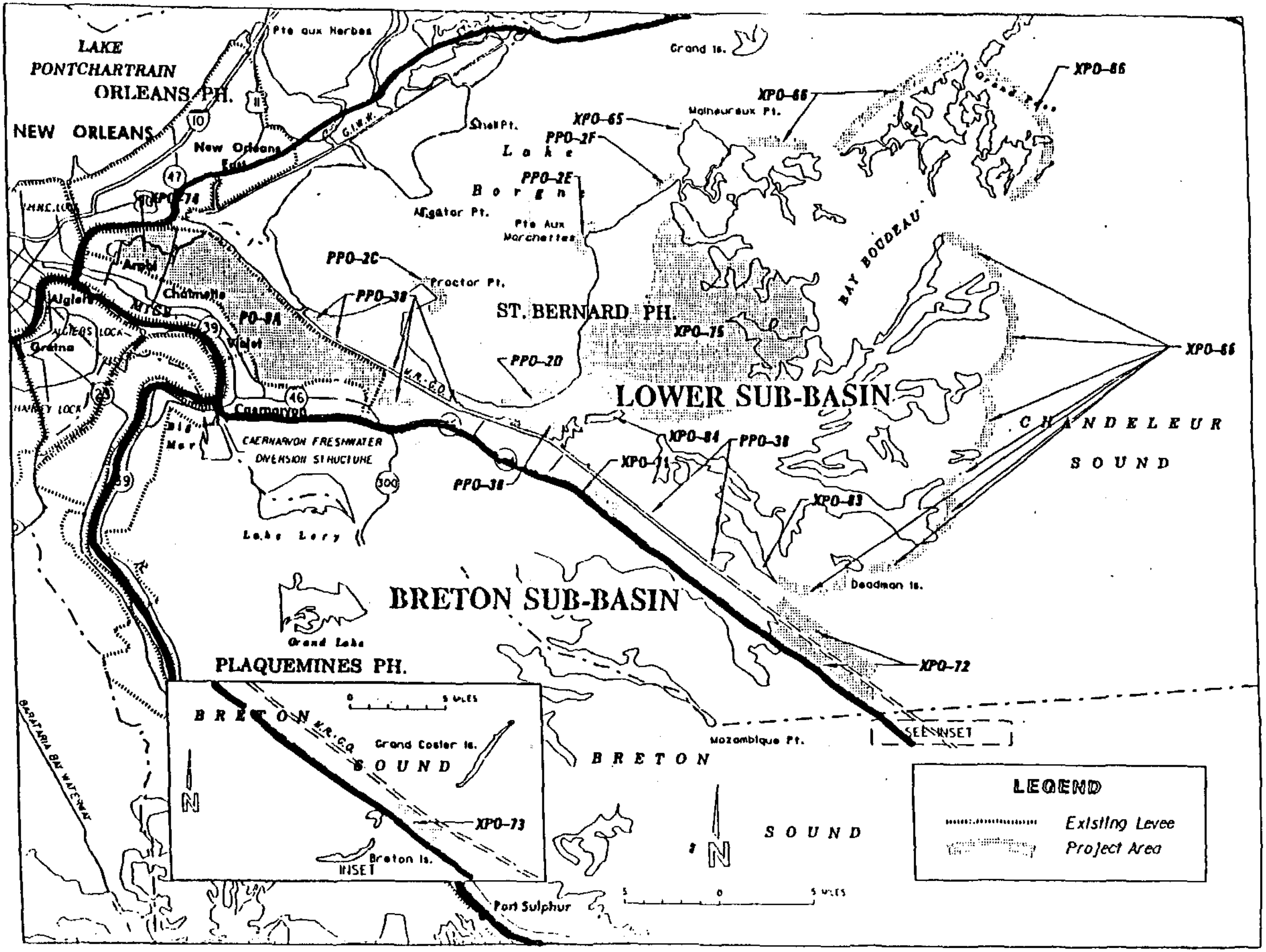


Figure 4.4 Lower Sub-Basin
Project Locations