State of Louisiana

EDWIN W. EDWARDS
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

WILLIAM C. HULS
SECRETARY

August 8, 1984

Colonel Robert C. Lee
District Engineer
New Orleans District, Corps of
Engineers
P. O. Box 60267
New Orleans, LA 70160

RE: C840314
Freshwater Diversion to Barataria and Breton Sound Basins Feasibility Study

Dear Colonel Lee:

Because of the importance of wetlands, and the vast fisheries and biological resources which they support, we have reviewed this project in great anticipation of the benefits which the State of Louisiana and the nation will derive. Land loss, particularly in these basins, has been documented to be occurring at unprecedented rates, with estimates as high as 102 km^2/yr. or 0.8% annually (Gagliano et al. 1981).

The reasons for this disappearance of wetlands are complex, with subsidence, lack of sediment input, salt water intrusion and canal dredging being the main contributors. Therefore, the implementation of freshwater diversion into Barataria and Breton estuaries will serve to increase productivity and slow land loss by the introduction of the sediment rich, freshwater from the Mississippi River.

A review of the applicable coastal use guidelines for freshwater diversion i.e. 7.1, 7.2, 7.4, 7.5 and 7.7 indicates that at this time the tentatively selected plan is consistent with the Louisiana Coastal Resources Program to the maximum extent practicable, in accordance with the Coastal Zone Management Act of 1972 (as amended), and the NOAA consistency regulations 15 CFR 930.30. However, the Coastal Management Division would appreciate the opportunity to comment as required by 15 CFR 930.37(c) on any future changes or supplemental reports which may result as the project is further developed, so that a consistency determination can be made as each major decision is made.

Again, we urge the Corps to move ahead with the tentatively selected plan, and we look forward to working with you in the future on this important, and worthwhile project.

Sincerely,

William C. Huls

By: C. G. Groat

WCH:CGG/ct

cc: Peter Tweedt
Ann Berger-Blundon

SUMMARY

SEPTEMBER 11, 1989 MEETING OF BARATARIA BASIN POLICY TEAM

HARVEY, LA.

On Monday, September 11, 1989, the fourth meeting of the Barataria Basin Policy Team (BBPT) was held in Room 1 on the second floor of the Jefferson Parish School Board Building, 501 Manhattan Blvd., Harvey, La. Roll call was at 9:36 A.M. Thirteen of the possible 25 representatives or alternates were present. Two representatives or alternates arrived after the roll call. A total of 15 representatives or alternates were present (Attachment).

The Summary of the August 29 Meeting of the BBPT was reviewed and accepted without modification or objection.

There was no old business to complete or technical reports to receive. Discussion moved directly into the consideration of the Passive policy statements for EMU 1. The Policy Team members discussed and analyzed the proposed policy statements. Several policies were modified and/or moved to other sections. Work was intensive from the opening until adjournment at approximately 3:40 P.M. Mr. Dugan Sabins, DEQ, will make a short report to the Policy Team on possible definitions of the term "full" as it applies to sewage treatment.

Several decisions were made by the Policy Team. First, the Facilitator will compile the revised policy statements for EMU 1 and the policies for Short-term Active projects for EMU 2. These will be distributed to the Policy Team within two weeks of the September 11 meeting. Second, the Facilitator will review the Policy statements for EMUs 3 and 4 and identify those which are similar to those revised for EMUs 1 and 2. This summary will be sent to the Policy Team with the revised policy statements. Third, the Policy

Team unaminuously voted to add a representative of the Governor's Coastal Advisory Committee and the National Park Service to the BBPT. Total membership of the BBPT is now 27. It was emphasized that these new members must agree to be active participants. Fourth, the issue of what constitutes a Quorum will be decided at the fifth BBPT meeting. Finally, the next meeting of the BBPT will be on **October 12, 1989 at 9:30 A.M. in the LOUISIANA ROOM on the first floor of the NEW Department of Wildlife and Fisheries Building on Quail Drive in Baton Rouge.** Exit I-10 at Essen Lane and drive to Perkins Road. Turn right on Perkins Road and travel approximately two miles. Turn left on Quail Drive. The new building is past the bridge on the left. See Attached map.

Mr. Greg DuCote has requested that Mr. Dugan Sabins, DEQ, make a twenty minute presentation on the relationship between DEQ and DHH and their respective water quality programs on point and non-point source pollution abatement. Mr. Sabins has been asked to have a written supplement for each BBPT representative.

Barataria Basin Policy Team

SEPTEMBER 11, 1989 Meeting
Harvey, La.

ROLL CALL

FEDERAL

Corps of Engineers, New Orleans District -- Oscar Rowe

Environmental Protection Agency, Region VI -- Laura Townsend

Fish and Wildlife Service, Lafayette, La. -- Gerry Bodin

National Marine Fisheries Service, B.R., La. -- Ric Ruebsamen

National Oceanic and Atmospheric Administration -- Absent

Soil Conservation Service, Alexandria, La. -- Bill Savant

STATE

Environmental Quality -- Dugin Sabins

Health and Hospitals -- Absent

Natural Resources -- Greg DuCote

Wildlife and Fisheries -- Absent

LUMCON -- Lawrence Rozas

PARISHES

Assumption -- Absent

Jefferson -- John Uhl

Lafourche -- Ed Fike

Orleans -- Absent

Plaquemines -- Absent

St. Charles -- Gretchen Binet

St. James -- Kermit Kraemer

St. John -- Absent

SPECIAL INTEREST

Commercial fishing -- Absent

Conservation - Louisiana Nature Conservancy -- Absent

Land owners -- Allen Ensminger

Oil and gas industry -- Vincent Cottone

Sportsmen -- Edgar Veillon

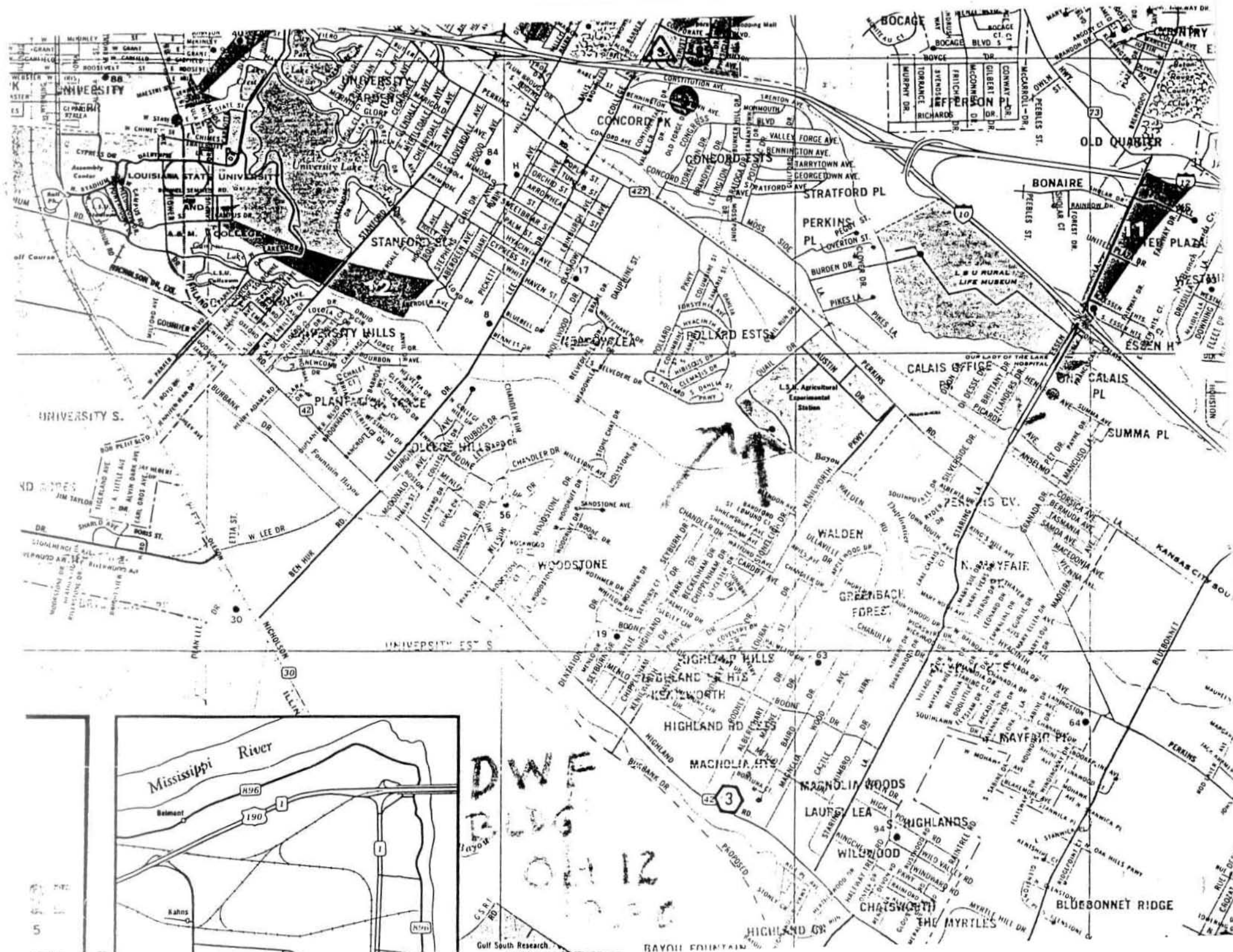
Trapping -- Absent

INTRODUCTION OF ALTERNATES AND VISITORS

Richard Hartman
Sam Holder
Frank Ehert
Chuck Killebrew
Mike Lyons
George Neusaenger
Ramona Mayer

15 PRESENT; 10 ABSENT

A QUORUM = 12 PRESENT.


UNIVERSITY
LOUISIANA STATE UNIVERSITY
STANFORD
UNIVERSITY PARK
University Lake
CONCORD PK
CONCORD ESTS
STRATFORD PL
PERKINS PL
BONAIRE
OLD QUARTER
L S U RURAL LIFE MUSEUM
UNIVERSITY HILLS
HOLLYDALE
POLLARD ESTS
CALAIS OFFICE
L.S.U. Agricultural Experimental Station
CALAIS PL
SUMMA PL
PLANTATION PLACE
COLLEGE HILLS
WOODSTONE
WALDEN
N. MAYFAIR
GREENBACK FOREST
HIGHLAND HILLS
HIGHLAND HTS
KENILWORTH
HIGHLAND RD
MAGNOLIA HTS
MAGNOLIA WOODS
LAUREL LEA
S. HIGHLANDS
WILDWOOD
CHATSWORTH
THE MYRTLES
BLUEBONNET RIDGE
MAYFAIR PLOP
UNIVERSITY S.
UNIVERSITY EST S
BAYOU FOUNTAIN
Mississippi River
Belmont
Kahns
Gulf South Research

WORKING DRAFT

RECOMMENDATIONS FOR POLICIES AND ACTIONS

in the

BARATARIA BASIN, LOUISIANA

prepared by

BARATARIA BASIN POLICY TEAM

SEPTEMBER 11, 1989

Rod E. Emmer, PhD.
Facilitator

9-26-87 Don Elguezabal - COE

Congressman Tauzin requested consideration of alternative alignments of Davis Pond project. Development interests want new alignment. COE will do preliminary evaluation of alternatives may be ready the end of Oct. Steering meeting with Parish Council (St Charles) on Oct 21. COE not anxious to revise will delay project a min. of one year and compleate hurricane protection levee project.

Dom Elguezabal
862-2599
Manager for Davis
Pond Project

ATTENDANCE RECORD

DATE(S)	SPONSORING ORGANIZATION	LOCATION
12/14/89	USCOE	LA DVV + F Bldg. Baton Rouge

PURPOSE Davis Pond Rock Weir

PARTICIPANT REGISTER *

NAME	ORGANIZATION	TELEPHONE NUMBER
Dom Elguezabal	LMNLC	862-2599
Carl E. Anderson	LMN ED	862-2610
Peggy M. Jones	NMFS	389-0508
Pamela A. DeLoach	LMNED	862-2621
Lisa Montelepre	LMNED-HD	862-2425
Ronny Paille	USFWS	318-264-6630
David Vigh	CELMN-PD-RE	504-862-2540
Bill Good	DNR/CRD	504-342-7305
John de Mond	CMD/DNR	504-342-7591
Gregory J. DuCote	DNR/CMD	504/342-7591

LMV FORM 583-R
(replaces LMN 906)
AUG 87

* If you wish to be furnished a copy of the attendance record, please indicate so next to your name.

PROPONENT: CELMV-IM

Rec'd 10-11-89

State of Louisiana

OFFICE OF THE GOVERNOR

Baton Rouge

70804-9004

BUDDY ROEMER
GOVERNOR

September 28, 1989

POST OFFICE BOX 94004
(504) 342-7015

Colonel Richard V. Gorski, District Engineer
U.S. Army Corps of Engineers
New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

Dear Colonel Gorski:

Reference is made to your September 21, 1989, letter inquiring about the State's intentions relative to the Bonnet Carre' Freshwater Diversion Project. It is my understanding that we are being asked to agree to contribute 20 percent (approximately $15 million) of the currently estimated first cost of the project and a like percentage of the annual operation and maintenance costs.

During a recent meeting, my Wetlands Conservation and Restoration Task Force reviewed the merits of both the Bonnet Carre' and the Davis Pond Freshwater Diversion Projects in light of this State's current wetland policy and its fiscal capability for cost-sharing in the construction of such projects. Based on these considerations, it was that group's unanimous recommendation that the State agree to provide 25 percent of the cost of construction, operation, and maintenance of the Davis Pond Structure despite Congressional authorization of that project at 100 percent federal cost. I fully support that recommendation contingent upon a federal commitment that the project schedule will be expedited to begin the construction phase (real estate acquisition) for the Davis Pond Project in federal fiscal year 1991, or earlier.

I also support the additional recommendation of my Task Force that the Bonnet Carre' project be put on hold until it can be compared with more efficient alternative vegetated wetland enhancement uses for limited Mississippi River water and sediment resources. This comparison could be accomplished during the cost-shared Louisiana Comprehensive Coastal Wetland Planning effort to be initiated this fall.

Clearly, projects like Davis Pond that enhance and conserve vegetated wetlands in a cost-effective manner are consistent with the Presidents's announced goal of no net loss of wetlands. We trust that you will support this State's recommendations to further that goal.

To advance further discussion on this matter, please contact David Soileau, my Coastal Activities Coordinator, at (504) 765-2812.

Sincerely,

Buddy Roemer

Buddy Roemer
Governor

cc: David Soileau
Raymond W. Stephens, Jr.

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

SEP 21 1989

Life Cycle Project
Management Office

Honorable Buddy Roemer III
Governor of Louisiana
Post Office Box 94004
Baton Rouge, Louisiana 70804

Dear Governor Roemer:

We have been advised that the Office of Management and Budget has completed its reexamination of the Mississippi and Louisiana Estuarine Areas project (the so-called Bonnet Carre' freshwater diversion structure). OMB has determined that the project should be treated as the kind of fish and wildlife enhancement project for which 25 percent non-Federal construction and operation and maintenance would be appropriate.

Based on an equitable distribution of benefits received, Louisiana's share is 20 percent and Mississippi's share is 5 percent of project costs. We currently estimate that the cost of construction will be $76 million and the annual cost of operation and maintenance will be $734,000. I enclose a more detailed cost breakout.

If we are to meet our proposed January 1995 completion date, we must conclude a Local Cost-Sharing Agreement by April 1990. In order to make this happen, I will need your written intentions on cost-sharing by October 20, 1989.

Sincerely,

Richard V. Gorski
Colonel, U.S. Army
District Engineer

Enclosure

Revised 12 September 1989

MISSISSIPPI - LOUISIANA ESTUARINE

COST ALLOCATION ($000)

	TOTAL	THRU 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	SCH BAL	PERCENT
TOTAL	76,000	3,337	1,674	9,100	11,200	11,300	23,000	2,800	13,589	100%
FEDERAL	57,000	3,337	474	6,800	8,400	8,500	17,200	2,100	10,189	75%
NON-FEDERAL	19,000	0	1,200	2,300	2,800	2,800	5,800	700	3,400	25%
LOUISIANA	15,200	0	960	1,840	2,240	2,240	4,640	560	2,720	20%
MISSISSIPPI	3,800	0	240	460	560	560	1,160	140	680	5%

Operation, Maintenance & Rehabilitation Yearly Cost (beginning Jan 1995)

TOTAL	734.0
FEDERAL	550.5
NON-FEDERAL	183.5
LOUISIANA	146.8
MISSISSIPPI	36.7

Rec'd 10-11-89

DAVIS POND FRESHWATER DIVERSION STRUCTURE

West Guide Levee Alignments

IMPACTS

Alignment No. 1 - Original alignment:

1. Most expensive alignment for Davis Pond project.
2. Least expensive alignment for Willowdale Hurricane Protection project.
3. Approximately 1,055 acres of wetlands would less likely be developed in the future if agreed to by state and federal agencies
4. Alignment ~~preferred by DNR~~.
5. No direct delays to Davis Pond project.

Alignment No. 2 - Shortest alignment:

1. Least expensive alignment for Davis Pond project. Savings amount to approximately $0.5 million.
2. Most expensive alignment for Willowdale Hurricane Protection. project. Additional cost is approximately $1 million.
3. Approximately 965 acres of wetlands would more likely be developed in the future. However, Section 404 permits would be required.
4. Benefit/cost (B/C) ratio for the Hurricane Protection project would be below 1.0 causing the Hurricane Protection feasibility study not to be initiated. There would be no Federal hurricane project proposed for west bank of St. Charles Parish (Willowdale area).
5. Davis Pond project would be delayed about 1 year to supplement the Environmental Impact Statement (EIS) and complete reviews.
6. Alignment preferred by two local property owners.

Alignment No. 3 - Compromise alignment:

1. Savings to Davis Pond project of about $300,000
2. Increase Willowdale Hurricane Protection project cost about $400,000.
3. Davis Pond project would be delayed about 1 year to supplement the Environmental Impact Statement (EIS) and complete reviews.
4. Approximately 545 acres of wetlands would more likely be developed in the future. However, Section 404 permits would be required.
5. Hurricane Protection project would have a very low B/C ratio and further study may indicate there would be no interest in a Federal hurricane protection project for the west bank of St. Charles Parish (Willowdale area).

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:

October 6, 1989

Life Cycle Project
Management Office

Mr. Gregory J. DuCote
Local Coastal Programs
Coastal Management Division
Department of Natural Resources
P.O. Box 44487
Baton Rouge, Louisiana 70804-4487

Dear Mr. DuCote:

As requested by the St. Charles Parish Council, a public meeting on the alternative west levee alignments for the Davis Pond Freshwater Diversion project has been scheduled for October 12, 1989 at 7:00 P.M. Participation by you, or a member of your staff, is requested.

Sincerely,

Domingo J. Elguezabal
Life Cycle Project Manager
for Project Management

Encl

L_PARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

October 6, 1989

Life Cycle Project
Management Office

Mr. Gregory J. DuCote
Local Coastal Programs
Coastal Management Division
Department of Natural Resources
P.O. Box 44487
Baton Rouge, Louisiana 70804-4487

Dear Mr. DuCote:

As requested by the St. Charles Parish Council, a public meeting on the alternative west levee alignments for the David Pond Freshwater Diversion project has been scheduled for October 12, 1989 at 7:00 P.M. Participation by you, or a member of your staff, is requested.

Sincerely,

Encl

Domingo J. Elguezabal
Life Cycle Project Manager
for Project Management

Mr. Elguezabal

ST. CHARLES PARISH
COUNCIL

P. O. BOX 302 • HAHNVILLE, LOUISIANA 70057
(504)783-6246 (504)466-1990

OCTOBER 5, 1989

P U B L I C N O T I C E

A MEETING HAS BEEN SCHEDULED FOR THURSDAY, OCTOBER 12, 1989, 7:00 P.M., COUNCIL CHAMBERS, COURTHOUSE, HAHNVILLE, TO DISCUSS THE DAVIS POND FRESHWATER DIVERSION PROJECT.

BY ORDER OF THE
COUNCIL CHAIRMAN

s/ STEVE SIRMON
STEVE SIRMON

PUBLISH IN RIVER PARISHES GUIDE
OCTOBER 8, 12

2/15/96 Davis Pond

Carl Anderson - COE / El Bayou / Sue Hawes / David Sifft

1.3' elevation of rock weir.
6 months of impoundment - Jan - June.

LW&P - structure in Bayou Verrette.

COE will consider putting in structure along w/ rock weir or notches in the rock weir.
Purpose of pond is to ~~be~~ equivalate water temp.

Sue - predicted trees on ridges to go to more water tolerant trees. → Cypress.

Ridge = ~2 1/2' elevation.

Sue - 1 week retention time needed to elevate the temperature

If rock weir lowered it may increase velocity of water ~~in~~ ~~coming~~ section.

Flowage easement - area within levee & levee. ~~Other~~
Will buy area ~~and~~ where structure is to be placed.

COE is looking to purchase of W^st area for W^st Bank H&C.

W^st Jefferson Levee District & LP Charles is not happy about mitigation plan.

of 1500 acres - 400 acres would be developed.

25' bottom width of borrow canal on west side

Levee must be 700' off of Highway - Edge of road to center of levee.

2000 - 2400' off road with alternative to put interchange.

70 acres direct impact

Impacts to excluded area - development

90% of fee title goes to flow easement.

1-1½ year for supplemental alignment.

Jensen Beach -

Bonita Loop - part of original I 310

LCA - agreement between State & Fed.
State may buy flowage easement

Col willing to revise roads/facilities but want letter requesting deviation from alignment 1.

EPA - wants EIS for all alternate alignments

L&E&F - does not care which alignment as long as there is a minimum of delay.

Landowners will attempt injunction

Nature Conservancy -

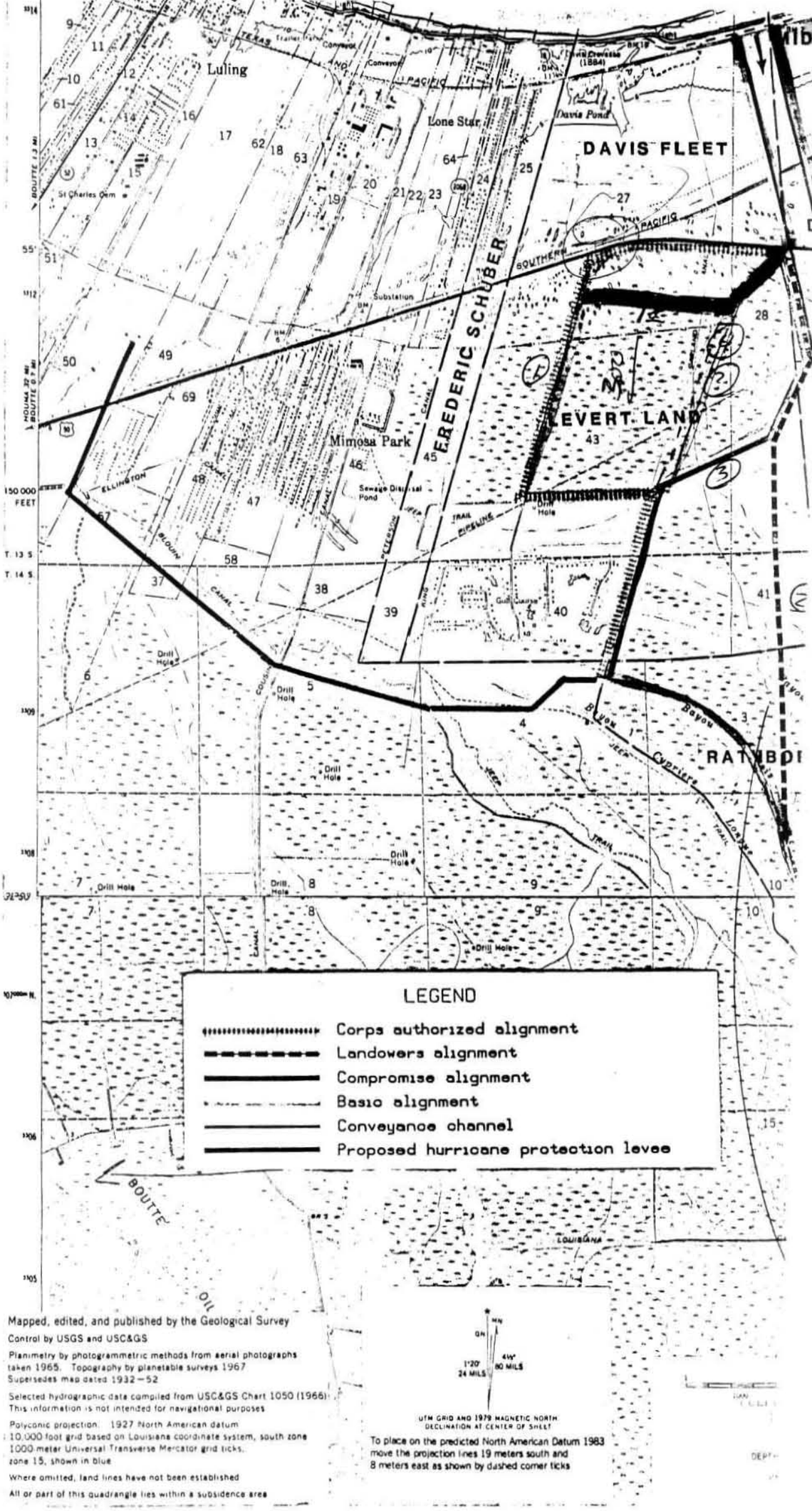
CDM - July deadline

1500 acres - Nature Conservancy

Water: Bird High - COE, NMFS, U.S. F&WS, EPA all feel that 404 and CZM is not sufficient to prevent area west of alignment B for development pressure. All very critical of the system, in particular Curt Robsamen who took the opportunity to smear CMD. It appears [redacted] and was out right stated as such, that the inclusion of this land was almost solely to prevent the destruction of bottom land hardwood ridges by development rather than to fulfill any engineering need for the Owings project. It is an accepted fact that the authorized alignment will severely alter these ridges through impoundment which will likely result in a change of habitat to fresh marsh. High contention is an altered W.C. is better than one developed. The lane alignment alternative B would impact fewer acres than the authorized alignment but the quality of the impacted habitat may be greater

Discussion about possibility of the Nature Conservancy purchasing the ridge/swale system then trading it over to the LWF. Reason that arose before was it appeared that area would be included in authorized levee alignment. If alignment be moved to be used the purchase of this area could not be considered match (learned latter that State would have to buy it from Conservancy if they purchase it).

Talking with Bill Good after meeting what Corps & he are looking to do is recommend authorized alignment and purchase the land our right as Fee title by paying the difference between the flood easement price & the fee simple price. Thought that easy injection would be avoided and price of land should be based on wetland rather than developable land (which is doubtful that it is under the constraints of 404 and CZM).



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Planimetry by photogrammetric methods from aerial photographs taken 1965. Topography by planetable surveys 1967
Supersedes map dated 1932–52

Selected hydrographic data compiled from USC&GS Chart 1050 (1966)
This information is not intended for navigational purposes

Polyconic projection. 1927 North American datum
10,000 foot grid based on Louisiana coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks,
zone 15, shown in blue

Where omitted, land lines have not been established

All or part of this quadrangle lies within a subsidence area

UTM GRID AND 1979 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

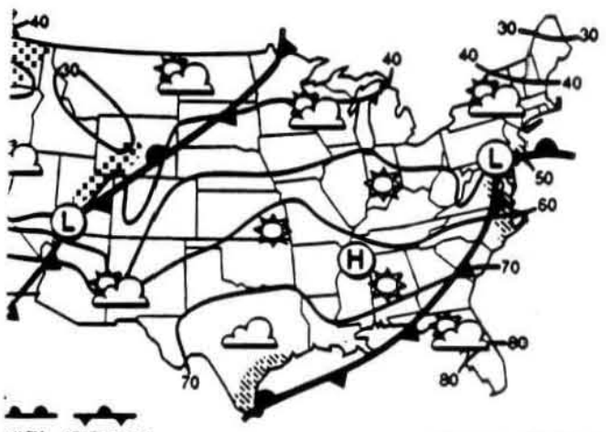
To place on the predicted North American Datum 1983 move the projection lines 19 meters south and 8 meters east as shown by dashed corner ticks

Scope and visit with Sabrina on 2/8/00

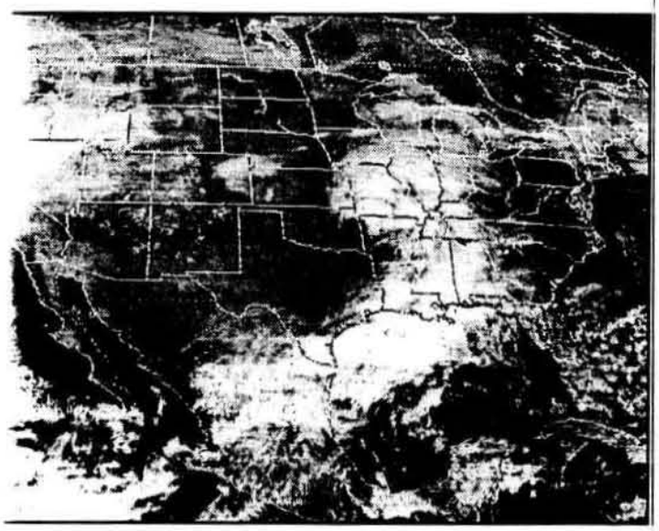
P861069 – Permit to St Charles P.
(5) 24" culverts
for mitigation of P45/1440 & Lavon SP St Charles Co.
& shopping center at Hwy 90
15

2/6/90 Don Elgorzalli -

Called to brief my on Davis Road, did not realize I was with Bond last Friday. Said the Duncan protection lines will have 0 culverts because they do not want to spend $ for mitigation for loss of WL. Thought that F&WS may have objection to alternative alignment based on conversation w/ Fuzz a few days ago. He is meeting with the Port Engineer about a pump station in the NE corner of the area W of the basin.



forecast from the National Weather Service.



cloud photo was taken Tuesday at 12:30 p.m.

er's forecast

Skies	Hi	Lo
fair	09	b09
snwrs	52	34
ptcldy	60	44
cloudy	45	30
cloudy	58	45
ptcldy	29	12
ptcldy	43	28
ptcldy	75	53
cloudy	45	28
ptcldy	67	44
cloudy	60	39
cloudy	42	23

City	Skies	Hi	Lo
Chicago	ptcldy	43	32
Dallas	sunny	64	38
Denver	sunny	48	22
Honolulu	windy	81	70
Houston	ptcldy	68	44
Kansas City	ptcldy	53	31
Las Vegas	cloudy	54	41
Los Angeles	ptcldy	61	47
Memphis	ptcldy	57	40
Miami Beach	ptcldy	78	64
Minneapolis	ptcldy	43	23

City	Skies	Hi	Lo
Nashville	cloudy	55	39
New York	ptcldy	48	34
Orlando	ptcldy	78	51
Philadelphia	cloudy	50	32
Phoenix	fair	65	42
Portland, Me.	sunny	39	18
St. Louis	ptcldy	50	34
San Francisco	ptcldy	53	37
San Juan, P.R.	sunny	85	69
Seattle	rain	44	33
Shreveport	sunny	67	39
Washington	ptcldy	52	37

dav's tides

St. Charles irked to be overlooked on wetlands project

By LISA FRAZIER
River Parishes bureau

St. Charles officials are taking the state and federal government to task for not notifying them earlier of a wetlands project planned in the parish.

The council Monday night unanimously approved a resolution asking the Army Corps of Engineers and the state's Department of Natural Resources to consult the parish before planning wetlands mitigation projects for St. Charles.

Through mitigation, companies that damage wetlands with construction or other projects are required to offset the damage by financing a wetlands enhancement project near the damaged area.

Council members were surprised in January when they learned that federal and state agencies had chosen an area next to the Salvadore Wildlife Management Area in Luling to mitigate wetlands damage caused by the Westwego-Harvey Canal hurricane levee in Jefferson Parish.

"St. Charles Parish officials were not consulted before this property was proposed for mitigation," Councilman Steve Talbot's resolution states. "The parish for which property is being considered for mitigation should have a voice in the planning process."

Though St. Charles wetlands will benefit from the mitigation, council members were upset because they were not consulted before the decision was made and because the mitigation conflicts with a separate project the council supports for the area.

The mitigation project would interfere with the proposed alignment for a freshwater diversion project that the corps plans to construct near Davis Pond. The project will divert fresh water from the Mississippi River into the coastal bays and marshes in the Barataria Basin to replenish them and battle coastal erosion.

The hurricane levee would mark the western boundary of the diversion project's stilling pond, used to warm the cool river water before it flows to the wetlands.

The corps has drafted a levee alignment that snakes around the area planned for mitigation. It includes 1,500 acres unnecessary to the project.

But an alternative alignment developed by the property owners and backed by the council would run straight north to south, split the mitigation site in half and leave the 1,500 acres for future use by the landowners.

The corps engineer for the diversion project, Domingo Elguezabal, said the landowners' alternative alignment would complicate the mitigation efforts.

The council two weeks ago unanimously approved a resolution supporting the alternative alignment. Councilman Chris Tregre of Hahnville urged the council to fight the corps if the agency refuses to realign the levee.

La. fishermen eligible

600,000 cu yds for dredging of outfall channel

C-DM - submitting in June

Mitigation for W. Jessamine Protection levee included
West Hickman to Raney Project under construction

COE permit for levee on Rabbit Rathbone land but not construction within.

Bonnieville - 3 month C-DM delay - $\frac{1}{2}$ million $ saving reduction. Reduce length. Reducing 60' of structure

St Charles Parish is voting on resolution by end on month to support or oppose new alignment

Land owners want to meet again w/ COE. Want to be brought in process earlier.

15-16-89

David Bond meeting St Charles Courthouse

Carl
Lisa
David V.
Ronnie Paille
Peggy Kenny

Dave Foley, Dave Chambers, Fred Decatt, Don Gagnable

Structure - set at -11. 14XH culverts - 4 culverts

Lift gate - screw gate type with power assist

Jan - May -

1.6' mean high tide

COE - will contract w/ DNR to operate. Daily inspection -
Can shut down in ± ½ hr. Portable generator will take ± one hour.

Monitoring program will dictate schedule of opening.
Will develop a mathematical model.
4 year monitoring will fine tune schedule.

Weir Design -
Rock weir for erosion protection.
Plan to excavate material → fill w/ bedding material then place rock
36"-48" rap. 1.6' MLLW top of weir.
.3' difference between mean high & mean low.
Seepage through the rock weir
Flotation canal → back side of rock weir ⇒ backfill
but with a shallow depth
Borrow on the front side would undermine structure from wave action.
Problem may arise from rock weir holding too much water. Paille suggested
±4 48" culverts to help relieve problems (opening in rock weir may close)

Gretchen Benoit 4/17/90

LACES – Civil Engineering

$17,000

Jason Benoit – T.L. James

467-6000. Computer Division

Dredging

(Rich Smith)

BD – before Dredging –

soundings.

AD – after dredging – report Corps

to COE. → computer

Geo Technical Lab.

Pow Tch Flooding – Armond Subdivision

Public meeting for input

FEMA – Denton

FEMA Rich – COE

Base flood – place in Armond

Flow ~~Basement~~ require pumpin

calculate.

No appreciable additional cost for construction

Lafere Company – split property with Louisa

Greg Lear – Rathbone

Carl Anderson the W[st] area is not necessary for

86 Water Resource act – planning did not require mitigation prior to 86. New alg. will require mitigation

Lafere is adamantly opposed to the #1 alignm

Leon Vial – Louisa property owner.

Charleston Davis Pond 10-12-89

Chris Frazer
Jay Robin
Robert Shultz
COE:
Don Elgaghal
Joe Witzel
David Lee
Joe Coplen - Real Estate
Carl Anderson

'84 Congressional Authorization
Year ago Tampa asked to look at alternative alignments.

Alignment 2 reduces cost by ½ million.
Bucket dredge & borrow canal
Levee from elevation 7 to elevation 6.

Alternative 3 - reduces cost by $390,000
Savings in length of levee & real estate savings.
If alternative is pursued must supplement EIS.

Any consideration of realignment will cause a round of

$9.2 million for alignment 2

COE - looked a incremental cost to raise levee. If 6' of water is already present it just has to be raised by 1'.

Elevation is only deficiency of the finish level

B/C ratio is still favorable even if area is

David Lee -
Wetland included BLH's, marsh etc.

Alt. #1 - 140 acres W.L. impacted. No mitig. required. (Prior to water resources act require one for one compensation.

Alt. #2 - additional 90 acres of W.L. to be acquired $2,160,000 cost. Indirect impacts to enclosed acres are considered minor and no mitigation.

Projected date if proceeding
Land acquisition in next year
Construction March of '92
Operation in '96

Steve Sumner - When does COE need answer from Parish.
Dom - need Parish input ASAP.
GDM - general design memorandum.
should be complete June 90.

COE - is buying flowage easement

Joe Weathy - COE ~~on~~ working on feasibility
study of Hurricane Protection Levee for
Willowdale → Found positive B/C
ratio for H.P.L. because of
Recon Number — levee with Davis Pond. Realignment
increase cost by $1 million. Alignment
3 increase by $400,000.
Can't proceed with Hur. P.L. unless ~~to~~ davis
pond levee alignment is decided.
Total [illegible]

FEMA - no new fill (take fill for
with Armond).
Moulton on new building.
Sec 12 extension

Advisory Committee - original align.
Council - wanted Land Owner
Sent Committee's recommendation to
Gorski. Sent letter to Breaux
saying the COE would go origin.

Carl Anderson - Engineering - 862-261

Direct Federal Agencies - Federal Rules &
Federal Courts, U.S. Justice Dept.
Condemnation
Loss of value before & after the project.
"Estate" written - don't take minerals
in flow easement but in levee &
channel yes

Price quoted does not include "contingency" factor
25% contingency factor.

Sue Solien - Congressional Authorization for alignment
Act 6 - Task Force (Authority) and
Trust Fund.
Constitution protection of Trust Fund.

OK to cut levee recently for Davis Pond &
Bonnet Carre - Trust fund established
stable source of money to install Fed &
Davis Pond but does prioritized over Bonnet Carre

If alternative alignment is chosen
Eliminate preferred routing
Eliminate dispersion benefits to the
tidal import
Elimination of sheet flow - disruption of
"Environmental Enhancement" project
saving levees will reduce
benefits.

$800 per acre is value of land used in B/C
Comparable sales.
~~$500 per acre~~

Report has not been
Economics branch - $400 per acre as
value of marsh (not fair market value
Has not been used for B/C ratio.
Bob Bacon of COE is person to
report from.

Contract appraisers - property owner in
along levee alignment.

32 acres — $72,000 mitigation

Hurricane Protection 88 acres
$206,000 mitigation - Induction enclosed area — low impact

Align 2 = 95 adjacent acre if Alignment 2
$220,000 cost of mitigation, Area enclosed would (of 1300 acres) 520 would be developed in 50 yr. life
$1,248,000 mitigation cost.

Align 3 70 acre —
875 acre induced (350 developed)
$840,000 mitigation

575 acres in #3
450 acres in #2 (below 3)

Commitment from the Governor that he would provide money (even if 100% federal) upon the expedited movement of the COE on this project. Task force may pull back offer if delays are shown

25%

Parish will meet within a month (if not sooner) to make recommendation on alignment how they would like COE to inform them the status of discussions COE is having w/ the land owners. There was an apparent leaning toward accepting the original alignment if moving it threatens the Hurricane Protection Levee project.

Joe Kopecky - Real Estate
Joe Kopec
Staff Appraiser COE
862-1174

Lois Brooks DOD
Credentials appraiser

ADVOCATE 2/26/93

Corps agrees to project assessment

By BOB ANDERSON
Environmental editor

Bowing to the demands of environmental and conservation organizations, the U.S. Army Corps of Engineers has agreed to do an environmental assessment of what a proposed $80 million project will do to Lake Pontchartrain.

The Coalition to Restore Coastal Louisiana has asked the state not to put up its share of the funds for the Bonnet Carre Freshwater Diversion project until the corps answers questions about the impact on the water quality of the lake.

"We're going to address all the issues raised by the public," said Bruce Baird of the corps.

The main concerns appear to be the impact on fishing and recreation in the lake as a result of regular diversion of water from the Mississippi River into the lake, corps officials said.

The environmental impacts of the diversion structure are largely unknown, could cause environmental damage and Louisiana is being asked to pay what appears to be a disproportionate share of the project, said Mark Davis, the coalition's executive director, in a letter to the state.

The main benefit of the project is that it would help oyster production off the Mississippi coast, Davis said in an interview.

The coalition stopped short of opposing the project, but suggested that a number of questions be answered before the state commits $15.7 million toward the project's construction and millions more for its maintenance.

Dom Elguezabal, the corps' senior manager of the project, said when the assessment is completed in several months the corps will decide whether it needs to do a more intensive Environmental Impact Statement.

The corps did an Environmental Impact Statement in 1984, but environmentalists maintained the work was inadequate and the lake has changed a great deal in the last 10 years.

Freshwater diversion structures are designed to add fresh water to areas where saltwater intrusion is a problem. Environmentalists maintain that salinity is not a problem in the area where the fresh water would be routed.

The project would be near the Bonnet Carre Spillway, which is used to route river water into the lake during times of flood to help ease pressure on the river's levees.

Local man arrested in rape of 12-year-old

City police arrested a Baton Rouge man Wednesday night and accused him of raping a 12-year-old girl earlier this month, records state.

An arrest warrant issued for 18-year-old Dwayne W. "Frog" Jenkins accuses him of raping the girl Feb. 14 in a garage in the 1700 block of Pocahontas Street.

Jenkins and another man allegedly coaxed the girl into drinking beer with them until she became intoxicated, according to the warrant.

Jenkins is accused of raping the girl after the other man pulled her clothes off, the warrant says.

When police arrested the other man, he told officers that Jenkins had sex with the girl, the warrant says.

In addition, the victim picked out Jenkins' picture and identified him as the man who raped her after viewing a lineup of six photographs, the warrant says.

Police booked Jenkins, of 1213 N. 48th St., into Parish Prison on one count of aggravated rape, a prison spokesman said.

Jenkins remained in Parish Prison Thursday night with bond set at $100,000, the prison spokesman said.

Four cited on DWI counts here

City police reported that four people have been cited for driving while intoxicated since Feb. 23.

The people cited and the counts against them are:

•Alphonse Giles, 39, of Route 1, Box 122, Roseland, cited Feb. 24 for first-offense DWI, improper lane usage and driving under suspension.

•John L. Landry, 40, of 13526 Coursey Blvd., No. 1007, cited Feb. 23 for first-offense DWI, speeding and driving under suspension.

•Thomas Moore, 30, of 334 Brice St., cited Feb. 23 for first-offense DWI and improper lane usage.

•Lisa K. Fontenot, 26, of 8 Cedar Place, Hammond, cited Feb. 23 for second-offense DWI and speeding.

From: Katherine Vaughan
To: Chuck Villarrubia
Date: Wed, Apr 8, 1998 1:09 PM
Subject: Re: permits

It is my understanding the Corps uses an E/A, not a permit and the state will have to make a consistency call. Please let me know if I'm not correct on this.

Katherine

>>> Chuck Villarrubia 04/08/98 12:54PM >>>
Katherine,

Do you want permits for WRDA (Davis Pond and Caernarvon); I checked with CMD and they are largely consistency determinations. There are of course other permitted activities in the project boundaries.

Charles R. Villarrubia
Natural Resource Geoscience Supervisor
LA Department of Natural Resources
Coastal Restoration Division
PO Box 94396
Baton Rouge, LA 70804-94396
504-342-0932
fax 504-342-9417
chuckv@dnr.state.la.us

CC: Bill Good

Davis Pond

C840314 *
C910249 *
~~C910246?~~ A-4
C960109 } Pipeline relocations
C940164 } cut-gone

Caernarvon

C840314 *
C840069
C850719 *
C940412 -

C#
Applicant name
brief description of activities authorized
Issue date

MEMORANDUM

MARCH 3, 1998

TO: Mr. Gerry Duszynski, Assistant Administrator
Ms. Diane Smith, Assistant Administrator

FROM: Katherine G. Vaughan,
Assistant Secretary

RE: Permit information for CWPPRA projects

In an effort to consolidate information regarding long term obligations under the CWPPRA program, I am evaluating permit obligations for individual CWPPRA projects. Accordingly, please have Project Managers compile the following information for each CWPPRA project under their management: a list of all permits (or applications) for each CWPPRA project, including permit number(s), permittee (or applicant), a brief description of the activity authorized by the permit, and beginning and expiration dates of the permit. Bear in mind that most projects will have regulatory approvals from both the state (Coastal Use Permit and/or Federal Consistency Determination) and the Corps (Section 10/404 permits).

Additionally, please ensure that the quarterly reports include this information and that it is updated by the Project Managers on a regular basis.

Thanks!

MEMORANDUM

April 13, 1998
DRAFT

To: Brian Marcks

From: Jeff Harris

Re: Coastal Use Consistencies relevant to Davis Pond and Carnarvon Freshwater Diversion Projects, St. Charles and Plaquemines Parish, Louisiana

Following is a listing of Consistencies files within the above referenced areas, together with applicant name, brief project description and issuance date.

DAVIS POND

C840314, New Orleans District, Corps of Engineers, provides feasibility study for plans for the construction and operation of Mississippi River freshwater diversion structures in the Davis Pond area of St. Charles Parish and in the Canarvon area of Plaquemines Parish, Louisiana. Consistency granted by DNR August 8, 1984.

C910249, New Orleans District, Corps of Engineers, provides changes in the West levee alignment and facility operation plans to accomodate changes caused by construction and interchanges

associated with upgrade of U. S. 90 in the vicinity of Davis Pond. DNR Consistency granted May 18, 1992. check date w/ Brenda

C930379, New Orleans District, Corps of Engineers, modification of the Davis Pond Freshwater Diversion Structure consisting of a change in pumping capacity and construction of rock weir. Consistency granted Dec. 15, 1993.

Canarvon

C840314, New Orleans District, Corps of Engineers, provides feasibility study of plans for the construction and operation of Mississippi River freshwater diversion structures in the Canarvon area of Plaquemines Parish and Davis Pond area of St. Charles Parish, Louisiana. DNR Consistency granted May 18, 1984.

C850719, New Orleans District, Corps of Engineers, provides plans for the construction and operation of a Mississippi River freshwater diversion project at Canarvon, Plaquemines Parish, Louisiana. DNR Consistency granted Dec. 5, 1985.

check date w/ Brenda

PERTINENT DATA

Location of Project:	Southeastern Louisiana in St. Charles Parish on the west bank of the Mississippi near Mile 118 AHP.[1]
Project Purpose:	To introduce freshwater from the Mississippi River into the Barataria Basin.
Area of Influence	
Datum Plane	National Geodetic Vertical Datum (NGVD)[2]

Hydrologic Data

Temperature (°F)	82.0
Average maximum monthly	51.8
Average minimum monthly	68.9
Average annual	
Precipitation	
Average maximum	
Average minimum	
Average annual	

Structure

Capacity	10,650 cfs
Box Culvert	4
Gates	4
Dimensions:	
Gross Width of Structure	71 feet
Clear Width of Structure	56 feet
Length of Culverts	353.5 feet
Clear Width of U-Shape Channel (Inflow Monoliths)	65 to 85 feet
Length of U-Shape Channel (Inflow Monoliths)	66.5 feet
Clear Width of U-Shape Channel (Outflow Monoliths)	65 to 88 feet
Length of U-Shape Channel (Outflow Monoliths)	123 feet

[1]Refers to Above Head of Passes (AHP)
[2]Elevations herein are in feet referred to National Geodetic Vertical Datum (NGVD) unless otherwise noted.

Elevations	
Invert of Culvert	-11.0
Roof of Culvert	
Top of Culvert	+6.0
Top of U-Shape Channel Slab (Inflow Monoliths)	-11.0
Top of U-Shape Channel Walls (Inflow Monoliths)	
Top of U-Shape Channel Slab (Outflow Monoliths)	-11.0 to -15.5
Top of U-Shape Channel Walls (Outflow Monoliths)	

Inflow Channel

Length	535 feet
Bottom Width	85 feet
Bottom Elevation	-11.0
Side Slopes	1V on 3H

Outflow Channel

Length	11,043 feet
Bottom Width	120 feet
Bottom Elevation	
Side Slopes	1V on 3H, -15.5 to -16.6

Weir

Length	10,500 feet
Width	20 to 30 feet
Elevation	+1.6

Levees

MRL B/L Sta

Top Width	
Design Elevation	
Side Slopes	

Outflow Channel Guide Levees

Top Width	10 feet
Design Elevation	7.0
Side Slopes	1V on 4H

Ponding Area Guide Levees

Top Width	8 feet 4
Design Elevation	7.0 to 8.0
Side Slopes	1V on 4H

Met with: Ron Gomez
Dave Saulter
Bill Good
Jerry Desmarais
Fred Whitrock
Bill Savant
Dave Chambers

A Davis Pond Primer

4/17/90 2:00 pm

HISTORY

1/26/83: Kevin Friloux, St. Charles Parish President, drafts eight point manifesto and sends it to Col. Lee. He demands:

1) no expense to St. Charles for construction, operations or maintenance of "facility".
2) involvement of St. Charles in facility operation.
3) hurricane levee on west side.
4) reclassification of wetlands of particular concern to St. Charles as non-wetlands.
5) permits for designated levees and 5 pump stations.
6) state or federal funding for pump station operation.
7) state or federal funding for mosquito control abatement.
8) adequate financial remuneration for affected landowners.

5/20/83: Gerald Bordelon (Treen Administration), Coastal Protection Task Force Chairman, responds to Friloux indicating that due to State's financial situation, funding for additional costs to Davis Pond Project was not available.

6/20/83: Col. Lee responds to Friloux stating that enlarging west guide levee was beyond the scope of the project, no commitments made.

7/14/83: St. Charles passes resolution 2479 opposing Davis Pond Project until Friloux' 8 point plan is negotiated.

12/2/83: Friloux writes to Gov. Edwards asking whether his administration will support Davis Pond Project.

3/12/84: Friloux asks Gov. Edwards to have DNR Secretary (Wm. Huls) provide him with State's position regarding Davis Pond.

3/19/84: Gov. Edwards acknowledges Friloux' letter, promises response from Mike Bourgeois, DNR Deputy Secretary.

6/4/84: St. Charles Parish Council passes Resolution 2610 (introduced by Friloux) tentatively approving Davis Pond, under the following conditions:

1) no expense to St. Charles for construction, operation or maintenance.
2) St. Charles involved in operation of the structure

Davis Pond, cont.

3) 2 pumps are provided as indicated
4) West guide levee shall conform to 100 year frequency storm elevation.
5) State, federal and local advisory council be formed for review of project design and construction.
6) "Consideration of straightening the western guide levee from Highway 90 to Willowdale Subdivision."
7) Consideration of flooding impacts on Des Allemands.
8) Considerations of concerns expressed by Rathborne Land Co.

7/19/84: Mike Bourgeois writes Col. Lee (cc: Friloux) acquiescing to all of the parish's (above) demands... "The conditions requested by the Parish are reasonable and must be honored by the Corps in order for the State to support the project.... If the Corps elects to design the levee at a lower level, the State will increase its match to cover the additional cost for raising the levee to the 100-year flood level."

7/31/84: Col. Lee sends Bourgeois (cc: Friloux) letter supporting position DNR's position on Davis Pond.

8/13/84: Friloux tells Bourgeois that Corps' response is not satisfactory, he wants clearer indication of commitment on pump stations and on the straightening of the west levee alignment.

7/27/88: Ray Stephens rescinds the commitments of 7/19/84, and suggests DOTD, Public Works as potential source of funding for west levee enlargement.

10/18/89: St. Charles adopts a resolution (#3413) that all State Agencies coordinate with the parish on projects in their area.

1/22/90: St. Charles adopts a resolution (#3419) requesting that the west guide levee at Davis Pond conform to "Alignment 2".

3/13/90: Ray Davezac, Director of Public Works/Sewerage, St Charles PArish requests that DNR "verify if the planned expenditure for this portion of the Diversion Project [the Cousin's Canal Pumping Station] is $1,000,000.00 as discussed and the approximate date the Parish will receive these funds".

Davis Pond, cont.

CURRENT STATUS

A: Issues to be resolved:

1) West levee alignment. IA is planned.

2) West levee height. built to project needs.

3) Cousin's Canal Pumping Station ($1,000,000).

4) Pumping station operations and maintenance.

5) LCA language regarding hazardous waste cleanup, etc.

B. Items needed by the end of June:

1) Draft LCA.

2) DNR's intent to sign LCA.

3) Financial Plan.

Interchange alignment

L.CA. on 24th -

+ J. Boron - COE Rebelute - Extension has been found that meets approval of Newman Trobridge.

Estimate $1,000/acre.

Open 7 out of 10.

Jordan est. $1,000,000 to get full fee value.

20 Million budget for Coast Guard to buy land. W.L. protection take place - upstate not reach.

Acquisition by Landowner

Gov. $20 Million to the LWCF for land acquisition

will go with IA alignment

AGENDA

DAVIS POND MEETING 2/15/90

Purpose: Review technical and environmental pros and cons of various west levee alignments.

Note: Policy on this issue to be determined by Louisiana Wetland Conervation Authority not Coastal Restoration Division.

Questions for Discussion:

1) Would original alignment result in the destruction of 1500 acres of crevasse splay vidge and swale bottomland hardwoods that could be avoided through alignment 2 if this area could be protected from development?

2) Would alignment 2 result in potential development of the area between alignment 2 and the original alignment?

   a. Would entire area within original boundaries be purchased and deeded to LWF if alignment 2 used?

   b. Would area in question remain under permitting and consistency jurisdiction of (COE and CMD)?

      Both 404 and coastal use permitting?

3) Would original alignment negatively impact hydrology (wetlands) west of NW corner of pond?

4) How do costs of construction and O & M of original and #2 compare?

5) Would #2 present serious management difficulties to LWF?

6) How much delay would #2 cause?

7) General discussion.

Davis Pond 2/15/90

Bill Good	DNR / CRD	342-7508
Dom Elguezabal	COE/Proj. Mgr.	862-2599
Carl Andersen	COE/Engr. Div	862-2610
Quin Kinler	FWS	318-264-6630
Lisa Montelepre	COE/Hydraulics Br.	862-2425
Sue Hawes	COE/Environmental	862-2518
David Vigh	COE/Environmental	862-2540
Ric Ruebsamen	NMFS	504/389-0508
Johnnie Tarver	DWF/FHR Div.	504 765 2811
Mike Condrey	DWF/Eng.	504-568-5816
Michael S. Rolland	COE/REALESTATE	(504) 862-1987
THAD J. Brown	COE/Real Estate	504 862 1150
Jeanene Peckham	EPA-6	214-655-2263
John de Mond	CRD/DNR-Consistency	504-342-7591
Peggy M. Jones	NMFS	504-389-0508
Bill Savant	DNR/CRD	504-342-7305
Bill Good	DNR/CRD	504-342-7308
Gretchen Binet	St. Charles Parish	504-783-660

JOHN BREAUX
LOUISIANA

COMMITTEES:

COMMERCE, SCIENCE, AND TRANSPORTATION

ENVIRONMENT AND PUBLIC WORKS

SPECIAL COMMITTEE ON AGING

United States Senate

WASHINGTON, DC 20510

WASHINGTON OFFICE:
(202) 224-4623

Central Louisiana Office:
534 Murray Street
Alexandria, LA 71301
(318) 473-7370

South Louisiana Office:
The Federal Building
705 Jefferson Street, Room 103
Lafayette, LA 70501
(318) 264-6871

North Louisiana Office:
Washington Square Annex Building
211 North 3rd Street, Room 102A
Monroe, LA 71201
(318) 325-3320

New Orleans Area Office:
Hale Boggs Federal Building
501 Magazine Street, Suite 1005
New Orleans, LA 70130
(504) 589-2531

March 13, 1990

Gretchen Binet
Administrator
St. Charles Coastal Zone Advisory Committee
P.O. Box 302
Hahnville, LA 70057

Dear Gretchen:

In response to your letter on behalf of the Lake Charles Coastal Zone Advisory Committee recommending that the U.S. Army Corps of Engineers pursue the original west guide levee alignment, I contacted federal officials. Enclosed is the response provided to me from the U.S. Army Corps of Engineers.

If I can assist you in any other way, please call on me at any time.

With kind regards,

Sincerely,

John Breaux

JOHN BREAUX
United States Senator

JB/jag
Enclosure

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

90 MAR 12 AM 9:52

March 6, 1990

REPLY TO
ATTENTION OF:
Life Cycle Project
Management Office

Honorable John Breaux
United States Senate
Washington, DC 20510

Dear Senator Breaux:

In your letter of February 5, 1990, forwarding a letter from Mrs. Gretchen Binet, you asked about the alignment for the west guide levee of the Davis Pond Freshwater Diversion project.

Enclosed is a fact sheet on the project that includes information on the alignment of this levee. Based on position taken by the State of Louisiana and Federal environmental resource agencies, I have decided to proceed with the authorized project alignment.

Sincerely,

Richard V. Gorski
Colonel, U.S. Army
District Engineer

Enclosure

Revised 12 February 1990

FACT SHEET

DAVIS POND, LA (MISSISSIPPI DELTA REGION)

AUTHORITY: The project was authorized by the Flood Control Act of 1965, (Public Law 89-298), the Water Resources Development Act of 1974 (Public Law 93-251), and the Water Resources Development Act of 1986 (Public Law 99-622).

PROJECT JUSTIFICATION: Deterioration of the marshes below New Orleans has long been recognized. This deterioration stems from factors such as subsidence, erosion, and saltwater intrusion. The introduction of freshwater and alluviums from the Mississippi River, via the recommended control structure, will serve to reduce this degenerating trend in the local area. The project will benefit existing commercial fisheries by enhancing marsh conditions, thereby improving the fish and wildlife resources of the area. The total average annual benefits include $9,181,000 for fish and wildlife benefits and $237,000 for recreation benefits, for a total of $9,418,000. The remaining benefit - remaining cost ratio is 3.1 to 1 at 8 7/8 percent.

EXPECTED PROJECT OUTPUTS: The project will divert freshwater from the Mississippi River to coastal bays and marshes in the Barataria Bay basin for fish and wildlife enhancement. Benefits will include restoration of former ecological conditions by controlling salinity and supplementing nutrients. The bays are important to oyster production and as breeding areas for shrimp and food fishes while the marsh areas produce natural food for fur-bearing animals and migratory waterfowl. A total of 83,000 acres of marsh land will be perserved and 777,000 acres of marshes and bays will be benefited by the project. The diversion will take place under regulated conditions developed from monitoring the impact on the environment, and the fish and wildlife.

PROJECT DEVELOPMENTAL HISTORY: Initial Mississippi Delta Region studies were suspended in 1973 at the request of local interests who were restudying freshwater needs in the area. The project remained inactive until January 1982, when the State of Louisiana indicated an interest in implementing the Caernarvon structure. A Post-Authorization Change (PAC) report was approved in June 1987, authorizing the Myrtle Grove site on the west bank to be moved upstream to a site called Davis Pond.

PROJECT FACT SHEET
DAVIS POND, LA (MISSISSIPPI DELTA REGION)

This change will increase the marsh area benefited and will maximize total benefits. The State of Louisiana has provided a letter of intent dated 28 September 1989, for the Davis Pond site. General Design Memorandum studies were begun in FY 1988, and are scheduled for completion in June 1990 with start of construction (land acquisition) scheduled for FY91. Present estimated project cost is $40.8 million, (1 October 1989 price levels).

FUNDING REQUIREMENTS: Section 77 of the Water Resources Development act of 1974 (PL 93-251) modified the requirements of local cooperation to reduce the local interest's contribution from 50 percent to 25 percent of the project cost. Section 906f of the Water Resources Development Act of 1986 (PL 99-662) changed the required non-Federal contribution from 25 percent of the project first cost to zero. However, in their letter of 28 September 1989, the State of Louisiana agreed to voluntarily contribute 25 percent toward the first cost of Davis Pond Structure.

Estimated Federal Cost	$30,600,000
Estimated Non-Federal Cost	10,200,000
Total Estimated Project Cost	40,800,000
FY90 Allocation	$ 399,000
Allocations to Date	2,051,000
FY91 Budget Request	845,000
Balance to Complete after FY90	27,704,000

WEST GUIDE LEVEE ALIGNMENT

The project, as originally authorized, provided for the west guide levee south of Highway 90 to follow an alignment that bordered existing development or permitted areas (Alignment #1). This alignment was arrived at after several negotiations between the environmental resource agencies and the Corps and provided for the most benefits to the wetlands.

During preparation of the Feasibility report alternate alignments were considered; but, the authorized alignment was the environmentally preferred plan and maximized intangible wetland benefits.

PROJECT FACT SHEET
DAVIS POND, LA (MISSISSIPPI DELTA REGION)

In October 1988, Congressman Tauzin asked that the Corps look into two alignments being proposed by two of the local landowners. Upon completion of surveys and soil borings, it was determined that one of the proposed alignments, with slight modifications (Alignment #2), would reduce project costs by about $500,000, but would cause a 12 to 18 month delay to the project because of requirements for a supplement to the EIS. An alternate alignment, Alignment #3, would yield savings of approximately $300,000 but would still delay the project 12-18 months.

The State asked that the authorized alignment be used. This was concurred in by other environmental agencies. However, St. Charles Parish feels that the project would be limiting the future growth of the Parish by taking lands not actually needed for project operation.

After considering all the facts related to the levee alignment and the input from interested Federal, State and Local agencies, the Corps decided to follow the authorized alignment. However, if the State requests a change to another alignment, then consideration to such a change will be given.

The September 11, 1989 Working Draft of the Recommendations for Policies and Actions by the Barataria Basin Policy Team has been revised to reflect changes made at BBPT meetings. All of the policies in EMU 1 and EMU 2 through Short-term, Active policies have been revised. Where policies have been moved to another section *the policies are now shown in italics.* This draft also includes policies received after the initial compilation. These policies are shown as underlined text. Finally, the BBPT requested identification of policies in EMU 3 & 4 which are identical or similar to what has been decided. These policies are marked by **enlarged and bold numbers, eg. 3**.

Should you have any questions or need anything, please do not hesitate to call or write Rod E. Emmer or Ray Sauvage, 1260 Main Street, Baton Rouge, La. 70806, (504) 383-7455.

RECOMMENDATIONS FOR POLICIES AND ACTIONS

BARATARIA BASIN POLICY TEAM

REVISIONS through
September 11, 1989
and
subsequently received policy statements

ENVIRONMENTAL MANAGMENT UNIT 1

Short-Term

Active

OIL and GAS

MOVED TO BASINWIDE SECTION, Short-term, Active

HYDROLOGY

1. Activities in the EMU shall employ water management control projects that produce the following: 1) reduction of excessively impounded standing water; 2) reestablishment of natural sheet flow and nutrient exchange; 3) introduction of increased sediment into an area; and 4) encouragement of vegetation of an area. One location in particular need of these actions is the LL&E reclamation area. → DELETE

DREDGED MATERIAL

1. Permanent deposition of dredged material shall be placed in the least environmentally damaging place and to allow for nutrient exchange.

EROSION

1. Stabilization material (structural and nonstructural) shall be used on areas of severe erosion.

2. Disturbed and subsided areas shall be revegetated with appropriate native materials to help prevent the future erosion or subsidence of the disturbed areas which often occurs before natural revegetation can occur. The erosion reduction program should include an plan for actively planting appropriate materials.

3. Establishing vegetation will be encouraged as part of a wetlands management plan, especially in subsiding areas.

DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF WATER RESOURCES

Develop a [water quality] management plan that stresses compliance with state water quality regulations for point source discharges of both industrial and municipal wastewaters and nonpoint source discharges from agricultural, urban, industrial and other sources. The use of wetlands for municipal wastewater treatment should be encouraged where and when appropriate. As a goal, the plan should specifically seek to achieve attainment of the state water quality standards through application of the state and federal permit programs and the Section 401 water quality certification program. To assess attainment of water quality goals, an adequate Basin monitoring program should be supported that is compatible with existing state monitoring programs.

— DELETE

MAN

1. A mangement plan should be developed and implemented for the discharge from forced drainage projects. When outfall canals are necessary, the cross-sectional area of the canals should be decreased and all intersections with other canals should be blocked. For example, flow can be regulated at Bayou Vacherie and the outflow through the Tisamond Foret Canal, and the Company Canal can be regulated.

Passive

PLANS and STUDIES

1. Develop an assessment report on water quality conditions and problems, identifying sources and priority drainage areas for action. The report should include information from agencies familiar with non-point pollution problems. These agencies can also suggest solutions for reducing sediment and nutrient pollution ~~on~~ FROM contributing agricultural lands. PESTICIDE

2. Develop a wetlands management plan that stresses full (Mr. Sabins will provide a discussion of "full") treatment of point source pollution, such as the use of wetlands for the tertiary treatment of sewage when appropriate. The results of the Thibodaux experiment should be followed and the findings used. Monitoring of all industrial and municipal projects is essential and should be a part of all programs.

3. Special hydrologic studies and wetlands restoration plans should be initiated for EMUs 1 and 3. The studies and wetlands restoration plans should include, but not be limited to forestry practices that improves circulation in those swamps where needed, water exchange across barriers such as highway embankments, evaluating

tributaries to Lac des Allemends, and the constriction of canals to force more water to flow into wetlands, thereby providing sediment and nutrients for these wetlands and decreasing eutrophication. The water management plans should stresses natural hydrologic circulation and encourages wetlands swamp regeneration.

ALL LAKE SYSTEMS

4. Site specific non-point source water quality problems should be identified and solutions proposed.

DELETE
REVISE 2

5. A study on retention ponds in urbanized and agricultural areas should be conducted.

REGULATIONS

1. Mitigation should be sought for all wetland impacts associated with development. The mitigation plan should be made part of the project permit and not appear as a separate action.

– HOLD/MOVE TO B/W

COORDINATION

1. There should be interdepartmental review of all drainage projects affecting the bottomland hardwood swamp areas within the EMU.

2. Point sources of pollution should be monitored in the receiving environment. All agencies with field stations in the basin should coordinate their activities by using one mutually agreeable procedure for sampling and collect a minimum set of basic parameters . The agencies should establish an efficient mechanism for sharing information.

Long-Term

Active

OIL and GAS

HYDROLOGY

1. Short-Term activities, such as water management plans, sediment diversions, and crop rotation, as proposed, should be maintained, operated, and monitored.

2. Levee and drainage projects should be more environmentally beneficial; for example, flow through pump stations should be designed and constructed or culverts should be placed through levees.

3. The findings of the hydrologic studies for EMU 1 should be implemented.

DREDGED MATERIAL

EROSION

MAN

Passive

PLANS and STUDIES

1. The effects of on-going diversion efforts should be studied and analyzed.

2 A study for a freshwater diversion near Lagan (3,000 to 5,000 cfs) should be conducted. Diversion projects with a purpose of introducing sediment into the basin should be restricted to the eastern half of the EMU. If diversions that seek to utilize the sediment load of the river are planned for the eastern half of the EMU, these diversions should be done by means of enclosed aqueducts to tranport the materials to the lower reaches of the Basin.

3. The recommendations of the studies on the EMU should be a long-term objective for the basin.

REGULATIONS

1. Reforestration of desirable species should be undertaken when lumbering activities occur. The objective is to maximize the forested wetlands in the EMU.

COORDINATION

ENVIRONMENTAL MANAGEMENT UNIT 2

Short-Term

Active

OIL and GAS

HYDROLOGY

1. Treatment of stormwater effluent for the exclusion of hazardous chemicals and hydrocarbons from non-point source pollutants should be utilized to decrease the detrimental effects on the fauna and flora of the lower basin.

2. Adequate acreage of wetlands found in EMU 2 receiving discharges from EMU 2 shall be set aside to serve as floodplain easements to augment flood protection of new and existing developments and to serve as and to be developed as marsh treatment sites for urban runoff. These areas shall be deeded to the local government or state for maintenance as easements and shall remain green space.

DREDGED MATERIAL

EROSION

MAN

1. Load, equilibrium, or capacities for prevalent and troublesome pollutants found in urban runoff and industrial discharges should be established for each developed area. An accounting system shall be developed to assure compliance.

2. Residential, commercial, and agricultural developments shall include or upgrade appropriate and adequate sewerage treatment.

3. Development within EMU 2 shall be considered to have cumulative impacts upon management units receiving EMU 2 discharges.

ADD ALSO TO REGS.

4. A mangement plan should be developed and implemented for the discharge from forced drainage projects. When outfall canals are necessary, the cross-sectional area of the canals should be decreased and all intersections with other canals should be blocked. For example, flow can be regulated at Bayou Vacherie and the outflow through the Tisamond Foret Canal, and the Company Canal can be regulated.

Passive

PLANS and STUDIES

1. An effective crop rotation system should be developed to decrease sediment loss and nutrient runoff from surrounding uplands. Buffer strips to trap sediment, nutrients, and other materials should be incorporated.

CHANGED

2. Special studies should be initiated for determining the effect AND EFFICIENCY of buffer zones at the wetlands interface on non-point source runoff from developed areas.

REGULATIONS

1. All human wastes should be fully treated prior to their release into the environment. One possibility is to allow for overland discharge (across wetlands) after secondary treatment.

2. Retention ordinances should be enacted by local governments for new developments within leveed areas to prevent increased stormwater flooding of areas outside leveed areas.

COORDINATION

1. The Coastal Management Division should define what "direct and significant impacts" means when referring to effects on coastal zone areas of activities in fastlands and on uplands.

Long-Term

Active

OIL and GAS

HYDROLOGY

DREDGED MATERIAL

EROSION

MAN

Passive

PLANS and STUDIES

REGULATIONS

COORDINATION

ENVIRONMENTAL MANAGMENT UNIT 3

Short-Term

Active

OIL and GAS

HYDROLOGY

1. Construction of the Davis Pond freshwater diversion should begin immediately; designs or operation scheduleus should be modified to maximize delivery of sediment into basin; an outfall plan should be developed and implemented. The outfall plan could include techniques for trapping sediment, such as fencing.

2. The EFFECTS OF THE planned siphon at Naomi should be ~~enlarged~~ MONITORED ETC.....

3. Freshwater and sediment diversion through the Algiers Lock system should be provided. — AS PER CHANGES

4. Saltwater intrusion should be controlled and/or decreased in Bayou Lafourche. JOHN SPANO — LAFOURCHE FRESHWATER DISTRICT DONALDSONVILLE

5. Openings should be placed in spoil banks CAUSING THE surrounding unintentionally impounded wetlands. MENT OF

TWO SYSTEMS

404c AREA

6. Circulation should be improved in the Bayou aux Carpes swamp and other swamps in need of such actions. → CHANGE – NRS PURCHASE ETC.

7. The cross-sectional area of canals entering Lakes Cataouatche and Salvador should be decreased, forcing more water to flow into

DUPLICATE PG. 1 #1
ADD 7, 13, 14, 8, 12 ETC.

wetlands, providing sediment and nutrients to wetlands and decreasing eutrophication of water bodies.

8. Drainage culverts should be breached and removed in the CIT and Bayou des Familles tract.

DELETE 9. The Jefferson Parish West Bank Hurricane Protection levee should be restricted to the alignment already permitted by the Corps of Engineers. Support the growth/no growth line around the V-levee.

10. Spoil banks should be established along the Bayou Segnette Waterway and the flooded former agricultural areas. Utilize these areas for marsh creation.

DELETE 11. Water control structures shall be installed and maintained at all canal intersections and bayous to decrease freshwater runoff and saltwater intrusion. For example, techniques should be installed to control saltwater within the Barataria Waterway from entering adjacent wetlands.

12. An earthern plug should be constructed at the end of the Boutte Canal and Gas Field at Baie Des Chactas.

13. On Couba Island, a program to close all ends of access canals and locational channels should be developed. Continuous spoil should be placed at the ends of the canals according to the following priorities: 1) close the end of the westernmost access canal (near the main canal entrance); and 2) close all other remaining canals.

14. A water control structure should be installed at the Lake Salvador/Bayou Villars connection to slow freshwater runoff.

DREDGED MATERIAL

PG 2 #1

1. Disturbed areas shall be revegetated with appropriate native materials to help prevent the future erosion or subsidence of the disturbed areas which often occurs before natural revegetation can occur.

PG 2 #2

2. Dredged material shall be placed to maintain natural drainage and nutrient exchange.

3. Excavated material from maintenance dredging should be utilized to create and maintain wetlands between Bayous Perot and Rigolettes and in the Delta Farms area.

4. DELETED — IN OTHERS Spoil banks shall be graded to avoid potholes or other fissures which would create water impoundments. Embankments along drainage canals or roadways for example, shall be breached to relieve unintentional impoundments and to allow for exchange of water, nutrients, and sediment with adjacent wetlands.

5. All spoil banks should be degraded to preexisting elevations, fertilized, and revegetated with native flora of the type and distribution characteristic of the area before initial disturbance.

6. Commercial clam shell dredging should not be permitted.

7. Dredged sites should be accessed by drilling barges and other deep draft vessels during high tides to reduce dredging.

8. Dredged material from the Barataria Bay Waterway and Intracoastal Waterway should be used to stabilize and repair the banks of that waterway, thereby retarding erosion and saltwater intrusion. Otherwise, dredged material should be spread hydroulically into subsided areas that flank the waterways to restore those areas as marshlands or should be discharged into the

plugged or abandoned pipeline or access canals that are conveniently close to the area dredged.

EROSION

Pg. 1 #1

1. Shorelines of Lake Cataouatche, Lake Salvador, particularly near the Bayou Signette Waterway, the Pen, and related inactive reclamation projects should be stabilized. Consideration should be given to using both structural and nonstructural methods for achieving the objectives. Funds for all phases of the project should be sought immediately.

Pg. 2 #1

2. Stabilizing material shall be used on areas of severe erosion along canal lengths.

3. The Lafourche Parish plan for protection and management of the Clovelly Farms to US Hwy. 90 wetlands should be refined and implemented.

4. A dam should be constructed across the Clovelly Canal at the northeast corner of Delta Farms. The east borrow ditch of Clovelly Farms should be connected with Clovelly Canal to allow freshwater into wetlands around Clovelly Farms.

5. Inactive oil and gas canals and all pipeline canals crossing Clovelly Canal and the Barataria Waterway should be plugged.

6. Sediment from Lake Salvador should be pumped into Clovelly and Delta Farms to create marsh.

7. Implementation of the West Fork, Bayou L'Ours Watershed Protection Plan should proceed as soon as possible. Funding for this project should be actively pursued at state and federal levels.

MAN

1. BASINWIDE All sanitary sewage and/or related domestic waste generation shall receive the equivalent of secondary treatment with disinfection prior to discharge into any watercourses or wetlands of the Basin.

2. Agricultural runoff from existing farmlands should be controlled to reduce or prevent adverse impacts on sensitive basin systems.

3. BASINWIDE Effluent discharges into Cousins Canal should be restricted. Measures to eliminate any leaching or runoff from the existing oxidation pond should be taken.

Passive

PLANS and STUDIES

1. Wildlife management plans that create a more diverse ecological system rather than a plan that is more favorable and productive to a limited number of species should be developed.

2. Wildlife management plans with goals and objectives to create more wetland areas and/or the revegetation of open water bodies should be allowed. Tax, development, and use incentives to encourage these types of programs should be instituted.

3. Research to investigate more cost effective bank stabilization methods should be funded.

4. An investigation should be initiated to determine the effects of the Jefferson Parish landfills on the surrounding wetlands. The study design would include a monitoring plan.

5. Studies that would examine methods of reducing marsh stress caused from canal impoundments should be funded.

6. The adequacy of current Intracoastal and Barataria Waterways dredged material maintenance areas should be reviewed.

7. Wetland restoration plans for inactive oil and gas production sites should be developed.

8. Development of a watershed protection plan should be initiated for the Lake Salvador Watershed.

REGULATIONS ALL PLANS WENT B/W PREVIOUSLY

1. Forced drainage discharges into marsh systems rather than into open water should be encouraged.

2. All effluents and emissions from point and nonpoint sources shall comply with state and federal regulations and proper certifications be obtained in order to insure that there are no detrimental impacts on the fauna and flora of the entire Basin from such substances as hazardous chemicals and hydrocarbons.

4. Only the use of waterborne or nonintrusive vessels in wetland areas should be allowed.

5. Septic tank installation permits should be monitored to reduce contamination of the surrounding area.

6. Activities that degrade or destroy wetlands or their value for fish and wildlife should be discouraged.

COORDINATION

Long-Term

Active

OIL and GAS

HYDROLOGY

Pg. 1 #1

1. A freshwater diversion (3,000 - 5,000 cfs) south of Jesuit Bend that would operate during peak flows of the river should be constructed and maintained.

2. Those diversion projects with the purpose of introducing sediment into the basin should be restricted to the eastern half of the EMU. If diversions that seek to utilize the sediment load of the river are planned for the western half of the EMU than they should be done so by means of enclosed aqueducts to tranport the materials to the lower reaches of the Basin.

3. A diversion from the river that will benefit the Pen should be designed and constructed.

4. Projects that demonstration wetlands restoration techniques should be developed.

DREDGED MATERIAL

1. Maintenance material from the GIWW should be used for marsh creation.

2. Revegetation of ponding areas or creation of new marsh should be considered as mitigation projects for activities impacting wetlands within the EMU.

EROSION

1. The Lafourche Parish Plan of Action "Wetland Protection and Maintenance Between U.S. Highway 90 and the Clovelly Oil and Gas Field in Lafourche Parish" should be monitored and maintained.

MAN

Passive

PLANS and STUDIES

Pg. 3#3

1. Management plans that incorporate proven forestry practices to improve circulation in the Bayou aux Carpes swamp and other swamps in need of such actions should be developed. The Bayou aux Carpes plan should include flap-gated culverts running under the hurricane protection levee with runoff canals directed into the swamp.

2. Wetlands management plans with the goal of maintaining the area of existing vegetated wetlands should be developed. Such plans may be initiated in the Salvador Wildlife Management Area, the Jean Lafitte National Park, and at Bayou Villars near Lake Salvador.

3. Pilot projects utilizing the recommendations in "Onshore Oil and Gas Activities along the Northern Gulf of Mexico Coast: A Wetland Managers Handbook" should be initiated.

4. Studies should be initiated that identify non-point source water quality problems. Recommendations should be made for solving these problems

5. A canal maintenance and management study should be initiated.

REGULATIONS

1. Programs should be initiated for monitoring and controlling brine discharges into Lake Salvador which contribute to salinity increases and a decline in water quality.

2. A program should be initiated to monitor and control landfill activities that impact surrounding wetlands.

3. Regulatory measures to protect the wetlands of EMU 3, their value for fish and wildlife, and the integrity and effectiveness of the activities described above should be developed implemented.

4. Alteration of natural hydrologic flow or the allowance of development in the stilling basin should be prohibited, except for approved freshwater/sediment diversion projects, such as Davis Pond.

5. Siting of waste disposal facilities should be discouaged.

COORDINATION

ENVIRONMENTAL MANAGMENT UNIT 4

Short-Term

Active

OIL and GAS

1. The use of directional drilling should be encouraged.

HYDROLOGY

1. Gaps should be placed in spoil banks and natural levees in deltaic area to allow for natural marsh creation. Low-level sills should be placed in levees south of Venice to encourage overbank flooding.

2 The Empire lock should be utilized as a source of freshwater and sediment to the Barataria Basin.

DREDGED MATERIAL

1. Maintenance dredge material should be used to create marsh and/or nourish existing islands.

2. All spoil banks should be degraded to preexisting elevations, fertilized, and revegetated with native flora of the type and distribution characteristic of the area before initial disturbance.

3. Dredged material from the Barataria Bay Waterway and Intracoastal Waterway should be used to stabilize and repair the banks of that waterway, thereby retarding erosion and saltwater intrusion. Otherwise, dredged material should be spread hydroulically into subsided areas that flank the waterways to restore those areas as marshlands or should be discharged into the plugged or abandoned pipeline or access canals that are conveniently close to the area dredged.

4. Permit applications to dredge through, fill or clear mangrove stands should be strongly discouraged. Where such activities are deemed unavoidable by the Administrator, the permit should require that after use has ceased, the dredged and filled areas are to be restored to their original elevation and revegetated with mangrove and other appropriate species.

5. Permits for dredging across islands, cheniers, or shell beaches shall not be issued. (Those natural features serve to break wave action and winds, reduce wave fetch, and slow tidal flows.)

6. Dredged sites should be accessed by drilling barges and other deep draft vessels during high tides to reduce the depth of dredging.

7. Turbidity screens should be used by dredgers if oyster beds are endangered.

8. Propwashing as a form of dredging should be strongly discouraged.

EROSION

1. Structural and nonstructural measures (riprap, dredged material, plantings) should be implemented to stabilize all eroding shorelines, particularly the Barataria Waterway and the Rigolettes.

2. Fencing should be constructed in floton marshes.

3. Sand should be used to nourish the beaches on Grand Isle, Shell Island, and Fourchon, in particular, and the barrier islands in general.

MAN

Passive

PLANS and STUDIES

1. Wildlife management plans with goals and objectives to create more wetland areas and/or the revegetation of open water bodies should be allowed. Tax, development, and use incentives should be instituted to encourage these types of programs.

2. Wildlife management plans that create a more diverse ecological system rather than a plan that is more favorable and productive to a limited number of species should be developed.

3. Techniques and methods should be refined and tested for determining when shellfish beds should be closed.

4. Development of a watershed protection plan should be initiated for the Bayou Dupont-Grand Bayou Watersheds.

REGULATIONS

1. Speed limits should be instituted in the Barataria Waterway for boats longer than 20 ft.

2. Further development of Grand Isle and other barrier islands should be prevented.

3. The natural sills (shoals or tidal deltas) in passes and the Barataria Waterway should be allowed to develop and thereby decrease saltwater intrusion.

4. BASINWIDE Reinjection of all produced waters should be required.

5. Only the use of waterborne or non-intrusive vessels should be allowed in wetlands.

COORDINATION

1. Nomination of the Barataria Bay into the EPA National Estuary Program should be encouraged.

Long-Term

Active

OIL and GAS

1. Plug and fill oil and gas canals.

HYDROLOGY

1. Water from the Mississippi River should be diverted into Bayou Lafourche during peak river flow. Water from Bayou Lafourche should be diverted into Yankee Canal (south of Golden Meadow) and the Barataria Basin.

2. A freshwater/sediment diversion (3,000 - 5,000 cfs) should be constructed near West Point a la Hache, a second in the Adams Bay-Bastion Bay area, and at other locations where they are proven beneficial to the enhancement and maintenance of the estuarine system. An outfall plan that distributes sediment and water to the lower ends of the basin to the maximum extent possible should be prepared. These diversions should be maintained and monitored. The objectives are to enhance and protect the barrier islands and gradually increase elevations of the land to pre-1950 status.

3. The Barataria Waterway should be isolated from the adjacent wetlands.

4. A saltwater intrusion device should be constructed on the Barataria Waterway.

5. Sediment from Southwest Pass should be diverted into the littoral drift.

DREDGED MATERIAL

1 Dredged material from the Barataria Waterway should be used to create marsh.

2. Disposal sites should not be overfilled. Material should be placed to marsh elevations. When these sites are filled, another site should be found.

EROSION

1. Meaningful stabilization and/or reconstruction programs for barrier islands should be enacted; in other words, a comprehensive barrier island protection strategy should be prepared. This strategy would include structural and nonstructural measures, such as nourishment of the beach and behind the islands, fences, and vegetative plantings. Sources of material would include the offshore, that brought in by barge, and sediment from the Mississippi River by aqueduct.

2. Segmented jetties should be placed out from the shoreline to trap more longshore sediments.

MAN

1. La. Hwy. 1 to Grand Isle should be maintained.

Passive

PLANS and STUDIES

1. The adequacy of current GIWW dredged material maintenance areas should be reviewed.

REGULATIONS

1. The oyster leases and laws should be changed to allow for marsh creation in open water areas.

2. Any and all laws that would inhibit the active management of EMU 4 for the enhancement of new wetlands should be suspended.

3. Canal dredging for mineral exploration within EMU 4 should be suspended until new sediment has been deposited and a pre-1950 environmental state has been attained.

4. Regulatory measures to protect the wetlands of EMU 4, the habitat value for fish and wildlife, and the integrity and effectiveness of the activities described above should be developed and implemented.

COORDINATION

BASINWIDE

Short-Term

Active

OIL and GAS

1. Activities should not contribute to indirect loss of wetlands in the Basin.

2. The following policies apply to mineral exploration and production activities:

a. Culverts shall be placed where streams and sloughs are crossed by the roadway embankment and at other locations along existing and proposed embankments to promote or maintain sheet flows. The openings of the culverts must be maintained so as to allow for the free flow of water.

b. Contents of mud pits and other drilling residues shall be removed from the site and disposed of in a lawful manner as the fluids and solids are produced. The best practical technology should be used. Consideration should be given to reinjection or containerization for later disposal in an approved manner.

c. Ring levees will be degraded by returning the material with which they were built into the areas from which it was removed, and the area leveled to as near pre-project conditions as practicable after mud pits have been cleaned.

d. Broken boards and other extraneous construction materials shall be removed from the site when the road is abandoned by the permittee. All plastic sheeting shall be removed from areas of the roadway from which the boards are removed and the site abandoned.

e. No hydrocarbons, substances containing hydrocarbons, drilling mud, drilling cuttings, or toxic substances shall be allowed to enter adjacent waterways and wetlands.

f. The road fill placed in the wetlands shall be degraded when the location is abandoned. The material shall be deposited into the borrow areas or ditches, and the area restored to as near pre-project conditions as practical using the material available in the road fill.

g. In the future should changes in the location or sections of the existing waterways, or in the generally prevailing conditions in the vicinity be required for the public interest, the applicant shall make such changes in the project or in the arrangement, as may be necessary to resolve the problem. The permittee shall bear all related cost.

h. All produced water shall be reinjected into appropriate strata rather than released into the surface environment.

3. Existing pipeline corridors shall be used to avoid unnecessary disruption of undisturbed wetlands by ditching. The width of altered areas of marsh and swamp adjacent to pipelines shall be restricted to reduce loss of wetlands by using the best available technology.

4. There should be no impoundment of wetlands by pipeline corridors.

5. Equipment that has been replaced should be removed from the site. For example, flowlines that serve the same field or site should be removed when they are no longer functioning for the purpurse for which they were intended, are not economically feasible to maintain, and pose a threat to the public health, safety, or welfare.

6. Pipeline trenches should be restored by backfilling with the available material that was removed during excavation.

7. All mouths of oil and gas access canals should be plugged upon abandonment until the main channel is plugged upon field abandonment. Any maintenance dredging of access channels should employ suction dredges which spray or broadcast dredged material onto subsiding areas near the channel. Spoil banks should be breached to allow for water circulation. Canals should be backfilled.

8. Abandoned pipelines should be used for sediment/freshwater transportation.

9. Directional drilling should be used when possible to reduce dredging.

10. Flowlines within established oil fields should be laid across wetlands without dredging.

11. The use of hover-craft, helicopters and other non-dredging related, well-site access methods shall be developed and utilized.

12. Use of marsh buggies shall be discouraged in favor or hover-craft or helicopters or other methods of access.

HYDROLOGY

1. The natural hydrology should be restored as much as possible by blocking or decreasing cross-sectional areas of unnecessary or little used canals that bypass natural waterways.

2. Cross-sectional areas of canals connecting different marsh types should be blocked or decreased.

3. Saltwater intrusion into center Bayou Lafourche should be controlled.

4. Freshwater diversion projects should be modified to increase or maximize sediment delivery to wetlands.

5. Those siphons presently in place but nonfunctional should be refurbished. All siphons should be used to the maximum extent possible.

6. Pilot sediment-trapping projects should be implemented.

7. Canalization impacts should be reduced (spoil banks removed or breached, canals plugged or backfilled, or unintentional impoundments eliminated).

8. Construction of future canals should be consistent with the water management objectives of each EMU.

DREDGED MATERIAL

1. Existing canals and channels should be used to access new drilling sites, thereby reducing dredging.

2. There shall be no net increase in the total surface area of canals presently found in the special management area.

3. There shall be no net increase in the total dredged volume of material than presently dredged in the special management area.

4. Permits for dredging across islands, cheniers, natural levees, or shell beaches should not be issued.

5. Permit applications for dredging canals into or through narrow strips of marsh that separate waterbodies should be strongly discouraged. (Permits for dredging such areas which are deemed unavoidable by the Administrator should require that the dredged material be placed continuously along all banks of the dredged area.

Foreseeable erosion which will be caused by a dredging project or the boat traffic during use of the dredged waterway must be reduced. After activities have ceased at the site, the canal shall be dammed, and the disturbed area shall be returned to its natural elevation and revegetated.)

6. Permits for dredging open waterbodies within 200 feet of shore and where circumstances allow should require that the dredged materials be cast towards the shoreline to reduce water depth appropriately between the dredging site and the shore, for the purpose of creating marsh. (The newly created shallows or mud flat should then be appropriately planted.)

7. The methods of spoil disposition should be decided on a case-by-case basis and must be consistent with other policies.

8. Permits for dredging should require that all unearthed stumps, logs and other objects that could be hazardous to boat traffic be removed from the waterbody and deposited at some designated approved disposal site usually upland out of wetland and open water.

9. Upon abandonment, canals must be backfilled and/or plugged using earthern plugs and rip-rap or other stabilizing material as standard mitigation. The surface area of the filled portion of the canal will be subtracted from the total surface area of canals found in the special management area (See Policy 2).

10. All spoilbanks, dams and backfilling specifically required under these policies are to be maintained by the permittee unless it can be proven that such maintenance cannot be accomplished due to conditions beyond the permittee's control or if it can be shown that the lack of such maintenance will have no adverse effects upon the vicinity.

EROSION

1. Vegetative plantings and other techniques should be used to stabilize shorelines and convert mudflats to salt-tolerant vegetation.

2. Rip-rap or vegetation stabilization and where appropriate other approved methods should be used instead of belkheading.

MAN

1. Actions to increase access by marine fishery resources to areas that are currently impounded or partially impounded should be implemented.

2. Trappers should be subsidized to remove nutria and muskrat in areas affected by "eat-outs." Nest counts (number/acre) should be used to determine areas potentially susceptible to damage.

3. Wetlands should be used for tertiary waste treatment of sewage whenever possible.

4. Local governments and private developers should be encouraged to install and operate adequate sewage treatment facilities, particularly in areas of new development.

5. All sanitary sewage and/or related domestic waste generation , including that from existing or proposed camps, shall receive the equivalent of secondary treatment with disinfection prior to discharge into any watercourses or wetlands of the Basin. Plans should be developed for those areas where secondary treatment does not now exist.

6. Any land reclamation activities in areas with poor soil conditions or a propensity to flooding and not presently fastlands or in established development corridors shall be prohibited.

7. Disturbed areas shall be revegetated with appropriate native species.

Passive

PLANS and STUDIES

1. Land loss "hot spots" (USACE Comprehensive Coastal Study) should be identified, specific land loss causes determined, and appropriate restorative measures implemented.

2. Areas of vegetative dieback as a result of saltwater intrusion should bed identified and revegetated immediately with salt-tolerant species.

3. All structures presently hydrologically connecting the Mississippi River to the Barataria Basin waterways (e.g., siphons, locks, etc.) should be examined for their diversion potential.

4. Rapidly eroding shorelines in the basin should be identified and protection of these shorelines should be made potential mitigation projects for activities perpetuated in the coastal zone.

5. Water management and land management plans and objectives should be established for each EMU of the Barataria Basin after completion of a hydrologic model of the basin. .

6. Mitigation plans should be developed for all future public works projects that occur in the coastal wetlands.

7. Canal impoundments should be studied and methods of improving water quality and exchange employed.

8. Septic tank installation permits should be monitored.

9. Existing landfills shall be monitored to prevent leaching into surrounding wetlands.

10. Oil and gas activities shall investigate directional drilling before considering a new access channel. Companies shall make maximum use of existing channels for access.

11. Wetlands values and functions should be documented and their distribution mapped for each EMU.

12. Specific plans should be developed for protecting biologically sensitive areas.

13. Studies concerning canal and spoil bank maintenance and management as well as retention ponds should be initiated.

14. As the non-federal sponsor of the Louisiana Comprehensive Coastal Wetlands Study, the State of Louisiana can place a high priority on starting this effort in the Barataria Basin. Plan development should begin immediately.

15. One state agency or office should guide and coordinate development of the framework plan.

16. The lead agency should enlist the cooperation and assistance of other agencies, units of government, and the private sector with resource management responsibilities, expertise, and interests within the basin.

17. Existing studies, resource evaluations and management plans within the basin should be utilized to complete the draft framework

plan. The lead agency may assign the development of specific plan components to cooperating members (agencies, individuals, etc.) and utilize a planning team to pull the information together in a draft form.

18. A minimum framework plan should include examples of the following information by sub-basins or similar management units:

- an assessment of resources and land uses;
- general resource conditions and trends;
- major resource problems;
- existing programs and management objectives;
- recommended management alternatives and objectives;
- priorities for action, both immediate and those requiring detailed planning;
- funding sources (programs) and recommended application procedures.

19. Detailed planning should proceed within the sub-basins or management units according to the priorities established within the framework plan. Individual watershed and hydrologic treatment units should serve as the basic planning implementation units within the sub-basins. Existing management plans and proposed projects which are consistent with sub-basin (management unit) objectives would be high priority measures for immediate implementation. Planning and implementation should proceed by priority watershed (hydrologic units) within each sub-basin. This will allow for several concurrent project initiatives within the entire basin, as funds and resources allow.

20. Public participation and involvement in the planning process will be absolutely essential in developing an acceptable basin plan. Public cooperation will be required to implement and maintain most of the structural measures and management practices.

REGULATIONS

1. All agricultural fields should be required to have buffer strips adjacent to drainage ditches and canals to help remove sediment and nutrients before runoff carries them into canals and bayous.

2. Plugging and backfilling should be required ofone abandoned or non-productive oil and gas canal for every new oil and gas access canal dug in the basin.

3. Beneficial use should be made of at least 50% of all dredged material resulting form NOD-22 or maintenance dredging activities if suitable, nearby alternatives exist. A condition should be made on every Corps of Engineers Maintenance Dredging and NOD-22 General Permit.

4. Oil and gas exploration companies actively involved in the coastal zone should be required to develop hovercraft or helicopter capabilities as mitigation for present or future activities in the basin.

5. All new development adjacent to wetland areas should be required to provide for adequate tertiary waste treatment of sewage.

6. All bulkheads should be placed at or above the mean high water level.

7. Containerization and/or reinjection of all produced waters and drillings muds and cuttings regardless of place of production should be required.

8. Produced water discharges should be controlled in sensitive environments.

9. No filling of coastal marshes for non-water-dependent purposes should be allowed.

10. All maricultural activities in coastal wetlands except for small cage cultures should cease.

11. Construction and use of surface pits for petroleum waste disposal in the Barataria Basin should be prohibited, and abandoned pits should be closed and restored.

12. In new developments, the natural drainage system should be used in its existing undeveloped state to slow runoff and encourage overland flow.

13. A"no net loss" criteria should be applied to all new dredge and fill activities. Empahsis should be on maintaining functional wetland values.

14. The importance of using dredged material beneficially to create land or plug and backfill canals should be stressed. Often, dredged material is deposited on top of already existing spoil banks or stacked in wetlands.

15. Require 50% of dredged material generated from maintenance dredging of all public waterways be used to generate soil elevations conducive to marsh creation or preservation. The remaining should be used for erosion control or made available for public sale to help finance the effort.

16. Commercial, industrial, and urban development should be directed toward appropriate areas in each EMU (e.g., noncoastal water-dependent activities to nonwetland habitats).

17. Historical and archaeological sites and the cultural heritage of the poeples within the Basin should be protected.

18. Mitigation should be sought where violations of water quality criteria have been demonstrated and have been shown to have adverse impacts on beneficial functions of the surrounding habitats. An illegal discharge site should be cleaned and it and the surrounding areas restored to pre-project conditions.

19. Mitigation should be sought for impacts on wetlands resulting from to urban development.

20. Landfill siting should be discouraged in wetlands.

21. Interdepartmental review of all drainage projects affecting bottomland hardwood swamps should be required.

22. Existing forested vegetation should be maintained by all developments within the modified wetlands areas to the maximum extent practical.

23. Activities that would needlessly destroy or degrade wetlands should be discouraged or modified. The least damaging water dependent alternatives should be selected. Improve habitat quality and quantity.

24. The permittee should be required to document that there are no practicalble alternatives or less damaging alternatives to the filling of wetlands after considering costs, logistics, and technical factors.

25. The permittee should be required to demonstrate that the project will not have an adverse impact on the public health.

26. All projects should be required to demonstrate that they meet or exceed FEMA requirements for flood damage reduction.

27. The discharge of improperly treated sewage should be discontinued and regulations should be strongly enforced.

28. All effluents and emissions from point and nonpoint sources shall comply with state and federal regulations. Proper certifications shall be obtained in order to insure that there are no detrimental impacts on the fauna and flora of the entire basin from such substances as hazardous chemicals and hydrocarbons. Water management plans shall include full (Insert discussion by Mr. Sabins) treatment of point source pollution.

COORDINATION

1. The coastal zone boundaries should be altered to include all of Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Assumption, Lafourche, St. James, Ascension, St. John the Baptist, St. Charles, Orleans, St. Bernard, Jefferson, and Plaquemines Parishes; that portion of Calcasieu Parish south of Interstate 10; and those portions of Livingston, Tangipahoa, and St. Tammany parishes south of Interstate 12 or south of Interstate 10 east of the I10/I12 intersection in St. Tammany Parish.

ALREADY IS

2. The public should be educated on the importance and need for the modifications and regulations recommended in this report. They should be educated about present and anticipated conditions in the basin in terms of increased flooding, development of wetlands, wetland loss, degradation of water quality, and declines in fish and wildlife abundance. The education or public awareness program should include:

a. developing elementary-high school curricula;

b. making presentations to elementary-high school students;

c. conducting teacher education workshops;

d. developing cross-training with local school teachers and state/federal agencies;

e. incorporating EPA student project awards program with wetland protection theme;

f. issuing news releases;

g. utilizing student camps;

h. coordinating with education centers

i. conducting lectures and community education workshops;

j. encouraging cross-training among state/federal agency personnel, in order to enhance agencies;

k. conducting hunters/fisherman education seminars;

l. developing more accurate depiction of the Louisiana's coastal boundary on all public maps.

3. A mitigation bank for all of the small "Mom & Pop" permit applications should be established by the Corps. Contributions would be applied to larger and more practical mitigation projects.

4. Federal and state permit fees should be raised.

5. Tax incentive programs should be established for landowners who protect or enhance wetlands.

6. The importance of the role of the U.S. Soil Conservation Service Plant Materials Laboratory in Galliano, La. should be emphasized.

7. State agencies should recommend standards that protect the physical, biological, and chemical functions of the aquatic systems of the Basin.

8. State and local governments should prepare plans that have as one objective the protection of wetlands. One element should be the proper management of non-point discharges.

9. State and local governments should rigidly enforce standards on point source discharges.

10. Only approved herbicides for use in aquatic environments should be used for the maintenance of rights-of-way. Indiscriminent or excessive use of herbicides should be discouraged.

11. Agencies should encourage mechanical removal of vegetation along rights-of-way in place of herbicides.

12. The COE, DNR, EPA, and local governments should emphasize greater protection of wetlands for their habitat value for fish and wildlife, and the integrity of the existing and proposed wetlands management plans. The agencies should coordinate their activities more closely.

13. Wetlaneds protection measures consistent with state and federal laws should be identified, developed, and employed and incorporated into :

- *A. state statutes:*
- *B. local ordinances; and*
- *C. the state Coastal Management program.*

14. Mitigation or compensation at an off-site location should be required for projects which would adversely impact wetland areas only where adequate mitigation cannot be conducted on site.

15. Management Unit Boundaries between 1 and 3 and between 3 and 4 are not fixed but represent a consensus for discussion and should not be considered hard and fast boundaries.

16. By utilizing established development trends, soil types and elevations, growth limiting lines should be established around all natural levees with established development and shall be included as part of Management Unit 2.

Long-Term

Active

OIL and GAS

HYDROLOGY

1. Diversion rights-of-way should be purchased in suitable areas near existing or planned freshwater diversion sites for use when present structures are no longer functional.

2. More freshwater diversions/siphons should be installed along the river.

3. Freshwater flow of Bayou Lafourche should be increased and a series of freshwater siphons installed to nourish lands on both sides of the Bayou.

4. Structural and nonstructural solutions for the control of saltwater intrusion, wave wash, and subsidence should be implemented.

5. Existing water circulation avenues should be modified to improve flushing of lakes and wetlands; sediment and nutrient transport to wetlands improved; freshwater retention capacity increased; and saltwater intrusion reduced.

DREDGED MATERIAL

EROSION

1. Revegetation of ponding areas should be examined and implemented when beneficial.

MAN

Passive

PLANS and STUDIES

1. All freshwater diversions should be monitored for the presence of priority pollutants.

2. A method for dealing with sanitation problems caused by camps should be determined.

3. The hydrology and topography of each unit should be studied and modeled.

4. Land use plans for each EMU that provide for economic growth while protecting the natural resources of the units should be developed.

5. Monitoring of long-term water quality in the basin should be undertaken. Where contaminats are shown to be a problem, regulations need to be amended and enforced for greater control of pollutants.

REGULATIONS

1. Industrial and landfill contamination of wetland areas should be minimized.

2. Deep and swamp cypress associations should be protected and preserved.

3. Strict monitoring and control of cypress lumbering activities should be required.

4. Agencies should undertake maximum surveillance and enforcement of permit conditions to insure permittee has complied with the standard and special conditions.

COORDINATION

1. A user fee for commercial shipping interests using man-made waterways should be established and used for the restoration and preservation of wetlands adjacent to that waterway.

2. Agencies should be required to undertake maximum surveillance and enforcement of permit conditions to insure that the permittee complies with the criteria.

3. The 404 permit regulations should be altered to include a provision of no net loss of wetlands.

4. The public trust doctrine should be developed and enforced for access to state-owned water bottoms.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
825 Kaliste Saloom Road
Brandywine Bldg. II, Suite 102
Lafayette, Louisiana 70508

February 7, 1992

Colonel Michael Diffley
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Diffley:

The Fish and Wildlife Service has prepared the attached report entitled, "Caernarvon Freshwater Diversion Contaminants Monitoring Study 1990-1991." The report documents pre-diversion contaminant levels in fish and shellfish collected from the Mississippi River and in the marsh downstream from the diversion structure. The attached report is submitted under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

We will continue to work closely with your staff during the planned post-diversion monitoring study. Please keep Mr. Paul Conzelmann of this office advised as the study progresses.

Sincerely yours,

David W. Frugé

David W. Frugé
Field Supervisor

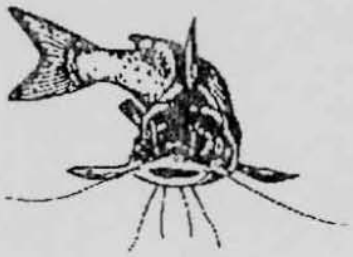
cc: EPA, Dallas, TX
NMFS, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD), Baton Rouge, LA
FWS, Atlanta, GA (AWE/ES)
LA Dept. of Environmental Quality, Baton Rouge, LA
LA Dept. of Health and Hospitals, Baton Rouge, LA
Plaquemines Parish Government
St. Bernard Parish Government

INTERIM REPORT:

CAERNARVON FRESHWATER DIVERSION

CONTAMINANTS MONITORING STUDY

1990-1991



SOUTHEAST REGION
U.S. FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
LAFAYETTE, LOUISIANA
FEBRUARY 1992

INTERIM REPORT:
CAERNARVON FRESHWATER DIVERSION
CONTAMINANTS MONITORING STUDY
1990-1991

Study Identifiers:
91-4-4249
90-4-4249

PAUL J. CONZELMANN AND THOMAS W. SCHULTZ
U.S. FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
LAFAYETTE, LOUISIANA
FEBRUARY 1992

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendix Tables

Page

Appendix A:

Appendix B:

ABSTRACT

The Caernarvon Freshwater Diversion Structure was completed in January 1991 by the U.S. Army Corps of Engineers. The purpose of the structure is to divert Mississippi River water into the Breton Sound area estuary in southeastern Louisiana, to ameliorate saltwater intrusion and associated wetland loss. Biota were sampled in 1990 and 1991 to evaluate pre-diversion contaminant levels in fish and shellfish from the Mississippi River and three marsh locations (Big Mar, Grande Lake, and Bay Gardene) at increasing distances downstream from the structure outfall. Fish and oyster tissue samples were analyzed for residues of organochlorine pesticides, polychlorinated biphenyls, aliphatic hydrocarbons, and heavy metals.

Contaminant levels in biota collected prior to diversion will be compared to levels in biota collected following diversion, to evaluate changes in contaminant levels in fish and oysters that may be attributable to operation of the structure. The organochlorine and aliphatic hydrocarbons residues should be the most indicative of any deleterious effects upon the downstream biota, because these contaminants were observed either only in the Mississippi River, or at higher concentrations in the river. The marsh locations generally exhibited higher heavy metal concentrations than those of the Mississippi River.

Key words: Louisiana, Mississippi River, Breton Sound, organochlorine pesticides, PCBs, aliphatic hydrocarbons, heavy metals, freshwater diversion.

INTRODUCTION

The Breton Sound estuary is located in extreme southeast Louisiana, and its associated wetlands support a diversity of fish, shellfish, and wildlife populations of commercial importance to fisherman, trappers, sportsmen, and wildlife enthusiasts. These resources are being seriously threatened by habitat changes associated with marsh loss, subsidence, and saltwater intrusion. The U.S. Army Corps of Engineers (Corps) constructed the Caernarvon Freshwater Diversion Structure to divert Mississippi River (River) water into Breton Sound, in an attempt to reduce the rate of wetland loss, and to enhance fish and wildlife productivity by restoring salinity regimes to levels that previously occurred, i.e., when the River seasonally flooded the area.

The objective of this study is to evaluate pre- and post-diversion contaminant body burdens in fish and molluscs, at various locations in the Breton Sound estuary, to insure that the diversion is not contributing unacceptable contaminant levels to those resources. This interim report documents baseline contaminant levels in the study-area biota prior to diversion for comparison with such levels in biota to be sampled following diversion.

METHODS AND MATERIALS

During 1990 and 1991, fish samples were collected from the River at the site of the diversion, and near the outflow of the structure at Big Mar. Fish and oyster samples were collected at Grand Lake and Bay Gardene, located progressively further downstream from the outflow structure (Figure 1). Sites were selected to coincide as closely as possible with biological monitoring sites previously established by the Louisiana Department of Wildlife and Fisheries to determine wildlife population changes associated with the Diversion.

Fish samples were collected using trotlines and variable-mesh gill nets, and oyster samples were collected using a boat-towed oyster dredge. Fish were individually weighed and measured, wrapped in aluminum foil, labeled, bagged, and placed in frozen storage. Oyster samples were shucked using a stainless steel oyster knife; the tissue was weighed, transferred to a labeled, analytically-cleaned glass jar with a teflon-lined lid, and placed in frozen storage.

Heavy metals analyses were conducted by Research Triangle Institute, Research Triangle Park, North Carolina. Organic analyses were conducted by Mississippi State University, Starkville, Mississippi, according to contract specifications established by the U.S. Fish and Wildlife Service's Patuxent

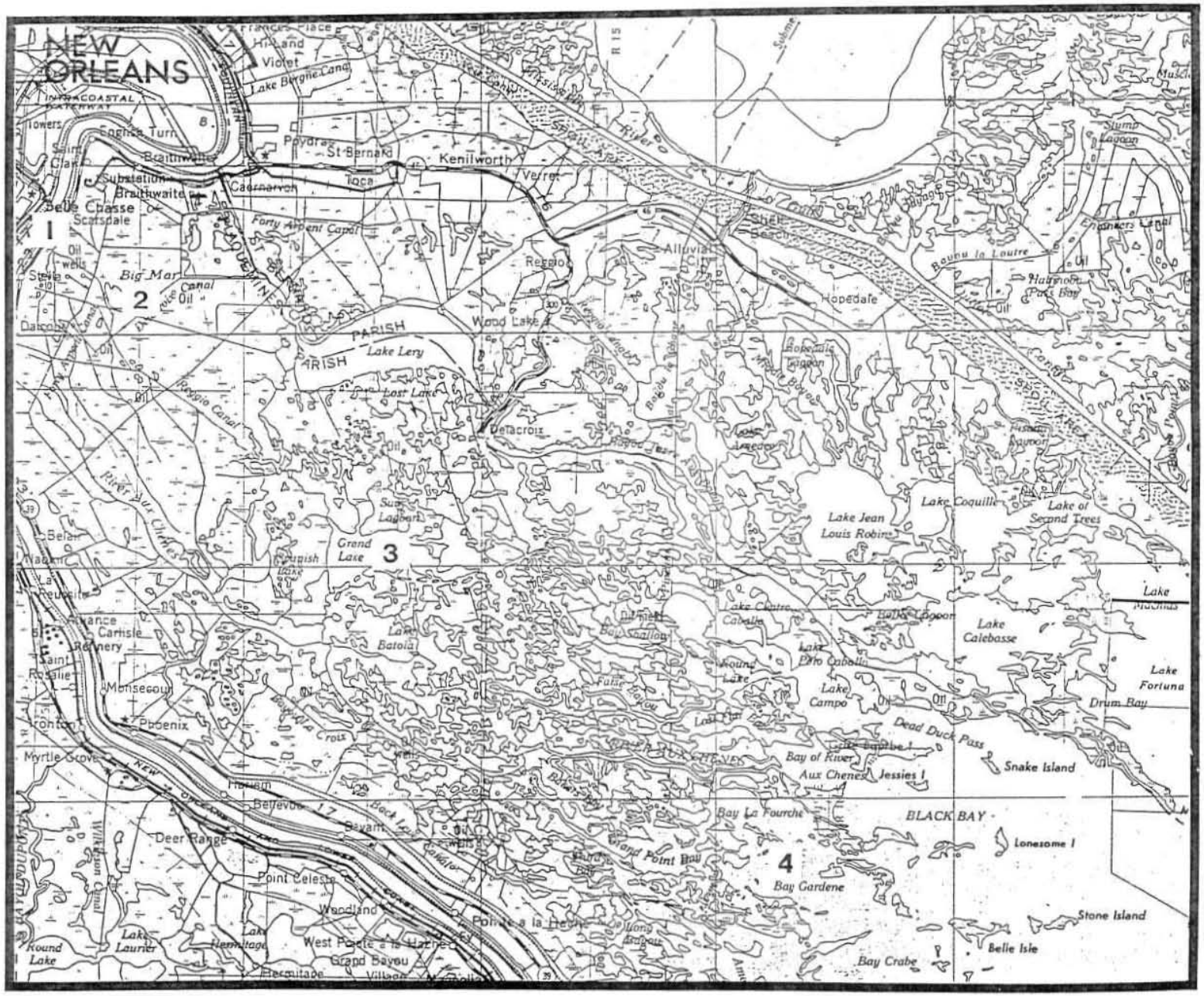


FIGURE 1. CAERNARVON FRESHWATER DIVERSION PROJECT'S SAMPLING LOCATIONS.

Analytical Control Facility (PACF), Laurel, Maryland. All resultant data was reviewed and evaluated for accuracy by PACF as part of their quality control and assurance program. Methodologies for the various analyses are presented in Appendix A. Appendix Tables A-1 and A-2 display the Minimum Detection Limits for all organic and inorganic parameters, respectively.

RESULTS AND DISCUSSION

The results of the tissue analyses for the four sampling locations of the Caernarvon Freshwater Diversion Project are presented in Tables 1 through 6 and Appendix B, Tables B1 through B6.

Tables B1 through B6 display contaminant concentrations detected in each of the various organisms sampled from the Mississippi River (site 1), Big Mar (site 2), Grand Lake (site 3), and Bay Gardene (site 4). Organochlorine parameters for 1990 and 1991 are presented in Tables B1 and B2, respectively; aliphatic hydrocarbon parameters for 1990 and 1991 are presented in Tables B3 and B4, respectively; and inorganic parameters for 1991 are presented in Tables B5 and B6, respectively.

Tables 1 through 6 summarize the data presented in Tables B1 through B6, with organochlorine residue data summarized in Tables 1 and 2, aliphatic hydrocarbon residue data summarized in Tables 3 and 4, and inorganic residue data summarized in Tables 5 and 6.

Organochlorine Residues. The tissue samples were analyzed for 22 organochlorine residues. Twelve of these were non-detected in all tissue samples taken during both years of the study [α-benzene hexachloride(BHC), γ-BHC, β-BHC, δ-BHC, oxychlordane, toxaphene, o,p'-DDE, o,p'-DDD, endrin, *cis*-nonachlor, o,p'-DDT, and mirex]. Heptachlor epoxide and polychlorinated biphenyls (PCBs) were non-detected in the 1990 samples.

There were eight organochlorine residues detected only in the River: hexachlorobenzene (HCB), heptachlor epoxide (1991 only), γ-chlordane, τ-nonachlor, PCBs (1991 only), α-chlordane, dieldrin, and p,p'-DDT (1991 only). Only two organic compounds, p,p'-DDE and p,p'-DDD, were detected on both sides of the diversion structure. The p,p'-DDD was detected in the Mississippi River (mean=0.027 mg/kg) and at Big Mar (mean=0.001 mg/kg) in 1991 only, while p,p'-DDE was detected at all collection sites in both years. The highest concentration of p,p'-DDE always occured in the River (mean=0.085 mg/kg in 1990 and 0.04 mg/kg in 1991), with lowest levels detected at Grand Lake in 1990 (mean=0.007 mg/kg) and Bay Gardene in 1991 (mean=0.003 mg/kg).

Aliphatic Hydrocarbon Residues. The tissue samples were analyzed for 13 aliphatic hydrocarbon residues which were detected at nearly all sampling locations. In both years, all aliphatic hydrocarbons exhibited a progression of decreasing concentrations, with the highest levels observed in the River and the lowest levels observed mainly in Bay Gardene. Two compounds, η-dodecane and η-tridecane, were detected only in the Mississippi River in 1990.

In comparing the three marsh locations, Grande Lake samples had elevated levels of octylcyclohexane in 1990; η-tridecane, nonylcyclohexane, η-heptadecane, and phytane in 1991; and pristane and η-eicosane in both years. Bay Gardene samples had an elevated level of η-pentadecane in 1990.

Inorganic Residues. Tissue samples were analyzed for 23 inorganic residues. Two parameters, silver and beryllium, were non-detected in 1990. There were no data for antimony, cobalt, silver, and tin in 1991 due to analytical problems; all other metals were detected at one or more stations.

Nearly all inorganic parameters (in both years) exhibited progressively increasing concentrations, with lower concentrations observed in the River and higher values occuring either in Grand Lake or Bay Gardene. Aluminum, barium, boron, cadmium, copper, iron, manganese, molybdenum, zinc, and arsenic values exhibited this progression. This trend was also observed for antimony, cobalt, and tin in 1990, and for beryllium and lead in 1991.

The lowest levels for magnesium and strontium (in both years) were observed in the Mississippi River, while the highest concentrations occurred at Big Mar. Vanadium and selenium concentrations decreased from the River to Big Mar, but levels at Bay Gardene were greater than those detected at the River.

Finally, the bioaccumulative ability of certain organisms in a sample can skew the data to indicate above normal levels of contamination. For example, the American oyster can bioaccumulate more efficiently than most fishes. The oyster's bioaccumulation ability is apparent in the data for aluminum, boron, copper, iron, cadmium, manganese, zinc, vanadium, selenium, and arsenic. This phenomenon can also be observed for certain fishes as with: chromium, iron, manganese, nickel, and vanadium in sheepshead; iron, nickel, and selenium in striped bass; and magnesium in spotted gar.

CONCLUSIONS

Organochlorine residues were found predominantly in samples from the River. The highest concentrations of aliphatic hydrocarbons, which were found throughout the system, also occurred in samples from the River. The heavy metals, were pervasive, but samples from the marsh locations generally exhibited higher concentrations. Now that the diversion structure is in operation, analysis of fish and wildlife samples should reveal any impacts of river diversion on specific contaminant levels in the receiving area.

This report completes the pre-diversion baseline contaminant sampling study. Post-diversion monitoring will begin after structure operations commence. Such operations should initially require opening the structure for sufficient flows and durations to assure that any contamination from the Mississippi River would be readily detectable.

ACKNOWLEDGEMENTS

The authors would like to thank Messrs. Waynon Johnson [National Oceanic and Atmospheric Administration, formerly U.S. Fish and Wildlife Service (USFWS)], Wilfred Kucera [USFWS retired], and Donald Schultz [USFWS] for their assistance in designing the study. Appreciation also is extended to Messrs. Bruce Baird [LA Department of Wildlife and Fisheries, formerly LA Department of Environmental Quality], Roy Giardina [LA Department of Wildlife and Fisheries], Richard Boe [U.S. Army, Corps of Engineers], and Andrew Dolan [USFWS] for their assistance with the field collection.

Table 1. Summary of organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
HCB	0.025 (0.02-0.03)	BDL[5]	BDL	BDL
α-BHC	BDL	BDL	BDL	BDL
γ-BHC	BDL	BDL	BDL	BDL
β-BHC	BDL	BDL	BDL	BDL
δ-BHC	BDL	BDL	BDL	BDL
OXYCHLOR	BDL	BDL	BDL	BDL
HEPT EPOX	BDL	BDL	BDL	BDL
γ-CHLOR	0.04 (0.03-0.05)	BDL	BDL	BDL
τ-NONACHL	0.035 (0.02-0.05)	BDL	BDL	BDL
TOXAPHENE	BDL	BDL	BDL	BDL
PCB's	BDL	BDL	BDL	BDL
o,p'-DDE	BDL	BDL	BDL	BDL
α-CHLOR	0.055 (0.05-0.06)	BDL	BDL	BDL
p,p'-DDE	0.085 (0.07-0.10)	0.013 (0.01-0.02)	0.007 (ND[6]-0.02)	0.015 (ND-0.02)
DIELDRIN	0.07 (0.05-0.09)	BDL	BDL	BDL
o,p'-DDD	BDL	BDL	BDL	BDL
ENDRIN	BDL	BDL	BDL	BDL
cis-NONAC	BDL	BDL	BDL	BDL

Table 1. (cont.) Summary of organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
o,p-'DDT	BDL[5]	BDL	BDL	BDL
p,p'-DDD	0.01 (0.01-0.01)	BDL	BDL	BDL
p,p'-DDT	0.06 (0.05-0.07)	BDL	BDL	BDL
MIREX	BDL	BDL	BDL	BDL

[1]Values for the Mississippi River are calculated on the basis of one specimen of channel catfish and one specimen of blue catfish.
[2]Values for Big Mar are calculated on the basis of three specimens: two spotted gar and one largemouth bass.
[3]Values for Grand Lake are calculated on the basis of seven specimens: three oysters, two red drum, a spotted gar, and an alligator gar.
[4]Values for Bay Gardene are calculated on the basis of five specimens: three oysters, a red drum, and an alligator gar.
[5]BDL= Below detectable limit.
[6]ND= None detected.

Table 2. Summary of organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
HCB	0.002 (ND[5]-0.01)	BDL[6]	BDL	BDL
α-BHC	BDL	BDL	BDL	BDL
γ-BHC	BDL	BDL	BDL	BDL
β-BHC	BDL	BDL	BDL	BDL
δ-BHC	BDL	BDL	BDL	BDL
OXYCHLOR	BDL	BDL	BDL	BDL
HEPT EPOX	0.008 (ND-0.03)	BDL	BDL	BDL
α-CHLOR	0.007 (ND-0.02)	BDL	BDL	BDL
τ-NONACHL	0.012 (ND-0.02)	BDL	BDL	BDL
TOXAPHENE	BDL	BDL	BDL	BDL
PCB's	0.29 (0.17-0.42)	BDL	BDL	BDL
o,p'-DDE	BDL	BDL	BDL	BDL
α-CHLOR	0.017 (ND-0.03)	BDL	BDL	BDL
p,p'-DDE	0.04 (0.02-0.06)	0.007 (ND-0.02)	0.006 (ND-0.03)	0.003 (ND-0.01)
DIELDRIN	0.032 (ND-0.09)	BDL	BDL	BDL
o,p'-DDD	BDL	BDL	BDL	BDL
ENDRIN	BDL	BDL	BDL	BDL
cis-NONAC	BDL	BDL	BDL	BDL

Table 2. (cont.) Summary of organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 [values the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
o,p-'DDT	BDL	BDL	BDL	BDL
p,p'-DDD	0.027 (0.01-0.04)	0.001 (ND[5]-0.01)	BDL	BDL
p,p'-DDT	BDL	BDL	BDL	BDL
MIREX	BDL	BDL	BDL	BDL

[1]Values for the Mississippi River are calculated on the basis of one specimen of channel catfish and one specimen of blue catfish.
[2]Values for Big Mar are calculated on the basis of three specimens: two spotted gar and one largemouth bass.
[3]Values for Grand Lake are calculated on the basis of seven specimens: three oysters, two red drum, a spotted gar, and an alligator gar.
[4]Values for Bay Gardene are calculated on the basis of five specimens: three oysters, a red drum, and an alligator gar.
[5]ND= None detected.
[6]BDL= Below detectable limit.

Table 3. Summary of aliphatic hydrocarbon residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
η-DODECANE	0.04 (0.02-0.05)	BDL[5]	BDL	BDL
η-TRIDECANE	0.04 (0.01-0.06)	BDL	BDL	BDL
η-TETRADECANE	0.14 (0.09-0.18)	0.003 (ND[6]-0.01)	0.001 (ND-0.01)	0.004 (ND-0.01)
OCTYLCHCLOHEXANE	0.08 (0.07-0.08)	BDL	0.02 (ND-0.05)	BDL
η-PENTADECANE	1.39 (0.28-2.5)	0.07 (0.05-0.09)	0.04 (ND-0.10)	0.06 (0.02-0.09)
NONYLCYCLOHEXANE	0.16 (0.12-0.19)	BDL	0.001 (ND-0.01)	BDL
η-HEXADECANE	0.75 (0.17-0.58)	0.007 (ND-0.01)	0.01 (ND-0.02)	0.01 (ND-0.02)
η-HEPTADECANE	3.75 (1.0-6.5)	0.14 (0.06-0.18)	0.14 (0.02-0.29)	0.07 (0.04-0.13)
PRISTANE	0.77 (0.24-1.3)	0.01 (ND-0.02)	0.07 (0.02-0.14)	0.01 (ND-0.02)
η-OCTADECANE	0.39 (0.15-0.62)	0.003 (ND-0.01)	0.01 (ND-0.01)	BDL
PHYTANE	0.21 (0.16-0.26)	0.02 (0.01-0.03)	0.01 (ND-0.02)	0.01 (ND-0.02)
η-NONADECANE	0.16 (0.06-0.25)	0.03 (0.02-0.04)	0.01 (ND-0.02)	0.004 (ND-0.02)
η-EICOSANE	0.08 (0.02-0.13)	0.003 (ND-0.01)	0.01 (ND-0.02)	BDL

[1]Values for the Mississippi River are calculated on the basis of one specimen of channel catfish and one specimen of blue catfish.
[2]Values for Big Mar are calculated on the basis of three specimens: two spotted gar and one largemouth bass.
[3]Values for Grand Lake are calculated on the basis of seven specimens: three oysters, two red drum, a spotted gar, and an alligator gar.
[4]Values for Bay Gardene are calculated on the basis of five specimens: three oysters, a red drum, and an alligator gar.
[5]BDL= Below detectable limit.
[6]ND= None detected.

Table 4. Summary of aliphatic hydrocarbon residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
η-DODECANE	0.03 (ND[5]-0.05)	0.02 (ND-0.04)	0.02 (ND-0.04)	0.02 (ND-0.04)
η-TRIDECANE	0.07 (ND-0.22)	0.03 (0.01-0.05)	0.04 (ND-0.07)	0.03 (ND-0.04)
η-TETRADECANE	0.10 (0.02-0.22)	0.03 (0.01-0.04)	0.03 (ND-0.12)	0.02 (0.01-0.03)
OCTYLCHCLOHEXANE	0.03 (ND-0.07)	0.004 (ND-0.02)	0.002 (ND-0.01)	BDL[6]
η-PENTADECANE	0.37 (0.13-0.82)	0.15 (0.03-0.16)	0.09 (ND-0.26)	0.04 (0.01-0.06)
NONYLCYCLOHEXANE	0.06 (0.01-0.16)	0.004 (ND-0.03)	0.02 (ND-0.20)	BDL
η-HEXADECANE	0.23 (0.03-0.71)	0.03 (ND-0.07)	0.04 (0.02-0.14)	0.03 (0.02-0.04)
η-HEPTADECANE	0.68 (0.19-0.68)	0.28 (ND-1.0)	0.64 (0.03-3.0)	0.04 (0.03-0.06)
PRISTANE	0.36 (0.06-0.51)	0.03 (ND-0.07)	0.07 (ND-0.85)	0.03 (0.01-0.08)
η-OCTADECANE	0.17 (0.02-0.52)	0.02 (ND-0.03)	0.03 (0.01-0.23)	0.01 (ND-0.02)
PHYTANE	0.15 (0.04-0.38)	0.05 (0.01-0.13)	0.08 (ND-0.70)	BDL
η-NONADECANE	0.13 (0.03-0.13)	0.04 (ND-0.12)	0.04 (ND-0.15)	0.01 (ND-0.02)
η-EICOSANE	0.09 (0.02-0.22)	0.01 (ND-0.03)	0.03 (ND-0.16)	0.03 (0.02-0.04)

[1]Values for the Mississippi River are calculated on the basis of one specimen of channel catfish and one specimen of blue catfish.
[2]Values for Big Mar are calculated on the basis of three specimens: two spotted gar and one largemouth bass.
[3]Values for Grand Lake are calculated on the basis of seven specimens: three oysters, two red drum, a spotted gar, and an alligator gar.
[4]Values for Bay Gardene are calculated on the basis of five specimens: three oysters, a red drum, and an alligator gar.
[5]ND= None detected.
[6]BDL= Below detectable limit.

Table 5. Summary of elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
Al	42.8 (38.5-47.1)	61.5 (<2.0-155.0)	121.7 (<2.0-365.0)	126.9 (<2.0-217.0)
Sb	BDL[5]	BDL	BDL	1.06 (<5.0-5.3)
Ba	2.52 (0.75-4.28)	7.51 (3.69-10.6)	16.9 (8.13-29.1)	10.9 (8.64-11.7)
Be	BDL	BDL	BDL	BDL
B	BDL	1.96 (<0.8-3.21)	2.74 (<0.8-4.89)	5.94 (1.42-8.92)
Cd	BDL	BDL	1.83 (<0.15-4.34)	2.93 (<0.15-5.17)
Co	BDL	BDL	0.82 (<0.5-4.49)	0.419 (<0.5-0.996)
Cr	3.47 (0.59-6.35)	1.89 (1.74-2.06)	1.45 (0.73-2.12)	1.72 (1.02-2.15)
Cu	1.28 (0.66-1.89)	4.29 (2.05-7.18)	86.2 (2.42-217.0)	93.5 (2.26-161.0)
Fe	127.0 (124.0-130.0)	104.0 (72.0-120.0)	250.8 (83.3-449.0)	225.4 (92.1-314.0)
Pb	BDL	BDL	0.53 (<1.2-2.54)	BDL
Mg	575.5 (421.0-730.0)	6023 (1580-9680)	3053 (1030-9020)	2642 (1400-6000)
Mn	6.46 (5.61-7.31)	20.1 (10.7-28.4)	31.1 (10.2-55.5)	32.4 (15.1-44.2)
Mo	BDL	BDL	BDL	0.174 (<0.8-0.87)
Ni	BDL	0.85 (<0.8-2.56)	1.90 (<0.8-7.47)	2.47 (<0.8-4.24)
Ag[6]	BDL	BDL	BDL	BDL
Sr	20.4 (5.13-35.7)	239.3 (101.0-328)	126.7 (22.9-308.0)	112.6 (14.6-365.0)
Sn	BDL	4.46 (<5.0-7.77)	4.86 (<5.0-23./9	1.07 (<5.0-5.36)

Table 5. (cont.) Summary of elemental residues in fish tissues from the Caernarvon Freshwater Diversion monitoring sites for 1990 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
V	BDL[5]	BDL	0.434 (<0.5-1.10)	0.649 (<0.5-1.23)
Zn	33.2 (24.0-42.3)	52.3 (50.1-56.2)	1741.4 (30.1-4760)	1238.1 (37.3-2050)
As	0.391 (0.371-0.410)	0.86 <0.3-1.75)	2.79 (0.653-6.26)	3.35 (1.17-4.66)
Hg	0.406(0.025-0.788)	0.311(0.135-0.497)	0.299(0.148-0.496)	0.217(0.065-0.678)
Se	0.760 (0.459-1.06)	0.593(0.478-0.717)	1.378 (0.603-2.39)	2.07 (0.358-2.82)

[1]Values for the Mississippi River are calculated on the basis of one specimen of channel catfish and one specimen of blue catfish.
[2]Values for Big Mar are calculated on the basis of three specimens: two spotted gar and one largemouth bass.
[3]Values for Grand Lake are calculated on the basis of seven specimens: three oysters, two red drum, a spotted gar, and an alligator gar.
[4]Values for Bay Gardene are calculated on the basis of five specimens: three oysters, a red drum, a spotted gar, and an alligator gar.
[5]BDL= Below detectable limit.
[6]The recovery of silver by ICP was usually low, thus little confidence can be placed in these results.

Table 6. Summary of elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
Al[6]	1.72 (<5.0-10.3)	64.8 (<5.0-182.0)	60.8 (<5.0-218.0)	116.7 (<5.0-262.0)
Sb		N O D A T A		
Ba	6.94 (1.75-10.9)	15.01 (7.81-27.3)	27.5 (3.82-133.0)	25.3 (15.1-37.1)
Be	BDL[5]	BDL	0.01 (<0.1-0.206)	0.25 (<0.1-1.48)
B	BDL	4.84 (<1.5-5.72)	3.35 (<1.5-9.07)	6.30 (<1.5-11.3)
Cd	0.02 (<0.1-0.132)	BDL	0.03 (<0.1-2.44)	4.63 (<0.1-9.51)
Co		N O D A T A		
Cr	2.47 (0.502-92.3)	29.2 (4.39-95.7)	18.3 (0.684-64.0)	3.16 (0.786-6.22)
Cu	12.8 (1.11-26.3)	6.12 (1.58-11.8)	20.4 (<0.5-108.0)	135.7 (2.96-295.0)
Fe	192.5 (29.9-640.0)	237.7 (50.1-633.0)	203.9 (<1.5-296.0)	280.5 (<1.5-36.6)
Pb	1.35 (<1.5-3.09)	4.52 (<1.5-10.9)	23.4 (<1.5-296.0)	12.1 (<1.5-36.6)
Mg	142.3 (768-1710)	3936 (1340-8550)	3619 (1530-9820)	2143 (1640-2750)
Mn	11.5 (5.45-18.7)	25.2 (12.1-38.9)	42.1 (9.12-169.0)	34.3 (21.5-43.6)
Mo	BDL	BDL	BDL	0.25 (<0.8-1.49)
Ni	5.12 (<0.8-21.0)	6.21 (1.06-20.6)	3.90 (<0.8-13.4)	2.97 (1.0-7.41)
Ag		N O D A T A		
Sr	102.1 (33.3-214.0)	293.7 (211-404)	289.4 (9.67-455)	125.5 (22.7-298.0)
Sn		N O D A T A		

Table 6. (cont.) Summary of elemental residues in fish tissues from the Caernarvon Freshwater Diversion monitoring sites for 1991 [values are the mean and range (in parentheses) expressed in mg/kg, dry weight].

PARA-METER	SAMPLING LOCATIONS			
	MISS. RIVER[1]	BIG MAR[2]	GRAND LAKE[3]	BAY GARDENE[4]
V	0.535 (<0.5-1.23)	BDL[5]	0.282 (<0.5-0.879)	0.674 (<0.5-1.53)
Zn	70.7 (40.0-115.0)	71.9 (7.1-76.3)	291.5 (38.7-1980)	1299.0 (72.7-2720)
As	0.401 (<0.3-0.899)	0.96 (<0.3-1.62)	1.33 (0.330-4.08)	3.23 (0.716-5.69)
Hg	0.151 (<0.05-0.322)	0.104 (<0.05-0.314)	0.0786(<0.05-0.320)	0.157(0.052-0.314)
Se	1.83 (0.335-3.47)	0.960 (0.379-1.92)	0.856 (<0.03-1.92)	2.60 (1.84-3.35)

[1]Values for the Mississippi River are calculated on the basis of one specimen of channel catfish and one specimen of blue catfish.
[2]Values for Big Mar are calculated on the basis of three specimens: two spotted gar and one largemouth bass.
[3]Values for Grand Lake are calculated on the basis of seven specimens: three oysters, two red drum, a spotted gar, and an alligator gar.
[4]Values for Bay Gardene are calculated on the basis of five specimens: three oysters, a red drum, a spotted gar, and an alligator gar.
[5]BDL= Below detectable limit.
[6]Due to the recent high laboratory variability in aluminum analyses, little confidence can be placed in these results.

APPENDIX A

I. Methodology for analyses of organochlorine pesticides and PCB's in animal tissues.

Ten gram tissue samples are thoroughly mixed with anhydrous sodium sulfate and soxhlet extracted with hexane for seven hours. The extract is concentrated by rotary evaporation, transferred to a tared test tube, and further concentrated to dryness for lipid determination. The weighed lipid sample is dissolved in petroleum ether and extracted four times with acetonitrile saturated with petroleum ether. Residues are partitioned into petroleum ether which is washed, concentrated, and transferred to a glass chromatographic column containing 20 grams of Florisil. The column is eluted with 200 ml 6% diethyl ether/94% petroleum ether (Fraction I) followed by 200 ml 15% diethyl ether/85% petroleum ether (Fraction II). Fraction II is concentrated to appropriate volume for quantification of residues by packed or capillary column electron capture gas chromatography. Fraction I is concentrated and transferred to a silicic acid chromatographic column for additional cleanup required for separation of PCBs from other organochlorines. Three fractions are eluted from the silicic acid column. Each is concentrated to appropriate volume for quantification of residues by packed or megabore column, electron capture gas chromatography. PCBs are found in Fraction II.

II. Methodology for analyses of aliphatic hydrocarbons in animal tissues.

A sample of appropriate size (i.e. 15 grams animal tissue, 2 grams adipose, etc.) is digested in 6N aqueous potassium hydroxide for 24 hours at 35°C. The digestate is thoroughly cooled in an ice bath and carefully neutralized with glacial acetic acid. The neutralized reaction mixture is extracted three times with methylene chloride; the combined extracts are concentrated to near dryness and reconstituted in petroleum ether for transfer to a 20 gram 1% deactivated silica gel column, topped with 5 grams neutral alumina. Aliphatic and polynuclear aromatic hydrocarbon residues are separated by eluting aliphatics from the column with 100 ml petroleum ether (Fraction I) followed by elution of aromatics using, first, 100 ml of 40% methylene chloride/60% petroleum ether, then 50 ml methylene chloride (Combined eluates, Fraction II). If needed, Fraction I containing aliphatics is subjected to additional cleanup by concentration and transferred to a deactivated (2% water) Florisil column. Aliphatic residues are eluted from the Florisil column using 200 ml 6% diethyl ether/94% petroleum ether. The eluate is concentrated to appropriate volume for quantification by capillary column, flame ionization gas chromatography. The silica gel Fraction II containing aromatic hydrocarbons is

concentrated, reconstituted in methylene chloride, and subjected to a gel permeation chromatography (GPC) cleanup prior to quantification by capillary, flame ionization gas chromatography and fluorescence HPLC.

III. Elution profiles for Florisil, silica gel, and silicic acid column separations.

A. Florisil Column:

1. Fraction I (6% ethyl ether containing 2% ethanol, 94% petroleum ether) HCB, α-BHC, β-BHC, γ-BHC, δ-BHC, oxychlordane, heptachlor epoxide, γ-chlordane, τ-nonachlor, toxaphene, PCBs, o,p'-DDE, α-chlordane, p,p'-DDE, o,p'-DDD, *cis*-nonachlor, o,p'-DDT, p,p'-DDD, p,p'-DDT, and mirex.

2. Fraction II (15% ethyl ether containing 2% ethanol, 85% petroleum ether) Dieldrin and endrin.

B. Florisil Mini-Column:

1. Fraction I (12ml hexane followed by 12ml 1% methanol in hexane) HCB, α-BHC (splits with Fraction II), γ-BHC (25%), τ-nonachlor, o,p'-DDE, p,p'-DDE, o,p'-DDD, o,p'-DDT, p,p'-DDD, p,p'-DDT, mirex, *cis*-nonachlor, and PCBs.

2. Fraction II (24ml 1% methanol in hexane) α-BHC(splits with Fraction I), β-BHC, γ-BHC (75%), δ-BHC, oxychlordane, heptachlor epoxide, and toxaphene.

C. Silica Gel:

1. SG Fraction I (100ml petroleum ether) η-dodecane, η-tridecane, η-tetradecane, ocylcyclohexane, η-pentadecane, nonycyclohexane, η-hexadecane, η-heptadecane, pristane, η-octadecane, phytane, η-nonadecane, and η-eicosane.

D. Silicic Acid:

1. SA Fraction I (20ml petroleum ether) HCB and mirex.

2. SA Fraction II (100ml petroleum ether) PCBs and p,p'-DDE (splits with SA Fraction III)

3. SA Fraction III (20ml mixed solvent: 1% acetonitrile, 80% methylene chloride, and 19% hexane) α-BHC, β-BHC, γ-BHC, δ-BHC, oxychlordane, heptachlor epoxide, γ-chlordane, toxaphene, o,p'-DDE, α-chlordane, p,p'-DDE, o,p'-DDD, *cis*-nonachlor, o,p'-DDT, p,p'-DDD, and p,p'-DDT.

Table A1. Minimum detection limits(MDL) for the organochlorine and aliphatic hydrocarbon tissue residue analyses.

ORGANOCHLORINES		ALIPHATIC HYDROCARBONS	
PARAMETER	MDL	PARAMETER	MDL
HCB	0.01	η-DODECANE	0.01
α-BHC	0.01	η-TRIDECANE	0.01
γ-BHC	0.01	η-TETRADECANE	0.01
β-BHC	0.01	OCTYLCYCLOHEXANE	0.01
δ-BHC	0.01	η-PENTADECANE	0.01
OXYCHLORDANE	0.01	NONYLCYCLOHEXANE	0.01
HEPTACHLOR EPOXIDE	0.01	η-HEXADECANE	0.01
γ-CHLORDANE	0.01	η-HEPTADECANE	0.01
τ-NONACHLOR	0.01	PRISTANE	0.01
TOXAPHENE	0.05	η-OCTADECANE	0.01
PCB's	0.05	PHYTANE	0.01
o,p'-DDE	0.01	η-NONADECANE	0.01
γ-CHLORDANE	0.01	η-EICOSANE	0.01
p,p'-DDE	0.01		
DIELDRIN	0.01		
o,p'-DDD	0.01		
ENDRIN	0.01		
cis-NONACHLOR	0.01		
o,p'-DDT	0.01		
p,p'-DDD	0.01		
p,p'-DDT	0.01		
MIREX	0.01		

Table A2. Minimum detection limits (MDL) for the inorganic tissue residue analyses.

HEAVY METALS		
PARAMETER	MDL(1990)	MDL(1991)
ALUMINUM	2.0	5.0
ANTIMONY	5.0	NA
BARIUM	0.5	0.5
BERYLLIUM	0.05	0.1
BORON	0.8	1.5
CADMIUM	0.15	0.10
COBALT	0.5	NA
CHROMIUM	0.5	0.5
COPPER	0.5	0.5
IRON	10.0	10.0
LEAD	1.2	1.5
MAGNESIUM	20.0	10.0
MANGANESE	0.3	0.5
MOLYBDENUM	0.3	0.8
NICKEL	0.8	0.8
SILVER	2.0	NA
STRONTIUM	0.5	0.5
TIN	5.0	NA
VANADIUM	0.5	0.5
ZINC	1.0	1.0
ARSENIC	0.3	0.3
MERCURY	0.02	0.1
SELENIUM	0.3	0.3

APPENDIX B

RESIDUES IN TISSUE SAMPLES FROM THE CAERNARVON FRESHWATER DIVERSION MONITORING SITES FOR 1990 AND 1991.

Table B1. Organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	WT.(g)	%H2O	%LIPID	HCB	α-BHC	γ-BHC	β-BHC	δ-BHC
1	CHANNEL CATFISH	444.0	61.2	24.5	0.03	ND	ND	ND	ND
	BLUE CATFISH	4160.0	70.0	1.05	0.02	ND	ND	ND	ND
2	SPOTTED GAR	1900.0	65.4	5.92	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	202.0	76.6	2.42	ND	ND	ND	ND	ND
	SPOTTED GAR	1710.0	66.6	4.36	ND	ND	ND	ND	ND
3	AMERICAN OYSTER	123.0	91.0	0.62	ND	ND	ND	ND	ND
	AMERICAN OYSTER	99.4	90.0	0.78	ND	ND	ND	ND	ND
	AMERICAN OYSTER	134.0	92.0	0.52	ND	ND	ND	ND	ND
	SPOTTED GAR	2070.0	67.5	3.44	ND	ND	ND	ND	ND
	ALLIGATOR GAR	6200.0	73.5	3.88	ND	ND	ND	ND	ND
	RED DRUM	4830.0	78.5	1.54	ND	ND	ND	ND	ND
	RED DRUM	5550.0	75.0	3.16	ND	ND	ND	ND	ND
4	AMERICAN OYSTER	266.0	85.0	1.52	ND	ND	ND	ND	ND
	AMERICAN OYSTER	244.0	85.5	2.00	ND	ND	ND	ND	ND
	AMERICAN OYSTER	276.0	84.0	1.80	ND	ND	ND	ND	ND
	ALLIGATOR GAR	5750.0	74.0	2.30	ND	ND	ND	ND	ND
	RED DRUM	6170.0	76.0	2.68	ND	ND	ND	ND	ND

Table B1. (cont.) Organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	OXYCHL ORDANE	HEPT. EPOX.	γ-CHLOR DANE	τ-NON ACHLOR	TOXA- PHENE	PCB's	o,p' -DDE	α-CHLOR DANE
1	CHANNEL CATFISH	ND	ND	0.03	0.02	ND	ND	ND	0.05
	BLUE CATFISH	ND	ND	0.05	0.05	ND	ND	ND	0.06
2	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
3	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND
4	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND

Table B1. Organochlorine residues in tissue samples from the Caernarvon Freshwater (cont.) Diversion monitoring sites for 1990 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT								
SITE	SPECIES	p,p′ -DDE	DIEL DRIN	o,p′ -DDD	ENDRIN	*cis*-NON ACHLOR	o,p′ -DDT	p,p′ -DDD	p,p′ -DDT	MIREX
1	CHANNEL CATFISH	0.07	0.09	ND	ND	ND	ND	0.10	0.07	ND
	BLUE CATFISH	0.10	0.05	ND	ND	ND	ND	0.10	0.05	ND
2	SPOTTED GAR	0.02	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	0.01	ND	ND	ND	ND	ND	ND	ND	ND
3	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	0.02	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	0.02	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	0.02	ND	ND	ND	ND	ND	ND	ND	ND

Table B2. Organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	WT.(g)	%H2O	%LIPID	HCB	α-BHC	γ-BHC	β-BHC	δ-BHC
1	STRIPED BASS	487	73.2	3.73	ND	ND	ND	ND	ND
	STRIPED BASS	426	76.2	3.13	ND	ND	ND	ND	ND
	STRIPED BASS	478	74.0	3.95	ND	ND	ND	ND	ND
	CHANNEL CATFISH	639	77.0	5.51	ND	ND	ND	ND	ND
	CHANNEL CATFISH	496	61.6	26.8	0.01	ND	ND	ND	ND
	CHANNEL CATFISH	858	73.0	6.83	ND	ND	ND	ND	ND
2	LARGEMOUTH BASS	254	72.2	5.55	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	315	75.2	2.12	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	121	73.4	1.23	ND	ND	ND	ND	ND
	SPOTTED GAR	688	67.0	4.69	ND	ND	ND	ND	ND
	SPOTTED GAR	587	68.4	6.08	ND	ND	ND	ND	ND
	SPOTTED GAR	657	64.2	6.99	ND	ND	ND	ND	ND
	BLACK DRUM	533	74.4	5.66	ND	ND	ND	ND	ND
	BLACK DRUM	435	74.0	5.21	ND	ND	ND	ND	ND
	BLACK DRUM	592	73.8	5.74	ND	ND	ND	ND	ND
3	ALLIGATOR GAR	3057	66.6	5.11	ND	ND	ND	ND	ND
	ALLIGATOR GAR	1449	72.6	2.56	ND	ND	ND	ND	ND
	ALLIGATOR GAR	2527	71.8	1.86	ND	ND	ND	ND	ND

Table B2. Organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight). (cont.)

		PARAMETER/CONTAMINANT							
SITE	SPECIES	OXYCHL ORDANE	HEPT. EPOX.	γ-CHLOR DANE	τ-NON- ACHLOR	TOXA- PHENE	PCB's	o,p' -DDE	α-CHLOR DANE
1	STRIPED BASS	ND	ND	ND	0.01	ND	0.32	ND	0.01
	STRIPED BASS	ND	ND	ND	ND	ND	0.17	ND	ND
	STRIPED BASS	ND	ND	ND	0.02	ND	0.42	ND	0.02
	CHANNEL CATFISH	ND	0.01	0.01	0.02	ND	0.25	ND	0.02
	CHANNEL CATFISH	ND	0.03	0.02	0.02	ND	0.35	ND	0.03
	CHANNEL CATFISH	ND	0.01	0.01	ND	ND	0.25	ND	0.02
2	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	BLACK DRUM	ND	ND	ND	ND	ND	ND	ND	ND
	BLACK DRUM	ND	ND	ND	ND	ND	ND	ND	ND
	BLACK DRUM	ND	ND	ND	ND	ND	ND	ND	ND
3	ALLIGATOR GAR	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	ND	ND	ND	ND	ND	ND	ND	ND

Table B2. Organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight). (cont.)

		PARAMETER/CONTAMINANT								
SITE	SPECIES	p,p′ -DDE	DIEL DRIN	o,p′ -DDD	ENDRIN	*cis*-NON-ACHLOR	o,p′ -DDT	p,p′ -DDD	p,p′ -DDT	MIREX
1	STRIPED BASS	0.04	0.02	ND	ND	ND	ND	0.02	ND	ND
	STRIPED BASS	0.02	ND	ND	ND	ND	ND	0.01	ND	ND
	STRIPED BASS	0.06	0.03	ND	ND	ND	ND	0.04	ND	ND
	CHANNEL CATFISH	0.03	0.02	ND	ND	ND	ND	0.02	ND	ND
	CHANNEL CATFISH	0.06	0.09	ND	ND	ND	ND	0.04	ND	ND
	CHANNEL CATFISH	0.03	0.03	ND	ND	ND	ND	0.03	ND	ND
2	LARGEMOUTH BASS	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	0.01	ND	ND	ND	ND	ND	0.01	ND	ND
	LARGEMOUTH BASS	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	0.02	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	BLACK DRUM	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BLACK DRUM	ND	ND	ND	ND	ND	ND	ND	ND	ND
	BLACK DRUM	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	ALLIGATOR GAR	0.02	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	ALLIGATOR GAR	0.01	ND	ND	ND	ND	ND	ND	ND	ND

Table B2. (cont.) Organochlorine residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	WT.(g)	%H2O	%LIPID	HCB	α-BHC	γ-BHC	β-BHC	δ-BHC
3	LARGEMOUTH BASS	423	71.4	6.30	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	388	74.2	4.35	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	433	71.0	6.38	ND	ND	ND	ND	ND
	REDEAR	322	72.2	5.22	ND	ND	ND	ND	ND
	REDEAR	220	72.2	3.18	ND	ND	ND	ND	ND
	REDEAR	204	72.4	3.47	ND	ND	ND	ND	ND
	SHEEPSHEAD	1093	68.2	9.47	ND	ND	ND	ND	ND
	SHEEPSHEAD	909	69.4	5.99	ND	ND	ND	ND	ND
	SHEEPSHEAD	539	67.8	5.43	ND	ND	ND	ND	ND
	SPOTTED GAR	1279	62.8	4.33	ND	ND	ND	ND	ND
	SPOTTED GAR	1162	61.0	9.14	ND	ND	ND	ND	ND
	SPOTTED GAR	951	55.0	5.36	ND	ND	ND	ND	ND
	AMERICAN OYSTER	190	61.0	1.65	ND	ND	ND	ND	ND
	AMERICAN OYSTER	147	86.2	1.49	ND	ND	ND	ND	ND
	AMERICAN OYSTER	190	85.8	1.48	ND	ND	ND	ND	ND
4	RED DRUM	3357	74.2	4.16	ND	ND	ND	ND	ND
	RED DRUM	1480	75.4	0.95	ND	ND	ND	ND	ND
	RED DRUM	1917	71.4	3.40	ND	ND	ND	ND	ND
	AMERICAN OYSTER	82	88.0	1.35	ND	ND	ND	ND	ND
	AMERICAN OYSTER	100	86.0	1.50	ND	ND	ND	ND	ND
	AMERICAN OYSTER	101	86.5	1.27	ND	ND	ND	ND	ND

Table B2. Organochlorine residues in tissue samples from the Caernarvon Freshwater (cont.) Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	OXYCHLORDANE	HEPT. EPOX.	γ-CHLORDANE	τ-NONACHLOR	TOXAPHENE	PCB's	o,p'-DDE	α-CHLORDANE
3	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND
	REDEAR	ND	ND	ND	ND	ND	ND	ND	ND
	REDEAR	ND	ND	ND	ND	ND	ND	ND	ND
	REDEAR	ND	ND	ND	ND	ND	ND	ND	ND
	SHEEPSHEAD	ND	ND	ND	ND	ND	ND	ND	ND
	SHEEPSHEAD	ND	ND	ND	ND	ND	ND	ND	ND
	SHEEPSHEAD	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
4	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND

Table B2. Organochlorine residues in tissue samples from the Caernarvon Freshwater (cont.) Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT								
SITE	SPECIES	p,p′ -DDE	DIEL DRIN	o,p′ -DDD	ENDRIN	*cis*-NON-ACHLOR	o,p′ -DDT	p,p′ -DDD	p,p′ -DDT	MIREX
3	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND	ND
	LARGEMOUTH BASS	ND	ND	ND	ND	ND	ND	ND	ND	ND
	REDEAR	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	REDEAR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	REDEAR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	SHEEPSHEAD	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	SHEEPSHEAD	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	SHEEPSHEAD	ND	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	0.03	ND	ND	ND	ND	ND	ND	ND	ND
	SPOTTED GAR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	RED DRUM	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	0.01	ND	ND	ND	ND	ND	ND	ND	ND
	RED DRUM	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table B3. Aliphatic hydrocarbon residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	WT. (g)	%H2O	%LIPID	η-DO DECANE	η-TRI DECANE	η-TETRA DECANE	OCTYLCYC LOHEXANE	η-PENTA DECANE
1	CHANNEL CATFISH	444.0	61.2	24.5	0.02	0.06	0.18	0.08	2.5
	BLUE CATFISH	4160.0	70.0	1.05	0.05	0.01	0.09	0.07	0.28
2	SPOTTED GAR	1900.0	65.4	5.92	ND	ND	0.01	ND	0.09
	LARGEMOUTH BASS	202.0	76.6	2.42	ND	ND	ND	ND	0.05
	SPOTTED GAR	1710.0	66.6	4.36	ND	ND	ND	ND	0.07
3	AMERICAN OYSTER	123.0	91.0	0.62	ND	ND	ND	ND	0.06
	AMERICAN OYSTER	99.4	90.0	0.78	ND	ND	ND	ND	0.02
	AMERICAN OYSTER	134.0	92.0	0.52	ND	ND	ND	ND	ND
	SPOTTED GAR	2070.0	67.5	3.44	ND	ND	ND	0.05	0.03
	ALLIGATOR GAR	6200.0	73.5	3.88	ND	ND	0.01	0.03	0.10
	RED DRUM	4830.0	78.5	1.54	ND	ND	0.01	0.03	0.09
	RED DRUM	5550.0	75.0	3.16	ND	ND	ND	ND	0.02
4	AMERICAN OYSTER	266.0	85.0	1.52	ND	ND	0.01	ND	0.08
	AMERICAN OYSTER	244.0	85.5	2.00	ND	ND	ND	ND	0.09
	AMERICAN OYSTER	276.0	84.0	1.80	ND	ND	ND	ND	0.06
	ALLIGATOR GAR	5750.0	74.0	2.30	ND	ND	ND	ND	0.04
	RED DRUM	6170.0	76.0	2.68	ND	ND	0.01	ND	0.02

Table B3. (cont.) Aliphatic hydrocarbon residue in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	NONYLCYC LOHEXANE	η-HEXA DECANE	η-HEPTA DECANE	PRIS TANE	η-OCTA DECANE	PHY- TANE	η-NONA DECANE	η-EIC OSANE
1	CHANNEL CATFISH	0.19	0.58	6.5	1.3	0.62	0.26	0.25	0.13
	BLUE CATFISH	0.12	0.17	1.0	0.24	0.15	0.16	0.06	0.02
2	SPOTTED GAR	ND	0.01	0.18	ND	ND	0.01	0.04	ND
	LARGEMOUTH BASS	ND	0.01	0.06	0.02	0.01	0.03	0.04	ND
	SPOTTED GAR	ND	ND	0.18	0.01	ND	0.01	0.02	0.01
3	AMERICAN OYSTER	ND	0.01	0.18	0.08	ND	ND	0.02	ND
	AMERICAN OYSTER	ND	0.02	0.02	0.03	ND	0.03	ND	ND
	AMERICAN OYSTER	ND	ND	0.02	0.02	ND	0.01	ND	ND
	SPOTTED GAR	ND	0.01	0.25	0.02	0.01	0.02	ND	0.01
	ALLIGATOR GAR	0.01	0.02	0.29	0.14	0.01	0.01	0.02	0.01
	RED DRUM	ND	ND	0.04	0.06	0.01	ND	0.01	0.02
	RED DRUM	ND	0.01	0.07	0.08	ND	ND	ND	0.01
4	AMERICAN OYSTER	ND	0.01	0.05	ND	ND	0.02	ND	ND
	AMERICAN OYSTER	ND	0.02	0.06	ND	ND	ND	ND	ND
	AMERICAN OYSTER	ND	0.01	0.05	ND	ND	ND	ND	ND
	ALLIGATOR GAR	ND	ND	0.13	0.01	ND	0.01	0.02	ND
	RED DRUM	ND	ND	ND	0.04	0.02	ND	ND	ND

Table B4. Aliphatic hydrocarbon residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	WT. (g)	%H2O	%LIPID	η-DO DECANE	η-TRI DECANE	η-TETRA DECANE	OCTYLCYC LOHEXANE	η-PENTA DECANE
1	STRIPED BASS	487	73.2	3.73	0.02	0.03	0.02	ND	0.15
	STRIPED BASS	426	76.2	3.13	0.02	0.04	0.04	ND	0.53
	STRIPED BASS	478	74.0	3.95	0.02	0.04	0.04	0.01	0.27
	CHANNEL CATFISH	639	77.0	5.51	0.05	0.06	0.12	0.05	0.29
	CHANNEL CATFISH	496	61.6	26.8	ND	ND	0.13	0.06	0.13
	CHANNEL CATFISH	858	73.0	6.83	ND	ND	0.13	0.06	0.13
2	LARGEMOUTH BASS	254	72.2	5.55	0.05	0.22	0.22	0.07	0.82
	LARGEMOUTH BASS	315	75.2	2.12	0.02	0.03	0.02	ND	0.03
	LARGEMOUTH BASS	121	73.4	1.23	0.03	0.03	0.03	ND	0.05
	SPOTTED GAR	688	67.0	4.69	0.01	0.02	0.03	ND	0.07
	SPOTTED GAR	587	68.4	6.08	0.03	0.04	0.04	ND	0.05
	SPOTTED GAR	657	64.2	6.99	0.03	0.03	0.04	ND	0.61
	BLACK DRUM	533	74.4	5.66	0.02	0.02	0.01	ND	0.07
	BLACK DRUM	435	74.0	5.21	0.03	0.04	0.03	0.02	0.16
	BLACK DRUM	592	73.8	5.74	ND	0.01	0.03	ND	0.14
3	ALLIGATOR GAR	3057	66.6	5.11	ND	0.01	0.03	ND	0.15
	ALLIGATOR GAR	1449	72.6	2.56	0.04	0.05	0.03	ND	0.19
	ALLIGATOR GAR	2527	71.8	1.86	0.01	0.03	0.03	ND	0.06

Table B4. Aliphatic hydrocarbon residues in tissue samples from the Caernarvon Freshwater (Cont.) Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	NONYLCYC LOHEXANE	η-HEXA DECANE	η-HEPTA DECANE	PRIS TANE	η-OCTA- DECANE	PHY- TANE	η-NONA DECANE	η-EIC- OSANE
1	STRIPED BASS	0.01	0.03	0.19	0.43	0.02	0.04	0.03	0.02
	STRIPED BASS	0.01	0.06	0.41	0.51	0.03	0.04	0.03	0.05
	STRIPED BASS	0.03	0.04	0.39	0.38	0.03	0.07	0.04	0.03
	CHANNEL CATFISH	0.09	0.32	1.3	0.24	0.27	0.22	0.18	0.13
	CHANNEL CATFISH	0.08	0.20	0.36	0.06	0,14	0.13	0.13	0.11
	CHANNEL CATFISH	0.16	0.71	1.4	0.51	0.52	0.38	0.34	0.22
2	LARGEMOUTH BASS	0.01	0.06	1.0	0.04	0.03	0.03	ND	0.02
	LARGEMOUTH BASS	ND	0.02	0.09	0.01	ND	0.04	0.12	0.02
	LARGEMOUTH BASS	ND	0.03	0.10	0.01	0.02	0.01	0.03	0.02
	SPOTTED GAR	ND	0.02	0.24	ND	0.01	0.01	ND	0.02
	SPOTTED GAR	ND	0.03	0.14	0.07	0.02	0.03	0.01	0.02
	SPOTTED GAR	ND	0.07	ND	ND	0.02	0.02	0.06	ND
	BLACK DRUM	ND	0.02	0.58	0.02	0.02	0.01	ND	0.07
	BLACK DRUM	0.03	0.04	0.13	0.02	0.02	0.13	0.03	ND
	BLACK DRUM	ND	0.02	0.22	0.07	0.02	0.09	0.04	0.03
3	ALLIGATOR GAR	ND	0.06	1.0	ND	0.03	0.01	0.04	ND
	ALLIGATOR GAR	0.02	0.02	0.03	ND	0.02	0.02	ND	0.02
	ALLIGATOR GAR	ND	0.02	0.66	ND	0.02	ND	0.04	0.01

Table B4. Aliphatic hydrocarbon residues in tissue samples from the Caernarvon Freshwater (cont.) Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	WT. (g)	%H2O	%LIPID	η-DO-DECANE	η-TRI DECANE	η-TETRA DECANE	OCTYLCYC LOHEXANE	η-PENTA DECANE
3	LARGEMOUTH BASS	423	71.4	6.30	0.03	0.07	0.12	ND	0.22
	LARGEMOUTH BASS	388	74.2	4.35	0.03	0.05	0.03	ND	0.08
	LARGEMOUTH BASS	433	71.0	6.38	ND	0.05	0.04	ND	0.20
	REDEAR	322	72.2	5.22	0.03	0.07	0.04	0.01	0.06
	REDEAR	220	72.2	3.18	0.03	0.03	0.03	ND	0.05
	REDEAR	204	72.4	3.47	0.01	0.01	0.02	ND	0.04
	SHEEPSHEAD	1093	68.2	9.47	ND	0.01	0.02	ND	0.26
	SHEEPSHEAD	909	69.4	5.99	0.04	0.05	0.03	0.01	0.17
	SHEEPSHEAD	539	67.8	5.43	0.02	0.03	0.02	ND	0.06
	SPOTTED GAR	1279	62.8	4.33	ND	ND	ND	ND	0.02
	SPOTTED GAR	1162	61.0	9.14	0.03	0.04	0.03	ND	0.07
	SPOTTED GAR	951	55.0	5.36	0.03	0.05	0.03	0.02	0.07
	AMERICAN OYSTER	190	61.0	1.65	0.02	0.03	0.02	ND	0.03
	AMERICAN OYSTER	147	86.2	1.49	0.02	0.02	0.02	ND	0.03
	AMERICAN OYSTER	190	85.8	1.48	0.03	0.05	0.03	0.01	0.03
4	RED DRUM	3357	74.2	4.16	0.02	0.03	0.03	ND	0.06
	RED DRUM	1480	75.4	0.95	0.02	0.03	0.02	ND	0.04
	RED DRUM	1917	71.4	3.40	0.02	0.05	0.03	ND	0.05
	AMERICAN OYSTER	82	88.0	1.35	ND	ND	0.02	ND	0.04
	AMERICAN OYSTER	100	86.0	1.50	0.04	0.04	0.03	ND	0.01
	AMERICAN OYSTER	101	86.5	1.27	ND	ND	0.01	ND	0.04

Table B4. Aliphatic hydrocarbon residues in tissue samples from the Caernarvon Freshwater (cont.) Diversion monitoring sites for 1991 (values expressed in mg/kg, wet weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	NONYLCYC LOHEXANE	η-HEXA DECANE	η-HEPTA DECANE	PRIS TANE	η-OCTA DECANE	PHY- TANE	η-NONA DECANE	η-EIC OSANE
3	LARGEMOUTH BASS	0.20	0.14	0.82	0.85	0.23	0.70	0.15	0.16
	LARGEMOUTH BASS	ND	0.03	0.51	0.01	0.02	0.03	0.03	0.02
	LARGEMOUTH BASS	0.01	0.05	0.85	ND	0.03	0.07	ND	0.02
	REDEAR	0.01	0.04	0.24	0.03	0.03	0.13	0.11	0.04
	REDEAR	ND	0.02	0.09	0.12	0.01	0.14	ND	ND
	REDEAR	ND	0.02	0.10	0.05	0.01	0.22	0.12	0.02
	SHEEPSHEAD	ND	0.05	3.0	0.06	0.04	0.03	0.12	0.04
	SHEEPSHEAD	ND	0.03	2.9	0.02	0.02	0.01	0.02	0.03
	SHEEPSHEAD	ND	0.02	0.03	ND	0.01	ND	0.01	0.02
	SPOTTED GAR	ND	0.02	0.17	ND	0.02	0.01	0.01	0.02
	SPOTTED GAR	0.01	0.03	0.21	0.03	0.02	0.01	0.01	0.03
	SPOTTED GAR	0.03	0.03	0.19	0.14	0.04	0.05	ND	ND
	AMERICAN OYSTER	ND	0.02	0.04	0.01	0.01	ND	ND	0.02
	AMERICAN OYSTER	ND	0.03	0.04	0.01	0.01	0.05	ND	ND
	AMERICAN OYSTER	ND	0.03	0.04	0.01	0.01	ND	ND	0.02
4	RED DRUM	ND	0.03	0.06	0.05	ND	ND	0.01	0.03
	RED DRUM	ND	0.03	0.05	0.01	0.02	ND	ND	0.02
	RED DRUM	ND	0.02	0.03	0.08	0.01	ND	ND	0.02
	AMERICAN OYSTER	ND	0.03	0.05	0.01	ND	ND	0.02	0.04
	AMERICAN OYSTER	ND	0.04	0.04	0.01	0.01	ND	0.01	0.03
	AMERICAN OYSTER	ND	0.03	0.03	0.01	ND	ND	ND	0.03

Table B5. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1990 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT								
SITE	SPECIES	WT.(g)	%H2O	Al	Sb	Ba	Be	B	Cd	Co
1	CHANNEL CATFISH	444.0	62.3	38.5	<5.00	0.75	<0.05	<0.80	<0.15	<0.50
	BLUE CATFISH	4160.0	70.3	47.1	<5.00	4.28	<0.05	<0.80	<0.15	<0.50
2	SPOTTED GAR	1900.0	64.3	<2.0	<5.00	10.6	<0.05	3.21	<0.15	<0.50
	LARGEMOUTH BASS	202.0	76.3	155	<5.00	3.69	<0.05	<0.80	<0.15	<0.50
	SPOTTED GAR	1710.0	68.3	29.5	<5.00	8.24	<0.05	2.67	<0.15	<0.50
3	AMERICAN OYSTER	123.0	89.3	176	<0.50	29.1	<0.05	4.89	4.05	4.49
	AMERICAN OYSTER	99.4	89.5	311	<5.00	22.6	<0.05	4.44	3.87	0.54
	AMERICAN OYSTER	134.0	89.9	365	<5.0	23.4	<0.05	4.69	4.34	0.72
	SPOTTED GAR	2070.0	66.0	<2.0	<5.0	12.1	<0.05	4.13	<0.15	<0.50
	ALLIGATOR GAR	6200.0	69.6	<2.0	<5.0	8.13	<0.05	1.06	0.518	<0.50
	RED DRUM	4830.0	75.9	<2.0	<5.0	11.5	<0.05	<0.80	<0.15	<0.50
	RED DRUM	5550.0	76.0	<2.0	<5.0	11.6	<0.05	<0.80	<0.15	<0.50
4	AMERICAN OYSTER	266.0	84.0	212	<5.0	8.85	<0.05	8.56	5.13	0.514
	AMERICAN OYSTER	244.0	83.4	217	<5.0	8.64	<0.05	8.31	4.35	0.587
	AMERICAN OYSTER	276.0	84.5	201	5.30	8.99	<0.05	8.92	5.17	0.996
	ALLIGATOR GAR	5750.0	70.3	<2.0	<5.0	11.7	<0.05	2.47	<0.15	<0.50
	RED DRUM	6170.0	74.2	4.43	<5.0	16.4	<0.05	1.42	<0.15	<0.50

Table B5. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1990 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni
1	CHANNEL CATFISH	0.593	0.660	124.0	<1.20	421.0	5.61	<0.80	<0.80
	BLUE CATFISH	6.35	1.89	130.0	<1.20	730.0	7.31	<0.80	<0.80
2	SPOTTED GAR	1.74	2.05	120.0	<1.20	9680.0	28.4	<0.80	<0.80
	LARGEMOUTH BASS	2.06	7.18	72.0	<1.20	1580.0	10.7	<0.80	2.56
	SPOTTED GAR	1.90	3.63	120.0	<1.20	6800.0	21.3	<0.80	<0.80
3	AMERICAN OYSTER	1.71	177.0	434.0	<1.20	1880.0	52.5	<0.80	7.47
	AMERICAN OYSTER	2.12	197.0	387.0	<1.20	1710.0	55.5	<0.80	3.11
	AMERICAN OYSTER	1.42	217.0	449.0	1.20	1880.0	54.0	<0.80	2.72
	SPOTTED GAR	1.64	2.69	197.0	<1.20	9020.0	16.4	<0.80	<0.80
	ALLIGATOR GAR	1.44	4.24	116.0	2.54	4750.0	15.8	<0.80	<0.80
	RED DRUM	0.730	3.19	89.0	<1.20	1030.0	13.4	<0.80	<0.80
	RED DRUM	1.08	2.42	83.3	<1.20	1100.0	10.2	<0.80	<0.80
4	AMERICAN OYSTER	1.02	145.0	298.0	<1.20	2110.0	44.2	0.87	3.73
	AMERICAN OYSTER	1.15	157.0	307.0	<1.20	1800.0	43.6	<0.80	3.26
	AMERICAN OYSTER	1.74	161.0	314.0	<1.20	1900.0	41.3	<0.80	4.24
	ALLIGATOR GAR	1.45	2.48	92.1	<1.20	6000.0	15.1	<0.80	<0.80
	RED DRUM	2.15	2.26	116.0	<1.20	1400.0	17.8	<0.80	1.13

Table B5. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1990 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Ag*	Sr	Sn	V	Zn	As	Hg	Se
1	CHANNEL CATFISH	<2.0	5.13	<5.0	<0.5	24.0	0.371	0.0247	0.459
	BLUE CATFISH	<2.0	35.7	<5.0	<0.5	42.3	0.410	0.788	1.06
2	SPOTTED GAR	<2.0	328.0	5.62	<0.5	50.1	0.830	0.135	0.478
	LARGEMOUTH BASS	<2.0	101.0	<5.0	<0.5	56.2	<0.300	0.497	0.717
	SPOTTED GAR	<2.0	289.0	7.77	<0.5	50.6	1.75	0.302	0.585
3	AMERICAN OYSTER	<2.0	22.9	<5.0	0.84	3430.0	3.48	0.178	1.65
	AMERICAN OYSTER	<2.0	46.9	<5.0	1.10	3790.0	3.54	0.284	1.49
	AMERICAN OYSTER	<2.0	26.0	<5.0	1.10	4760.0	3.67	0.463	1.04
	SPOTTED GAR	<2.0	308.0	23.9	<0.5	78.5	1.02	0.148	0.603
	ALLIGATOR GAR	<2.0	279.0	10.1	<0.5	67.9	6.26	0.258	0.925
	RED DRUM	<2.0	88.8	<5.0	<0.5	30.1	0.653	0.496	2.39
	RED DRUM	<2.0	115.0	<5.0	<0.5	33.3	0.914	0.267	1.55
4	AMERICAN OYSTER	<2.0	16.9	<5.0	1.23	2010.0	4.66	0.0731	2.59
	AMERICAN OYSTER	<2.0	14.6	<5.0	0.994	2030.0	4.63	0.0813	2.81
	AMERICAN OYSTER	<2.0	19.5	<5.0	1.02	2050.0	4.42	0.0649	2.82
	ALLIGATOR GAR	<2.0	365.0	<5.0	<0.5	63.0	1,86	0.190	0.358
	RED DRUM	<2.0	147.0	5.36	<0.5	37.3	1.17	0.678	1.78

* The recovery of silver by ICP was usually low, thus little confidence can be placed in these results.

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring sites for 1991 (values expressed in mg/kg, dry weight).

			PARAMETER/CONTAMINANT						
SITE	SPECIES	WT. (g)	%H2O	Al*	Sb	Ba	Be	B	Cd	Co
1	STRIPED BASS	487	73.2	<5.0		10.5	<0.10	<1.5	<0.10	
	STRIPED BASS	426	76.2	<5.0		10.9	<0.10	<1.5	<0.10	
	STRIPED BASS	478	74.0	<5.0	N	9.76	<0.10	<1.5	<0.10	N
	CHANNEL CATFISH	639	77.0	<5.0		4.85	<0.10	<1.5	<0.10	
	CHANNEL CATFISH	496	61.6	<5.0	O	1.75	<0.10	<1.5	<0.10	O
	CHANNEL CATFISH	858	73.0	10.3		3.86	<0.10	<1.5	0.132	
2	LARGEMOUTH BASS	254	72.0	<5.0		7.81	<0.10	<1.5	<0.10	
	LARGEMOUTH BASS	315	75.2	71.1		9.10	<0.10	<1.5	<0.10	
	LARGEMOUTH BASS	121	73.4	<5.0		12.1	<0.10	<1.5	<0.10	
	SPOTTED GAR	688	67.0	182	D	13.4	<0.10	3.69	<0.10	D
	SPOTTED GAR	587	68.4	144		8.78	<0.10	5.72	<0.10	
	SPOTTED GAR	657	64.2	135	A	11.8	<0.10	3.59	<0.10	A
	BLACK DRUM	533	74.4	11.6		27.3	<0.10	<1.5	<0.10	
	BLACK DRUM	435	74.0	29.2	T	22.1	<0.10	<1.5	<0.10	T
	BLACK DRUM	592	73.8	9.99		22.7	<0.10	3.54	<0.10	
3	ALLIGATOR GAR	3057	66.6	<5.0	A	12.1	<0.10	<1.5	<0.10	A
	ALLIGATOR GAR	1449	72.6	<5.0		17.0	<0.10	2.07	<0.10	
	ALLIGATOR GAR	2527	71.8	<5.0		10.2	<0.10	<1.5	<0.10	

*Due to the recent high laboratory variability in aluminum analyses, little confidence can be placed in these results.

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni
1	STRIPED BASS	27.1	25.6	205	3.09	1710	11.5	<0.80	6.23
	STRIPED BASS	9.93	26.3	129	1.54	1690	10.5	<0.80	2.18
	STRIPED BASS	92.3	21.2	640	3.44	1690	18.7	<0.80	21.0
	CHANNEL CATFISH	14.1	1.59	63.5	<1.50	1300	11.0	<0.80	<0.80
	CHANNEL CATFISH	0.502	1.11	29.9	<1.50	768	5.45	<0.80	<0.80
	CHANNEL CATFISH	4.28	2.26	87.8	<1.50	1580	11.6	<0.80	1.31
2	LARGEMOUTH BASS	95.7	6.71	633	8.20	1790	25.9	<0.80	20.6
	LARGEMOUTH BASS	8.89	2.54	152	3.39	2010	12.1	<0.80	2.02
	LARGEMOUTH BASS	4.39	1.58	50.1	1.80	2290	13.3	<0.80	1.06
	SPOTTED GAR	21.8	11.5	224	7.16	8440	38.9	<0.80	4.39
	SPOTTED GAR	10.0	8.84	159	10.9	8280	27.6	<0.80	2.27
	SPOTTED GAR	66.8	11.8	454	7.45	8550	33.5	<0.80	14.9
	BLACK DRUM	36.4	4.21	246	1.77	1350	38.5	<0.80	7.36
	BLACK DRUM	7.48	3.56	104	<1.50	1340	16.4	<0.08	1.81
	BLACK DRUM	11.2	4.34	117	<1.50	1370	25.0	<0.80	1.47
3	ALLIGATOR GAR	14.3	2.26	121	1.93	4110	15.8	<0.80	2.58
	ALLIGATOR GAR	13.0	1.85	105	<1.50	7810	27.1	<0.80	2.11
	ALLIGATOR GAR	10.1	<0.50	31.6	<1.50	4130	12.0	<0.80	1.01

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Ag	Sr	Sn	V	Zn	As	Hg	Se
1	STRIPED BASS		141		<0.50	71.1	0.759	0.322	2.63
	STRIPED BASS		214		<0.50	59.1	0.899	0.249	2.56
	STRIPED BASS	N	96.8	N	0.532	115	0.746	0.138	3.47
	CHANNEL CATFISH		67.4		0.715	64.7	<0.3	<0.05	0.996
	CHANNEL CATFISH	O	33.3	O	1.23	40.0	<0.3	<0.05	0.335
	CHANNEL CATFISH		60.2		0.735	74.5	<0.3	0.197	0.972
2	LARGEMOUTH BASS		246		<0.50	97.1	0.592	0.0884	0.779
	LARGEMOUTH BASS		211		<0.50	52.8	<0.3	0.0655	0.445
	LARGEMOUTH BASS	D	396	D	<0.50	68.3	<0.3	0.198	0.619
	SPOTTED GAR		404		<0.50	76.3	1.05	0.0933	0.621
	SPOTTED GAR	A	393	A	<0.50	76.3	1.56	0.180	0.379
	SPOTTED GAR		318		<0.50	69.5	1.31	0.314	0.596
	BLACK DRUM	T	221	T	<0.50	65.5	1.16	<0.05	1.36
	BLACK DRUM		214		<0.50	66.4	1.38	<0.05	1.92
	BLACK DRUM	A	240	A	<0.50	74.8	1.62	<0.05	1.92
3	ALLIGATOR GAR		223		<0.50	47.7	0.483	0.320	0.513
	ALLIGATOR GAR		561		<0.50	71.4	0.439	0.100	0.449
	ALLIGATOR GAR		217		<0.50	38.7	0.330	0.0553	<0.3

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

			PARAMETER/CONTAMINANT						
SITE	SPECIES	WT. (g)	%H2O	Al	Sb	Ba	Be	B	Cd	Co
3	LARGEMOUTH BASS	423	74.1	8.46		133	<0.10	<1.50	0.277	
	LARGEMOUTH BASS	388	74.2	<5.0		33.6	0.206	<1.50	<0.10	
	LARGEMOUTH BASS	433	71.0	<5.0	N	22.9	<0.10	<1.50	0.213	N
	REDEAR	322	72.2	<5.0		16.9	<0.10	2.10	<0.10	
	REDEAR	220	72.2	60.6	O	18.2	<0.10	2.02	<0.10	O
	REDEAR	204	72.4	27.7		16.0	<0.10	<1.5	<0.10	
	SHEEPSHEAD	1063	68.2	5.81		57.1	<0.10	3.01	<0.10	
	SHEEPSHEAD	909	69.4	51.1		44.7	<0.10	3.50	<0.10	
	SHEEPSHEAD	539	67.8	<5.0	D	37.6	<0.10	1.52	<0.10	D
	SPOTTED GAR	1279	62.8	76.8		8.07	<0.10	7.17	<0.10	
	SPOTTED GAR	1162	61.0	210	A	10.9	<0.10	6.58	<0.10	A
	SPOTTED GAR	951	55.0	73.8		8.63	<0.10	6.38	<0.10	
	AMERICAN OYSTER	190	61.0	184	T	20.7	<0.10	8.32	2.44	T
	AMERICAN OYSTER	147	86.2	178		3.82	<0.10	9.07	0.437	
	AMERICAN OYSTER	190	85.8	218	A	24.4	<0.10	8.60	2.02	A
4	RED DRUM	3357	74.2	5.56		34.2	<0.10	<1.5	<0.10	
	RED DRUM	1480	75.4	10.7		28.9	1.48	3.22	1.04	
	RED DRUM	1917	71.4	<5.0		37.1	<0.10	1.94	<0.10	

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni
3	LARGEMOUTH BASS	6.43	2.07	93.2	296	1640	9.12	<0.80	1.15
	LARGEMOUTH BASS	3.15	2.28	63.1	6.40	1790	11.0	<0.80	<0.80
	LARGEMOUTH BASS	4.67	1.84	67.6	56.4	1530	10.0	<0.80	2.09
	REDEAR	35.2	3.04	270	2.91	1710	25.0	<0.80	6.68
	REDEAR	10.2	1.77	168	<1.50	1870	19.5	<0.80	2.68
	REDEAR	14.7	2.20	185	2.57	1920	23.4	<0.80	2.83
	SHEEPSHEAD	64.0	4.39	388	2.76	2320	169	<0.80	13.4
	SHEEPSHEAD	55.2	5.44	444	4.50	1900	133	<0.80	9.89
	SHEEPSHEAD	49.7	3.92	290	<1.50	1900	146	<0.80	10.8
	SPOTTED GAR	10.2	6.30	182	4.90	8800	29.7	<0.80	1.78
	SPOTTED GAR	19.9	12.0	163	5.67	7620	14.9	<0.80	2.95
	SPOTTED GAR	11.8	6.81	93.1	2.13	9820	29.9	<0.80	1.97
	AMERICAN OYSTER	2.73	127	351	13.0	2050	29.6	<0.80	3.65
	AMERICAN OYSTER	0.684	75.3	319	<1.50	2240	25.7	<0.80	1.17
	AMERICAN OYSTER	3.27	108	335	22.6	1990	27.9	<0.80	3.38
4	RED DRUM	6.22	3.06	109	36.6	1640	43.6	<0.80	1.00
	RED DRUM	4.55	3.97	85.9	<1.50	1770	25.7	1.49	7.41
	RED DRUM	5.48	2.96	75.9	35.8	1680	21.5	<0.80	1.26

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Ag	Sr	Sn	V	Zn	As	Hg	Se
3	LARGEMOUTH BASS		291		<0.50	237	0.756	<0.05	0.550
	LARGEMOUTH BASS		241		<0.50	111	0.721	0.147	0.632
	LARGEMOUTH BASS	N	242	N	<0.50	77.1	0.651	0.106	0.602
	REDEAR		387		<0.50	67.5	0.919	0.0770	0.815
	REDEAR	O	455	O	<0.50	73.7	1.16	<0.05	1.02
	REDEAR		448		0.603	81.4	1.42	0.0644	0.882
	SHEEPSHEAD		303		0.644	68.2	0.905	<0.05	0.706
	SHEEPSHEAD		315		0.532	67.9	1.37	0.0694	1.01
	SHEEPSHEAD	D	281	D	0.584	58.6	1.09	0.157	1.14
	SPOTTED GAR		401		0.879	71.2	0.998	<0.05	0.838
	SPOTTED GAR	A	381	A	<0.50	61.5	0.931	0.0775	0.515
	SPOTTED GAR		410		<0.50	66.7	0.717	0.0904	0.658
	AMERICAN OYSTER	T	24.2	T	0.716	1980	3.48	<0.05	1.63
	AMERICAN OYSTER		9.67		0.557	398	4.08	0.150	1.92
	AMERICAN OYSTER	A	19.1	A	0.564	1670	3.51	<0.05	1.53
4	RED DRUM		298		<0.50	77.7	1.14	0.267	1.84
	RED DRUM		133		1.53	72.7	0.716	0.314	2.21
	RED DRUM		232		<0.50	127	1.31	0.182	1.96

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

			PARAMETER/CONTAMINANT						
SITE	SPECIES	WT. (g)	%H2O	Al	Sb	Ba	Be	B	Cd	Co
4	AMERICAN OYSTER	82	88.0	216	NO	17.7	<0.10	10.6	9.10	NO
	AMERICAN OYSTER	100	86.0	262		18.9	<0.10	11.3	9.51	
	AMERICAN OYSTER	101	86.5	206	DATA	15.1	<0.10	10.7	8.12	DATA

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni
4	AMERICAN OYSTER	0.991	295	488	<1.50	2570	38.5	<0.80	3.18
	AMERICAN OYSTER	0.944	263	526	<1.50	2750	41.1	<0.80	2.39
	AMERICAN OYSTER	0.786	246	398	<1.50	2450	35.2	<0.80	2.58

Table B6. Elemental residues in tissue samples from the Caernarvon Freshwater Diversion monitoring (cont.) sites for 1991 (values expressed in mg/kg, dry weight).

		PARAMETER/CONTAMINANT							
SITE	SPECIES	Ag	Sr	Sn	V	Zn	As	Hg	Se
4	AMERICAN OYSTER	NO	25.4	NO	0.826	2720	5.10	0.0567	3.16
	AMERICAN OYSTER		41.8		0.911	2490	5.69	0.0710	3.35
	AMERICAN OYSTER	DATA	22.7	DATA	0.778	2310	5.44	0.0524	3.05

DEPARTMENT OF NATURAL RESOURCES

Coastal Management Division

Bo
Darryl
FRANK

11/27
Jm 12/3/85
PC 12/1/85
~~DHB~~ 12/4/85

For your information and for anyone else who might be interested - Darryl, Bo etc,

Chip

Bo -
Please copy & Jim.
DC

Darryl,
Do you want this for a file
Bo

P.O. Box 94124 . Baton Rouge, Louisiana 70804-9124 . 504/342-7591

Caernarvon Freshwater Diversion

biological monitoring - 3 phases
3 yr pre construction
4 yr. post construction program
46 yr long term program

Marsh vegetation monitoring
- total of 100 miles of transects (Chabreck + Linscombe)
- sampling stations at 0.25 or 0.50 mi. intervals
- use LORAN C coordinates by helicopter
- ocular estimate made with helicopter hovering
- all marsh species present and percent composition would be recorded
- observations of submerged aquatic vegetation

Project Mgr ⇒ **not** allow quantification of changes in marsh acreage
GIS [can be done by GIS at CWPPRA]

Nutria
muskrat populations simultaneously w/ vegetation

- also water level, salinity

fisheries
oysters - spat set intensities on collecting plates (spat/cm²/week)
- grow-out trays

shrimp - continue present efforts along with ~~with~~ additional trawl stations
-also finfish and blue crabs and
collect & monitored

Isohalines
salinity, water temp and conductivity

By TIM TALLEY
Advocate staff writer

Both candidates in the race for the Division J judgeship in the 19th Judicial District Court agree that the chief issue is which of them is best qualified for the job.

Each of the candidates, City Court Judge Curtis A. Calloway and attorney Lawrence "Larry" Dersona, maintain that their professional backgrounds make them best qualified to take over the district court seat.

"Who can do the better job?" Dersona said. The election should be won by the candidate that can best dispense justice, he said.

"It's a lifelong ambition to be judge," he said. "I had a calling from God to enter this race. God has touched me to offer myself for public

Calloway said the election's only issue is "the ability to do the job — that's about it. Certainly, in this race, I certainly am the most qualified candidate."

"The job that I have done over here (in City Court) is open to scrutiny. I'm here until 5 o'clock. When people call me I try to get them some help," Calloway said.

"I'm looking forward to going over there (district court) and working," he said.

Calloway, 52, and Dersona, 36, will face each other in the Oct. 3 primary election for the district court seat. Each candidate is a Democrat.

The Division J judgeship is one of three judgeships up for grabs in a newly-created, predominantly black election subdistrict

jurists. The district court judgeships have parishwide juris diction, but only voters within the subdistrict will participate in the election.

Division J was vacated in March by the retirement of former Judge L.J. Hymel and has been filled with temporary judicial appointments by the state Supreme Court until a permanent replacement was elected.

Calloway, a U.S. Marine Corps veteran of Vietnam, is a graduate of the Southern University Law Center and was in private practice for 16 years before he was elected to a six-year term on the City Court in 1988.

Calloway said he has played an active role in improvements in the operation and management of the court since he took his seat. Calloway has handled both criminal and civil

"City Court is a much better place than it was three years ago," he said.

City Court judges have implemented a docketing system for criminal charges handled by the court. City Court has jurisdiction over misdemeanor and traffic offenses within the city limits.

Calloway said City Court judges have also initiated regular weekly meetings to discuss issues that affect the court.

Calloway said he also wants to influence the system as a district court judge. He said he is particularly interested in helping the victims of alcohol abuse through referrals to rehabilitation services.

☐ See ISSUE, Page 2B

Tangipahoa civil deputy's arrest reported

By CHRISTOPHER BAUGHMAN
Advocate staff writer

Tangipahoa Parish Sheriff Ed Layrisson arrested one of his civil deputies Friday afternoon after an audit of his office found a shortage of about $56,000, a spokesman said.

Layrisson arrested Melba Joiner of 696 S. First St., Ponchatoula, for theft in connection with the missing funds, sheriff's spokesman Chuck Reed said.

Layrisson accused Joiner of embezzling the funds over the last year, Reed said.

Joiner worked in the Hammond substation of the Sheriff's Office in a section that distributes hunting licenses to the public.

Although Reed said he did not know how the woman allegedly took the funds, her job required handling cash from the public. And

☐ See DEPUTY, Page 2B

Davis Pond coastal restoration project finally OK'd, DNR says

By BOB ANDERSON
Environmental editor ADVOCATE 9/21/92

The state has won a battle with the U.S. Army Corps of Engineers for approval of what state coastal officials said is the most important coastal restoration project planned for the state.

Davis Pond is the most significant and important coastal project of all those that have been built or are on the drawing board, said Dave Soileau, assistant secretary of DNR.

The Louisiana Department of Natural Resources had accused the corps of intentionally delaying the project. After 10 years of preparation work, the project appeared to be held up at corps headquarters in Washington, D.C.

But DNR officials said that with the help of U.S. Sen. J. Bennett Johnston, D-La., they have gotten top corps officials to approve construction of the $87 million Davis Pond project, which will help to protect hundreds of thousands of acres of important marsh south of New Orleans.

"The assistant secretary of the Army has approved" the project and the paperwork is "en route back to New Orleans for implementation," Soileau said.

All that has to be done now is to acquire the land and finish the final project design and engineering, he said.

That should begin in a few days and there should be "a project on the ground within a couple of years," Soileau said.

That project will directly preserve 83,000 acres of marsh and benefit more than 750,000 other acres in the Barataria Basin, Soileau said.

But Soileau and other DNR coastal officials had become frustrated by delays that had put the project more than a year-and-a-half behind schedule and what Soileau called attempts by corps headquarters to stall the work as part of an election-year attempt to reduce spending.

A corps spokesman said there had been questions about the project at corps' headquarters in Washington, D.C. and talk of reducing its size and cost.

☐ See POND, Page 2B

tancing his
ict judge.
ice report
ampaign a
reporting

n printing

The city court judge spent $14,819 on the campaign and had $653 in in-kind contributions.

Calloway's contributions include $400 from a political committee and $11,675 raised from the sale of tickets to a campaign fund-raising event, the report states.

Major contributors include: John J. Pace, $500; United Brotherhood of Carpenters and Joiners of America Local Union 1098-CARPIC, $400; Marks & Lear, $250; Rick A. Caballero, $1,000; Paul H. Due, $1,000; Jo A. Fleming, $350; Newman, Mathis, Brady, Wakefield & Spedale, $300; Ferrara Fire Apparatus Inc., $250; George and George Ltd., $250; Lawrence A. Durant, $250; Thibaut, Thibaut, Bacot & Latchem, $250; Taylor, Porter, Brooks & Phillips, $500; Ferrara & Eyre, $500; Antony J. Marabella Jr., $250; Mathews, Atkinson, Guglielmo, Marks & Day, $250; Syed A. Salat & Associates, $250; Raymond L. Simmons, $250; Mr.

Lawrence 'Larry' Dersona: Division J candidate

or Mrs. Karl Koch, $250; Steven F. or Linda B. Watkins, $250; G. Stephen Covert, $250; Thomas C. D'Amico, $250; Etta Kay Hearn, $250; Greco & Greco, $250; Lewis O. Unglesby, $250; Paul Richard Matzen, $250; L.D. Sledge, $500; and Walter Landry Smith, $1,000.

Pond

CONTINUED FROM 1B

That project will directly preserve 83,000 acres of marsh and benefit more than 750,000 other acres in the Barataria Basin, Soileau said.

But Soileau and other DNR coastal officials had become frustrated by delays that had put the project more than a year-and-a-half behind schedule and what Soileau called attempts by corps headquarters to stall the work as part of an election-year attempt to reduce spending.

A corps spokesman said there had been questions about the project at corps' headquarters in Washington, D.C. and talk of reducing its size and cost.

The project will deliver 10,500 cubic feet a second of fresh water to Lake Cataouatche, Lake Salvadore and Barataria Bay.

It will help to imitate the water that built and nourished the marshes before levees were constructed along the Mississippi River. Without that water and the sediment it carries, the marshes are subsiding and eroding at a rapid rate.

The state's marsh is considered important habitat for waterfowl and other wildlife and a necessary nursery grounds for most of the species that make Louisiana a national leader in fish harvest.

The marsh below New Orleans is also considered a vital storm buffer to the city, which is below sea level, because each mile of marsh has the capability of reducing storm surge by 1 foot and also helping to reduce hurricane wind velocity.

her with a knife. Emergency workers treated her for lacerations before taking her to the Baton Rouge General Medical Center.

Police were searching for the assailant Sunday evening, described by Cavell as a black man in his 30s. A witness who saw the man running from the scene said he was wearing a turquoise T-shirt, a blue ball cap and dark shorts.

Another witness saw a man fitting that description leaving the area in an

witness said he sa
description of
shirtless, driving
truck.

Several resident
gathered after
commented on the
attack occurring a
of the afternoon
populated apartme

Police are askin
any information ab
389-3853.

City police officials say man sh

A 30-year-old man was shot twice Sunday night while talking to someone in a car on West Johnson Street, city police spokesman Cpl. Kevin Cavell said.

Another person may have been injured in the shooting, but investigators were not sure, Cavell said.

The man, who was shot once in the arm and once in the back, walked into the police department's Second District after the incident.

Emergency Medical Services personnel at the scene said the man went into shock and had to be taken to Our Lady of the Lake Regional Medical Center.

Cavell said the victim was shot while

talking to some men

Investigators did
the shooting late Su

Chris Robinson s
down the road from
shooting occurred.

Robinson said
traffic on West Joh
suspects' car was b
the victim asked th

The men in the
stopped and when
them to move again
back seat fired se
victim.

"They shot that
Robinson said.

He said there wa
car.

might be
HA policy
ie grocer,
made it
y health

insurance
provided
pany, but
inued the
has been
s, he said.
over him,
elated to
h, he said.

executive
onsumers
board, the
urse.
ll benefit
not want
ings to get
me time it
to unload

pretext to
the hook"
ed health.
quired to
who can
r health

insurance
oard, said
ibited by
clients'

dumping
said.
that some
tections,

may not be able to get insurance because of their health conditions.

Deputy

CONTINUED FROM 1B

Reed said Joiner sometimes worked by herself in a room.

As a civil deputy, Joiner did office work and did not carry a gun or make arrests, Reed said.

The missing funds first came to light during a yearly internal audit begun in July, Reed said.

The Sheriff's Office called in an outside auditor to confirm the findings. After that was done, Reed said both auditors presented their findings to Layrisson.

After her arrest, Joiner admitted she had taken the money, Reed said.

"It is my understanding that there was a confession and an agreement to assist in the investigation," Reed said.

But Reed said he did not know if Joiner told investigators why she took the money or what she did with it.

Joiner has worked in the Sheriff's Office for eight years, Reed said, and her arrest stunned him.

"She was involved with charity functions and was well-respected in the neighborhood," Reed said. "It was a shock to everybody."

Layrisson booked Joiner into the Hammond substation, Reed said.

She bonded out on a personal property and surety bond a short time later, he said.

CONSISTENCY NUMBER: C85.7.1.91

APPLICANT NAME: COE/NOD

PARISH: PLAQUEMINES

SEC | TWP | RANGE | LONGITUDE | RECEIVED DATE

CDRAFT DATE | ILSUE DATE | FEDERAL AGENCY | CATEGORY | STATUS | REVIEWER | # 3 DECKS

DEAL | MONTEH | # NEW JOBS | # NE PIPELI

OCS | AREA | BLOCKS | PUBLIC NOTICE DATE | NEW ONSHORE FACILITIES | ACRE: NEW FACI

ONSHORE BASE NAME | OCS NUMBER | # PIPELINES ONTO SHORE | MILES OF PIPELINE | PIPED COMMODI

FAS | FEDERAL CODE | BLK GRANT | $ AMOUNT | CONTACT AGENCY NUMBER | CONTACT AGENCY DUE DA

FLP | PUBLIC NOTICE DATE | AFTER FACT | LOCAL PERMIT | DFA | PROJECT DESCRIPTION | STATE AGENCY CONST. | FUNDING SOU

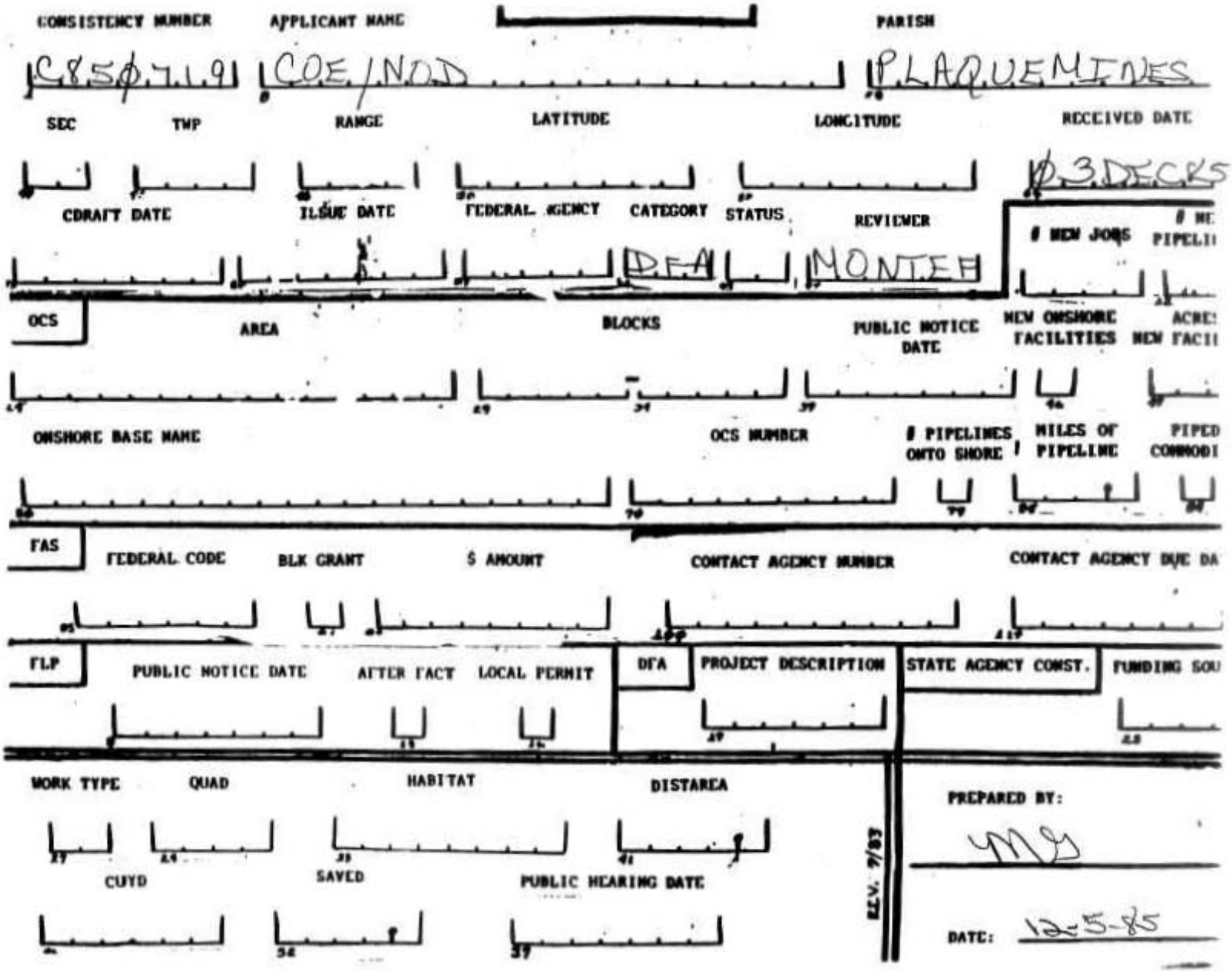
WORK TYPE | QUAD | HABITAT | DISTAREA

CUYD | SAVED | PUBLIC HEARING DATE

REV. 7/83

PREPARED BY: MS

DATE: 12-5-85


CONSISTENCY NUMBER
APPLICANT NAME
PARISH
C85.7.1.91
COE/NOD
PLAQUEMINES
SEC
TWP
RANGE
LATITUDE
LONGITUDE
RECEIVED DATE
#3 DECKS
CDRAFT DATE
ISSUE DATE
FEDERAL AGENCY
CATEGORY
STATUS
REVIEWER
NEW JOBS
NE
PIPELI
DEA
MONTEH
OCS
AREA
BLOCKS
PUBLIC NOTICE DATE
NEW ONSHORE FACILITIES
ACRE
NEW FACI
ONSHORE BASE NAME
OCS NUMBER
PIPELINES ONTO SHORE
MILES OF PIPELINE
PIPED COMMODI
FAS
FEDERAL CODE
BLK GRANT
$ AMOUNT
CONTACT AGENCY NUMBER
CONTACT AGENCY DUE DA
FLP
PUBLIC NOTICE DATE
AFTER FACT
LOCAL PERMIT
DFA
PROJECT DESCRIPTION
STATE AGENCY CONST.
FUNDING SOU
WORK TYPE
QUAD
HABITAT
DISTAREA
CUYD
SAVED
PUBLIC HEARING DATE
REV. 9/83
PREPARED BY:
DATE:
12-5-85

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 15570
BATON ROUGE, LA. 70895

J. BURTON ANGELLE, SR.
SECRETARY
(504) 925-3617

EDWIN W. EDWARDS
GOVERNOR

November 18, 1985

Dr. Stuart J. Guey, Jr.
Commissioner of Health
Plaquemines Parish Commission Council
106 Avenue "G"
Belle Chasse, LA 70037

Dear Dr. Guey:

This is in response to your letter of October 22, 1985 requesting that the Louisiana Department of Wildlife and Fisheries not lease particular grounds because of the potential liability associated with the operation of the controlled freshwater introduction. I can assure you this Department has been involved with freshwater diversion projects for some five directors prior to myself, going back to the Olga project. As you pointed out, we have been made aware of liabilities associated with the controlled freshwater diversion projects before, particularly the Bayou Lamoque structure. This was in 1972, and at the time we discussed the matter with the individual and he decided it was more profitable to maintain the lease than to receive a small settlement. However, at that time we became aware of the problem.

In your letter of October 22, you bring up several points that could potentially cause problems. Towards the end of not leasing -- what happens when the structure produces oysters in the area; who would be legally able to take the oysters. Under the present law, virtually no one. Secondly, who will determine the "adversely affected area"?

Dr. Guey, I truly feel after extensive consultation with my legal and scientific staffs that for some years now a subservient clause placed on all new leases in this area should remove this liability. This would be on all leases since they are proposed to be built statewide, and even though flow-through Caernarvon is some 15 years away, it is timely to consider it now. The problem I am running into is the use of the exact wording which should not prevent the oyster leasee from his legal right to obtain damage claims. Our legal counsel and staff has been working on the wording and it will be forthcoming. This will be a statement in the lease document allowing the state to operate the structure without being liable for oyster mortality. Those potential oyster leasees who feel this will present problems should not lease those areas.

Thank you very much for your interest in this matter, and if I can be of any further assistance, please contact me.

Sincerely,

J. Burton Angelle
Secretary

JBA:HES:scn

cc: Senator Samuel Nunez
Representative Frank Patti
Department of Natural Resources, Dr. Chip Groat
Mr. William S. "Corky" Perret
Mr. Harry Schafer
Mr. Ron Dugas
Mr. Mark Chatry
Mr. Al Anderson
Mr. Don Puckett

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
POST OFFICE BOX 98000
BATON ROUGE, LA 70898

J. BURTON ANGELLE, SR.
SECRETARY
(504) 925-4007

EDWIN W. EDWARDS
GOVERNOR

11-4-85

AGENDA SECT.
PREPARE RESPONSE
FOR SECRETARY
BATON ROUGE OFFICE

DATE: OCTOBER 30, 1985

MEMORANDUM

TO: CORKY PERRET, ASST. SEC.

FROM: J. BURTON ANGELLE, SECRETARY

Please look into this matter and prepare a written response for my signature within 72 hours. Include two copies of your reply for filing in this office. Thank you.

RECEIVED
LA. DEPARTMENT OF
WILDLIFE & FISHERIES
OCT 30 1985
ASSISTANT SECRETARY
OFFICE OF COASTAL
& MARINE RESOURCES

Plaquemines Parish Commission Council

COMMISSIONER OF HEALTH
106 Avenue "G"
BELLE CHASSE, LOUISIANA 70037

DR. STUART J. GUEY, JR.
COMMISSIONER

Phone: 392-6690

October 22, 1985

COPY

Burton Angelle, Secretary
Louisiana Department of Wildlife & Fisheries
P.O. Box 15570
Baton Rouge, La. 70895

Dear Mr. Angelle:

I am requesting that you consider not leasing any additional oyster grounds located in Plaquemines and St. Bernard parishes that will be adversely affected by the proposed Caernarvon Freshwater Diversion project. The continued leasing of oyster grounds in areas where the freshwater diversion will have adverse effects may eventually lead to mitigating activities on behalf of the lessee against the lessor. If you are unable to curtail the leasing of future oyster grounds in the Caernarvon Outfall area, then it should be made known to the lessee that this area may be adversely impacted as a result of the proposed Caernarvon Freshwater Diversion project and that neither the State nor the Parish should be held responsible for the mortality of the oysters on those leased beds.

When reviewing the request for leases to be renewed in this area we request, if possible, that a statement be made so as to eliminate liability of the State and the Parishes which may result from future operation of the structure.

Please consider this request and advise us as to any action the Louisiana Department of Wildlife & Fisheries intends to take.

Sincerely,

Dr. Stuart J. Guey, Jr.
Commissioner of Health

SJG/dbs

cc: Representative Frank Patti
Senator Sammy Nunez

DEPARTMENT OF NATURAL RESOURCES
COASTAL MANAGEMENT DIVISION
P. O. BOX 44487
BATON ROUGE, LOUISIANA 70804-4487
(504) 342-7591

D22

COASTAL USE PERMIT/CONSISTENCY DETERMINATION

C.U.P. No. P920092

C.O.E. No. NOD-100

NAME AND ADDRESS: **PLAQUEMINES PARISH:** ATTN: Leslie Albano, c/o Brown & Root, Inc., 1112 Engineers Road, Belle Chasse, LA 70037

LOCATION: **PLAQUEMINES PARISH, LA:** Unsurveyed section of T14S-R13E, east bank of Big Mar along the Caernarvon Canal, Lat. 29°50'00"N Long. 89°53'50"W.

PROJECT DESCRIPTION: Install five 90'long x 5'wide wave dampening "Christmas tree" brush fences. Fences will be constructed of wolmanized ten foot long 2" x 4" posts spaced 4' apart and driven to a depth of 4' into the water bottom. Trees will be secured within the closures to a depth of 4' using either nylon cord, welded-wire fencing or 1" x 6" x 8' boards.

Copy

In accordance with the rules and regulations of the Louisiana Coastal Resources Program and Louisiana R.S. 49, Sections 213.1 to 213.21, the State and Local Coastal Resources Management Act of 1978, as amended, the permittee agrees to:

1. Carry out or perform the use in accordance with the plans and specifications approved by Department of Natural Resources.
2. Comply with any permit conditions imposed by the Department of Natural Resources.
3. Adjust, alter, or remove any structure or other physical evidence of the permitted use if, in the opinion of the Department of Natural Resources, it proves to be beyond the scope of the use as approved or is abandoned.
4. Provide, if required by the Department of Natural Resources, an acceptable surety bond in an appropriate amount to ensure adjustment, alteration, or removal should the Department of Natural Resources determine it necessary.
5. Hold and save the State of Louisiana, the local government, the department, and their officers and employees harmless from any damage to persons or property which might result from the use, including the work, activity, or structure permitted.
6. Certify that the use has been completed in an acceptable and satisfactory manner and in accordance with the plans and specifications approved by the Department of Natural Resources. The Department of Natural Resources may, when appropriate, require such certification be given by a registered professional engineer.
7. All terms of the permit shall be subject to all applicable federal and state laws and regulations.
8. This permit, or a copy thereof, shall be available for inspection at the site of work at all times during operations.
9. The applicant will notify the Coastal Management Division of the date on which initiation of the permitted activity described under the "Coastal Use Description" began. The applicant shall notify the Coastal Management Division by mailing the enclosed green initiation card on the date of initiation of the coastal use.
10. Unless specified elsewhere in this permit, this permit authorizes the initiation of the coastal use described under "Coastal Use Description" for two years from the date of the signature of the Secretary or his designee. If the coastal use is not initiated within this two year period, then this permit will expire and the applicant will be required to submit a new application. Initiation of the coastal use, for purposes of this permit, means the actual physical beginning of the use or activity for which the permit is required. Initation does not include preparatory activities, such as movement of equipment onto the coastal use site, expenditure of funds, contracting out of work, or performing activities which by themselves do not require a permit. In addition, the permittee must, in good faith and with due diligence, reasonably progress toward completion of the project once the coastal use has been initiated.
11. This Coastal Use Permit authorizes periodic maintenance, but such maintenance activities must be conducted pursuant to the specifications and conditions of this permit.
12. The following special conditions must also be met in order for the use to meet the guidelines of the Coastal Resources Program:

a. That the applicant shall insure that all sanitary sewage and/or related domestic wastes generated during the subject project activity and at the site, thereafter, as may become necessary shall receive the equivalent of secondary treatment (30 mg/l BOD_5; 30 mg/l TSS) with disinfection prior to discharge into any of the streams or adjacent waters of the area or, in the case of total containment, shall be disposed of in approved sewerage and sewage treatment facilities, as is required by the State Sanitary Code. Such opinion as may be served by those comments offered herein shall not be construed to suffice as any more formal approval(s) which may be required of possible sanitary details (i.e. provisions) scheduled to be associated with the subject activity. Such shall generally require that appropriate plans and specifications be submitted to the Department of Health and Hospitals for purpose of review and approval prior to any utilization of such provisions.

b. (i) This permit authorizes the initiation of the Coastal Use described under "Coastal Use Description" for two years from the date of the signature of the Secretary or his designee. Initiation of the Coastal Use, for purposes of this permit, means the actual physical beginning of the use or activity for which the permit is required. Initiation does not include preparatory activities, such as movement of equipment onto the Coastal Use site, expenditure of funds, contracting out of work, or performing activities which by themselves do not require a permit. In addition, the permittee must, in good faith and with due diligence, reasonably progress toward completion of the project once the Coastal Use has been initiated. If the Coastal Use is not initiated within this two year period, an extension may be granted pursuant to the requirements contained in the Rules and Procedures for Coastal Use Permits (Title 43:I.723.D.). Please note that a request for permit extension MUST be made no sooner than 180 days and no later than 60 days prior to the expiration of the permit.

(ii) The expiration date of this permit is five (5) years from the date of the signature of the Secretary or his designee.

(iii) Upon expiration of this permit, a new Coastal Use Permit will be required for completion of any unfinished or uncommenced work items and for any maintenance activities involving dredging or fill that may become necessary. Other types of maintenance activities may also require a new Coastal Use Permit.

c. The permittee shall allow representatives of the Coastal Management Division or authorized agents to make periodic, unannounced inspections to assure the activity being performed is in accordance with the conditions of this permit.

d. In order to ensure the safety of all parties, the permittee shall contact the Louisiana DOTTIE System (1-800-272-3020) a minimum of 48 hours prior to the commencement of any excavation (digging, dredging, jetting, etc.) or demolition activity.

By accepting this permit the applicant agrees to its terms and conditions.

I affix my signature and issue this permit this _____ day of _____, 19_____.

DEPARTMENT OF NATURAL RESOURCES

_____

TERRY W. HOWEY, DIRECTOR
Coastal Management Division

This agreement becomes binding when signed by the Director of the Coastal Management Division, Department of Natural Resources.

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

(33 CFR 325)

OMB APPROVAL NO. 0702-0036
Expires 30 June 1992

The Department of the Army permit program is authorized by Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act and Section 103 of the Marine Protection, Research and Sanctuaries Act. These laws require permits authorizing activities in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Information provided on this form will be used in evaluating the application for a permit. Information in this application is made a matter of public record through issuance of a public notice. Disclosure of the information requested is voluntary; however, the data requested are necessary in order to communicate with the applicant and to evaluate the permit application. If necessary information is not provided, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (*see sample drawings and instructions*) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

1. APPLICATION NUMBER *(To be assigned by Corps)*

2. NAME AND ADDRESS OF APPLICANT

Plaquemines Parish
P. O. Box 61
Pointe-a-la-Hache, LA 70082
Attention: Mr. Luke Petrovich, President

Telephone no. during business hours

A/C ( ) _____ (Residence)
A/C (504) 392-6690 (Office)

3. NAME, ADDRESS, AND TITLE OF AUTHORIZED AGENT

Brown & Root, Inc.
1112 Engineers Road
Belle Chasse, LA 70037

Telephone no. during business hours

A/C ( ) _____ (Residence)
A/C (504) 394-5000 (Office)

Statement of Authorization: I hereby designate and authorize _____ Brown & Root, Inc. _____ to act on my behalf as my agent in the processing of this permit application and to furnish, upon request, supplemental information in support of the application.

SIGNATURE OF APPLICANT: Luke A. Petrovich, Jr. DATE: Jan 21, 1992

4. DETAILED DESCRIPTION OF PROPOSED ACTIVITY

4a. ACTIVITY

A total of 5, 5 foot wide x 90 foot long wave dampening brush fences will be constructed. Christmas trees will be used to fill the fences to a depth of 4 feet. Each fence will consist of wolmanized lumber with posts of 10 foot long 2 x 4's driven into the ground 4 feet. All enclosures will be secured to contain the trees with either nylon cord, welded-wire fencing or 1 x 6 boards (see attached drawings).

4b. PURPOSE

The purpose of the project is to reduce erosive wave energy at the project site, as well as capturing sediment and floating material to stimulate the formation of emergent marsh.

4c. DISCHARGE OF DREDGED OR FILL MATERIAL

Christmas Trees

To the best of my knowledge the proposed activity described in my permit application complies with and will be conducted in a manner that is consistent with the Louisiana Coastal Management Program.

5. NAMES AND ADDRESSES OF ADJOINING PR[illegible]ITY OWNERS, LESSEES, ETC., WHOSE PROPERTY ALL[illegible]JOINS THE WATERWAY

Delacroix Land Corporation
206 Decatur Street
New Orleans, Louisiana
(504) 523-2245

6. WATERBODY AND LOCATION ON WATERBODY WHERE ACTIVITY EXISTS OR IS PROPOSED

The Big Mar fences will be located on the east-southeast shore of Big Mar along eroding banks of the Caernarvon Canal.

7. LOCATION ON LAND WHERE ACTIVITY EXISTS OR IS PROPOSED

ADDRESS Big Mar fences will be located approximately 2 miles south of Caernarvon, LA.

STREET, ROAD, ROUTE OR OTHER DESCRIPTIVE LOCATION

Plaquemines Parish, LA 70037

COUNTY STATE ZIP CODE

Coast Guard, Group New Orleans, LA (504) 942-3001

LOCAL GOVERNING BODY WITH JURISDICTION OVERSITE

8. Is any portion of the activity for which authorization is sought now complete? ☐ YES ☒ NO
If answer is "yes" give reasons, month and year the activity was completed. Indicate the existing work on the drawings.

9. List all approvals or certifications and denials received from other federal, interstate, state or local agencies for any structures, construction, discharges or other activities described in this application.

ISSUING AGENCY	TYPE APPROVAL	IDENTIFICATION NO	DATE OF APPLICATION	DATE OF APPROVAL	DATE OF DENIAL
NA					

10. Application is hereby made for a permit or permits to authorize the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities or I am acting as the duly authorized agent of the applicant.

Earl A. Britsch, Paul Britsch — Jan. 21, 1992 — Kenneth Faust — 1/9/92.

SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 3 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of The United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

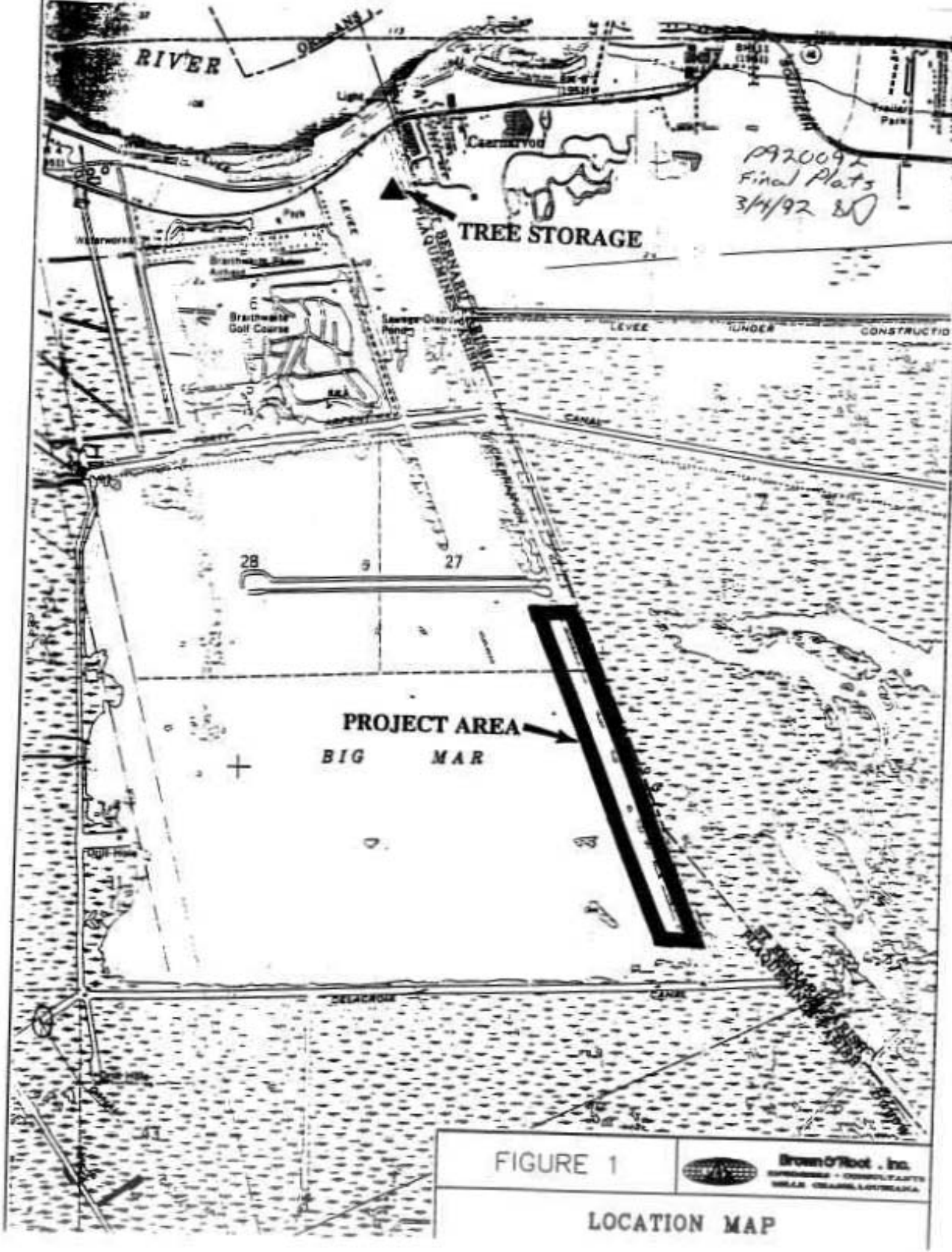


FIGURE 1

Brown & Root, Inc.

LOCATION MAP

P920092
Final Plats
3/4/92 SD

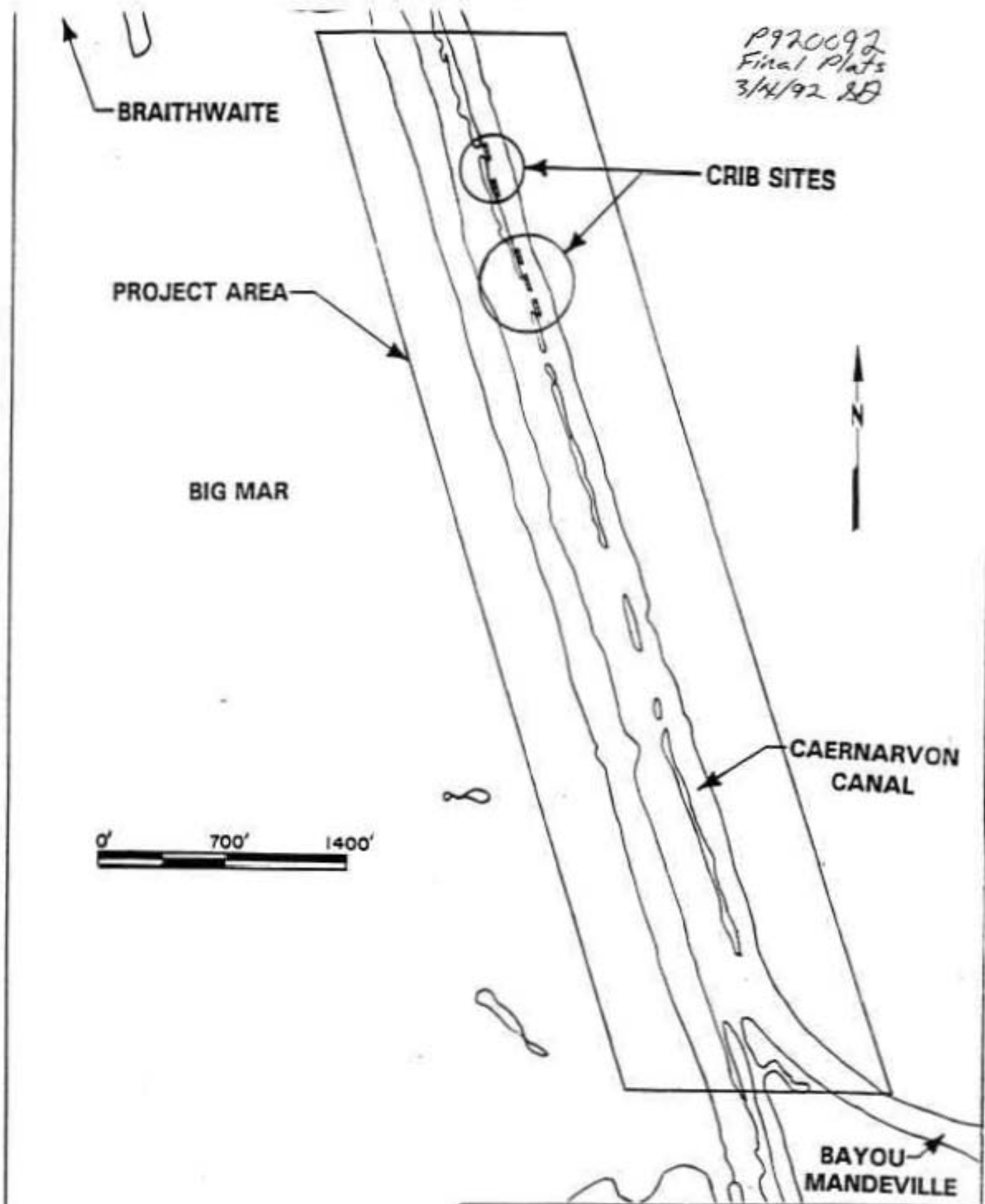


FIGURE 2

Brown & Root, Inc.

PROJECT AREA

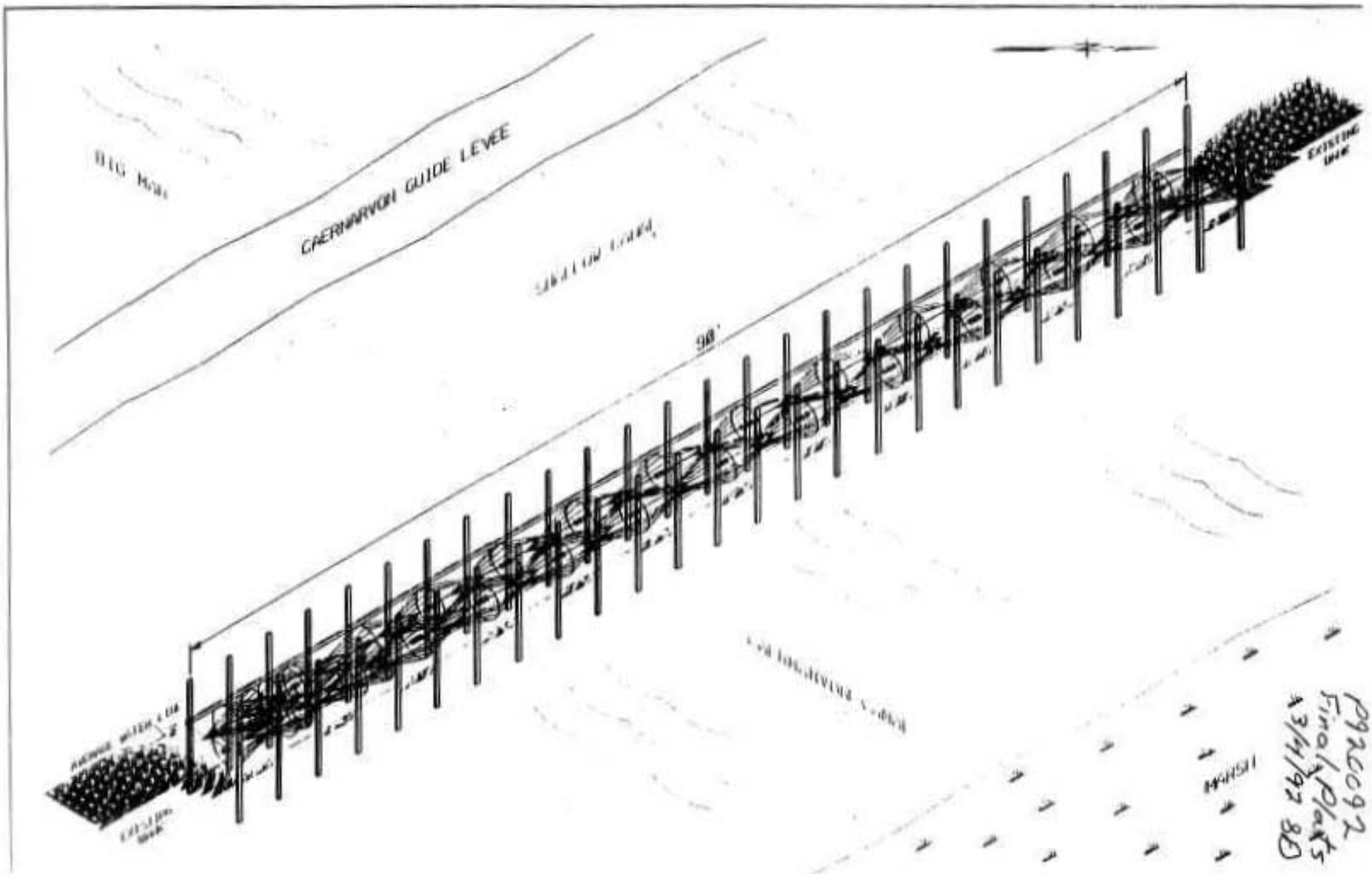


FIGURE 3

Brown & Root, Inc.
ENGINEERS - CONSULTANTS
BATON ROUGE, LOUISIANA

CHRISTMAS TREE CRIB
ISOMETRIC VIEW

P92C092
Final Plots
3/14/97 BD

P920092
Final Plats
3/4/92 SD

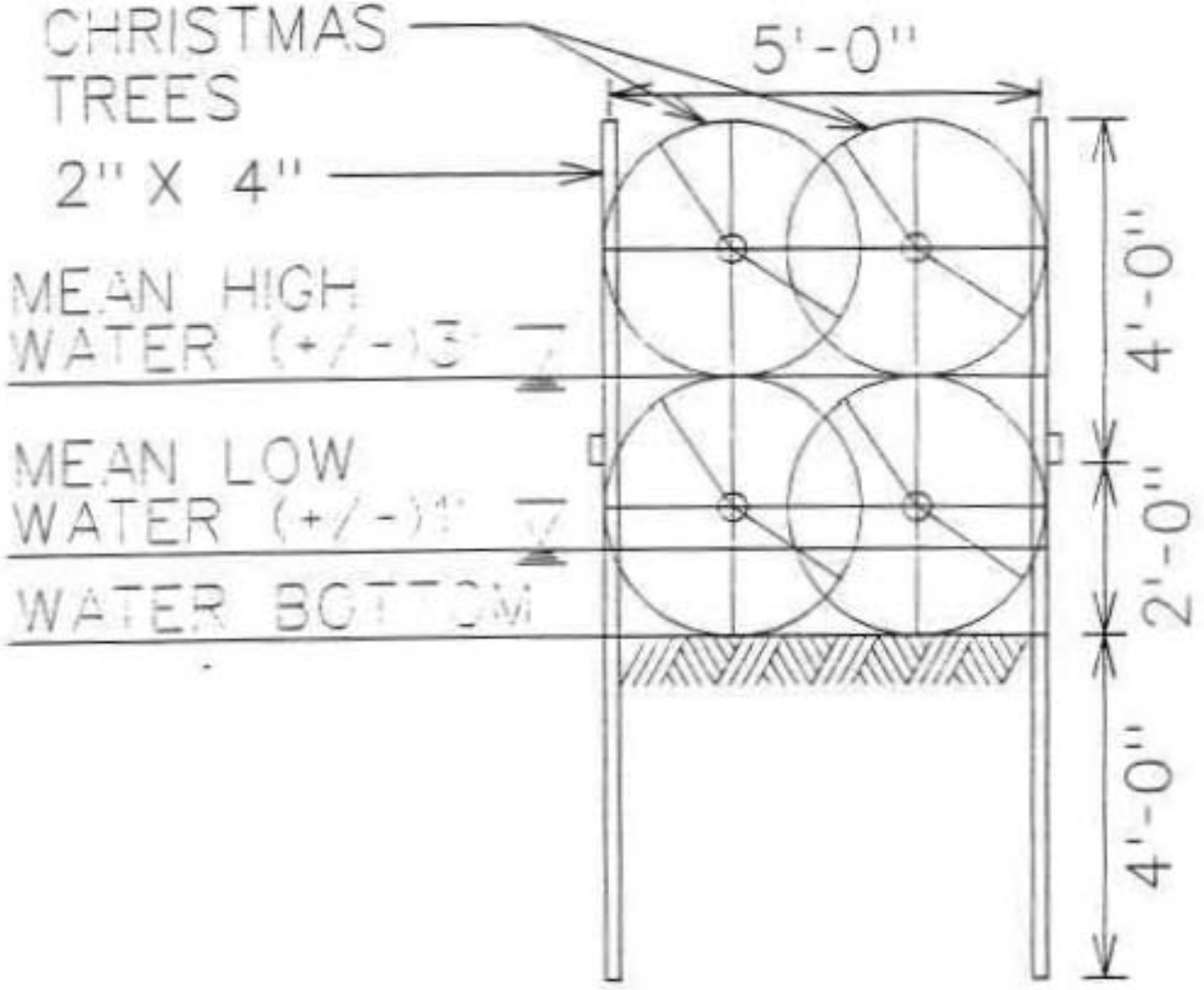
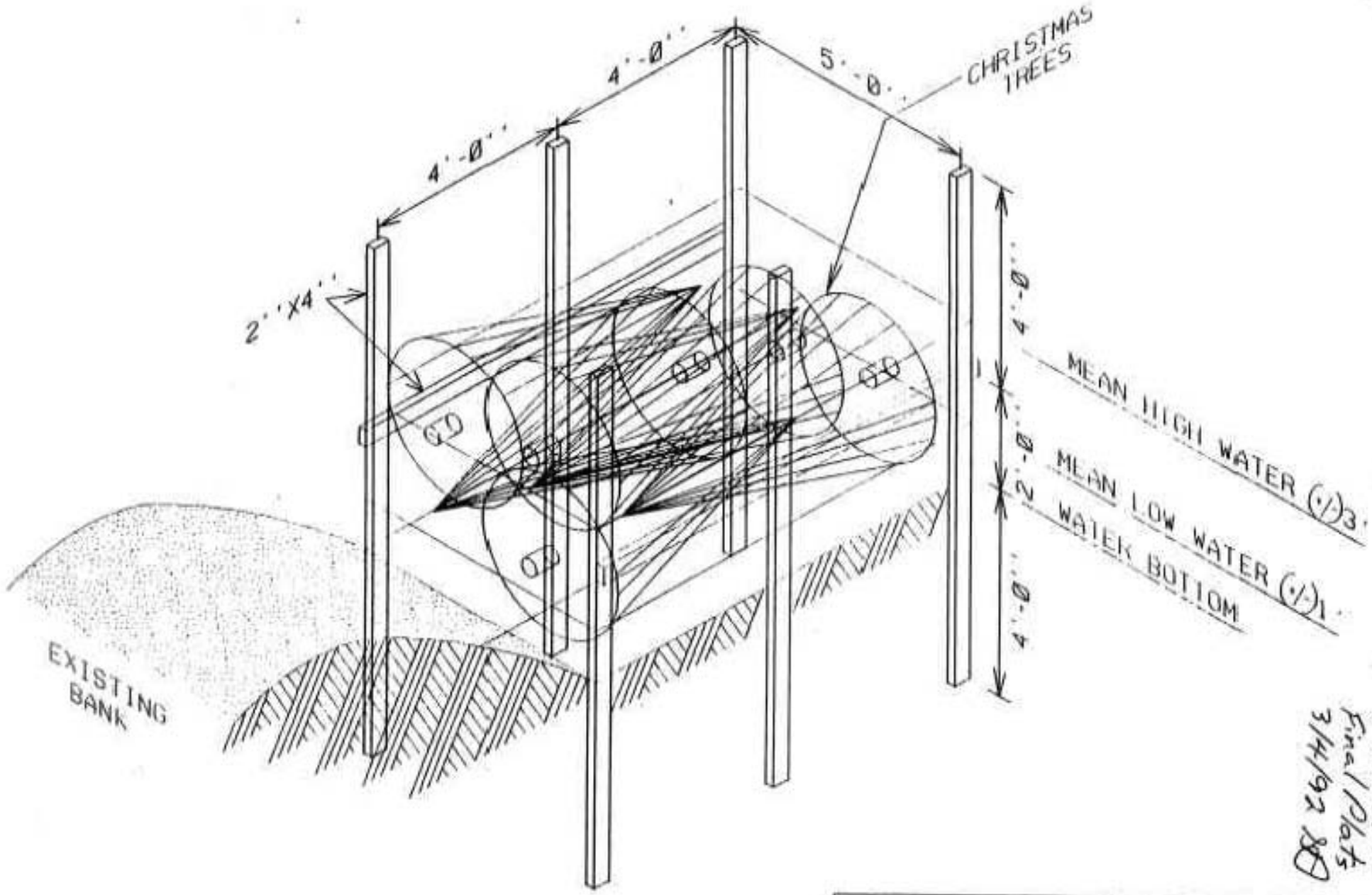


FIGURE 5

Brown & Root, Inc.

CHRISTMAS TREE CRIB
LEFT VIEW



P92009.2
Final Plots
3/14/92 SD

FIGURE 4

Brown & Root, Inc.

CHRISTMAS TREE CRIB
ISOMETRIC VIEW DETAIL

United States Department of the Interior
FISH AND WILDLIFE SERVICE

POST OFFICE BOX 4305
103 EAST CYPRESS STREET
LAFAYETTE, LOUISIANA 70502

October 25, 1985

Mr. Frederic M. Chatry
Chief, Engineering Division
Project Engineering Section
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Mr. Chatry:

The Fish and Wildlife Service has reviewed the draft reports for the biological and hydrological, water, and sediment quality monitoring programs for the freshwater diversion structure at Caernarvon, Louisiana, as requested by your September 26, 1985 letter. This letter is submitted on a planning-aid basis.

The environmental concerns relative to the potential effects of freshwater diversion are adequately addressed by the numerous elements comprising the draft monitoring programs. However, we do not believe that additional modeling is needed for development of operational procedures for the diversion structure. Therefore, we do not consider development of such a model to be a necessary element of the proposed monitoring program.

We appreciate the opportunity to assist in the development of a comprehensive monitoring program for this freshwater diversion feature. We plan to continue our coordination of the biological monitoring program with NOD and Louisiana Department of Wildlife and Fisheries personnel.

Sincerely yours,

David W. Fruge
Field Supervisor

cc: LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD), Baton Rouge, LA
FWS, Atlanta, GA (AHR/ES)
NMFS, Galveston, TX

ADVOCATE 11-9-97

[illegible] rewriting plan for river diversion

[illegible]

Gus Livaudais, a longtime Plaquemines Parish resident and landowner, says he sees lots of evidence that diverting some Mississippi River water into the marsh is working.

On a recent trip, he and others saw thousands of ducks that created what looked like paint smears across the silvery surface of ponds in the marsh being replenished with fresh water from the Caernarvon Freshwater Diversion near Braithwaite.

There's a lot of "duck potato," a freshwater marsh plant that ducks eat after flying south for the winter to Louisiana, he said.

"The waterfowl has drastically improved because you have feed," he said. The alligator population has also boomed, he said. "The only thing you don't see is the nutria. The alligators are taking control of that," Livaudais said.

Livaudais is one of several people who say they see positive things in the marsh where freshwater diversion is occurring.

But there are some who see destruction, not resurrection.

State Sen. Lynn Dean, R-Braithwaite, says he thinks the diversion has done nothing but push oyster and crab fishermen farther away from home. He said he thinks a virus outbreak that hit oyster beds earlier this year is tied to pollution coming into the Breton Sound Estuary from the diversion project.

St. Bernard Parish's sewage treatment plant discharges into the river just above Caernarvon and on some rainy days, the system is bypassed because too much water flows into it, he said. Dean is the former St. Bernard Parish president.

The Department of Natural Resources says the federal Food and Drug Administration studied the virus problem and concluded the outbreak was from local sources and not "distant sources" such as the diversion project.

Pete Jones, a Plaquemines Parish employee who runs the structure, said people who don't see the improvement in the

and concluded the outbreak was from local sources and not "distant sources" such as the diversion project.

Pete Jones, a Plaquemines Parish employee who runs the structure, said people who don't see the improvement in the marsh "don't want to see it. ... People, I think are afraid of change."

And there apparently has been a lot of change since the five 45-foot-square culverts were opened first in 1991. The culverts run from the river under the levee and La. 39 into a canal that opens in the top of the estuary.

At peak flow, the structure can move 8,000 cubic feet of water per second into the marsh. With it comes silt and nutrients that help build land and encourage freshwater plant growth. Much of the marsh's soil comes from plant growth decomposition. The freshwater also pushes the saltwater farther toward Breton Sound.

The Department of Natural Resources said surveys show that the addition of fresh water has increased the waterfowl pass, alligators, nutria, and freshwater vegetation. In nine sample sites, the diversion has created 406 acres of land.

Bill Good, head of the DNR's Coastal Restoration Division, said officials are still not sure how the marsh has been built. It is probably a combination of silt coming in with the water and nutrients that helped make soil more conducive to freshwater plant growth, he said.

Researchers from LSU and University of Southwestern Louisiana are beginning a study to figure out how it all works, Good said.

That's just one of many unknowns that must be dealt with in the concept of diversion.

Good said the hydrology of Caernarvon and other large-scale diversions "is so complicated you cannot model it." One can predict what might happen but not with much certainty.

The advisory board that determines how the structure is operated is considering changing procedures.

Originally run to hit a target salinity level, officials now think that is unfeasible and have rewritten plans to operate it based on flow and needs of the ecosystem, said Program Manager Chuck Villarrubia of DNR.

One person who agrees with Villarrubia is Oniel Malbrough, president of Coastal Engineering and Environmental Consultants Inc. His firm advises Jefferson Parish and other parishes on coastal issues. Right now, Jefferson is trying to determine the impact of a proposed diversion at Myrtle Grove, on the west side of the river down into Barataria Bay.

The experience at Caernarvon tells Malbrough that officials will "have to build it and then manage it."

As more diversion projects are considered, DNR officials will find out if the public agrees with that build-it-then-manage-it philosophy.

Mike Dunne covers the environment for The Advocate.

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

REPLY TO
ATTENTION OF

SEP 26 1985

Engineering Division
Projects Engineering Section

Mr. Dave Chambers
Louisiana Department of Natural
Resources
Louisiana Geological Survey
2133 Silverside Drive
Baton Rouge, LA 70808

Dear Mr. Chambers:

This letter is to bring you up to date on the status of the monitoring program for the Caernarvon Freshwater Diversion Project, and to transmit copies of draft reports for the biological and hydrological, water, and sediment quality monitoring programs.

At the workshop held from October 9-11, 1984, on Grand Terre Island, it was determined that the most efficient way to work out detailed designs for the monitoring programs would be to use smaller subgroups composed primarily of individuals from the larger working group. We have incorporated input from both the large workshop and the numerous smaller meetings in developing the overall monitoring program.

It is requested that you review the enclosed reports and provide your comments by October 25, 1985. If deemed necessary, additional meetings will be held to further discuss the monitoring program.

It has been a pleasure working with you and we look forward to continued cooperation on development of the final monitoring program.

If you have any further questions, please do not hesitate to call.

Sincerely,

Frederic M. Chatry
Chief, Engineering Division

Enclosures

MISSISSIPPI RIVER AND TRIBUTARIES
MISSISSIPPI DELTA REGION, LOUISIANA
SALINITY CONTROL STRUCTURES

CAERNARVON FRESHWATER DIVERSION STRUCTURE

DRAFT HYDROLOGIC, WATER, AND SEDIMENT QUALITY DATA ACQUISITION PROGRAM REPORT

TABLE OF CONTENTS

TABLES

FIGURES

I. Introduction.

The Corps of Engineers New Orleans District report entitled "Louisiana Coastal Areas, Louisiana - Freshwater Diversion to Barataria and Breton Sound Basins" was released September 1984. This four-volume feasibility study report explored possibilities and potentialities associated with diverting freshwater from the Mississippi River to the Barataria and Breton Sound estuaries. Appendixes H (Section 12) and K of the report stressed the need for continuing acquisition of environmental data as an integral element of freshwater diversion projects intended to enhance fish and wildlife resources. Freshwater will be diverted from the Mississippi River to the Breton Sound estuary via a control structure constructed near Caernarvon, Louisiana. This freshwater diversion structure is one of several authorized under the Mississippi River and Tributaries - Mississippi Delta Region, Louisiana Project.

Some aspects of network design, i.e., station locations, sampling variables, and sampling frequency were proposed at a program development workshop held at Grand Terre Island, Louisiana October 9-11, 1984. Details of the program development discussions are outlined in the workshop memorandum-for-record (Attachment 2 of the Biological Monitoring Program Draft Report).

Data needs, as identified in the feasibility report and at the program development workshop, are amplified here. This document outlines the rationale, scope, objectives, and cost estimate for the hydrologic, water, and sediment quality data acquisition component of the freshwater diversion project. While sample collection, laboratory analyses, data handling and analysis, and information utilization are important components of the overall data acquisition program, these topics are not addressed in detail in this document.

II. Data Acquisition Needs and Rationale.

In general, data acquisition requirements rest in three principal areas: (1) describing baseline conditions; (2) developing effective freshwater diversion structure operating procedures and controlling diversion structure operation; and (3) documenting the nature and rates of induced change to environmental systems. The rationale for and scope of data acquisition efforts with respect to these three areas of need are discussed briefly in the following paragraphs.

A. Establishment of Baseline Conditions

Why document baseline conditions? Quite simply, the effects of the project on the estuary's marsh acreage and the estuary's ability to support wildlife, finfish and shellfish are expected to be significant. It is anticipated that diversion of nutrient and sediment rich freshwater will rejuvenate existing marsh, significantly reduce dependence on local rainfall and runoff as the principal source of freshwater input to the estuary, and attenuate peak salinity values and induce more regularity in the seasonal pattern of measured salinities. Achieving and maintaining consistently high levels of fish and wildlife production is the ultimate benefit envisaged by accomplishing these goals. Documenting the pre-freshwater diversion characteristics of the estuary is essential for accurate measurement of the extent to which the stated goals are realized during the project life. Ideally, this documentation of baseline conditions and characteristics should be in quantitative terms and in as much detail as practical.

Presently a significant data gap exists for documenting pre-freshwater diversion general water quality characteristics on seasonal and spatial bases. Several state agencies currently measure bacteria density and salinity in the Breton Sound estuary. Water quality assessments in terms of these two characteristic parameters are made regularly for many locations, principally in support of regulatory functions. However, continuing accumulation of relatively long-term records of an extensive suite of water quality parameters is only occurring for two locations in the estuary. These two locations - Lake Petit West Shore and Bay Gardene at Bayou Lost - are part of the Basic

Water Monitoring Network sampled by the Louisiana Department of Environmental Quality (LDEQ). Water samples are, in general, collected monthly at the two locations; data for about 28 characteristic parameters are provided to describe water quality. Public access to and statistical analyses of these data are facilitated by storage onto the US Environmental Protection Agency's STORET data base as well as LDEQ's own computer system. Significantly broader sampling coverage of the estuarine area is imperative if an accurate description of baseline characteristics is to be formulated. Chemical analyses for a suite of water quality parameters comparable to that of the two currently active sampling locations is proposed for six additional locations in the estuary. Time series data for the proposed six additional sampling locations will help to better define the spatial distribution of baseline water qualities. The proposed eight location baseline water quality data acquisition network is shown on Figure 1.

No data are available on sediment quality in the estuary. Baseline data are required to characterize the quality of submerged surficial sediments in areas where deposition of sediment suspended in diverted freshwater might occur. It is anticipated that most of the suspended sediment in the diverted freshwater will be removed from the water column in Big Mar. Finely divided silt and clay particles which escape deposition in Big Mar might be deposited in the proposed west and south flow way areas and in Lake Lery. The quality of bottom sediments in these areas will be characterized by analyses of random samples collected immediately prior to initiating diversions of freshwater.

B. Development of Diversion Structure Operating Procedures

Operation of the diversion structure will be based on estimates of freshwater discharge rates required to impose seasonally dependent upper limits on salinities realized at specific estuary locations. Elements of operating procedures will include the following: (1) desired seasonal target salinities for specific locations; (2) the capability to measure salinities at the target locations; (3) an algorithm to update a current freshwater discharge rate; and (4) a practical

FIGURE 1. Tentative locations of in situ monitoring stations.

frequency, based on system response time and limitations of data gathering methods, for observed versus target salinity comparisons and discharge rate adjustments.

The estimate of optimal salinity regime for oyster production developed by Louisiana Department of Wildlife and Fisheries personnel (Chatry, et. al) can represent seasonal target salinities. This estimate is the average of eight averages of calendar-month salinity measured at three locations over the estuary's public reefs during four years that preceded good seed oyster production. The standard errors (standard deviations of the sample averages) of the mean salinities can be used to define a range of desirable mean salinity for each calendar month. A seasonally dependent band of target salinity can be represented by linear interpolation between the discrete estimates of monthly mean $\pm$ standard error values. Conceivably, other salinity regimes (targets), deemed optimal for other purposes and measured at other locations, could be adopted.

Measurements of salinities realized at the target locations will be the primary input data for control of the operation of the freshwater diversion structure. These data can be conveniently and cost-effectively obtained using in-field salinity recorders.

Salinity variation with time at a particular location is a continuous hydrologic process. Continuous recordings of variables which measure continuous hydrologic processes contain maximum information about the structures of the processes. Transformation from continuous recording to discrete data sequence (digitizing) results in a loss of information. The larger the interval between each observation in the discrete series the greater the information loss relative to a continuous recording. Intuitively, a monthly average salinity value derived from four observations taken at one week intervals will be less accurate than an average of 30 daily values. Similarly, average salinity computed from many individual observations well distributed over an area should be more representative than the average of a few measurements taken at one location. Presently available salinity data, for all but a very few estuary locations, consist of single observations

taken at intervals of a week to a month. Salinity data have been accumulated intermittently for many locations in the estuary; however, relatively long high temporal density data records are extremely rare. In general, presently available data appear to be less than optimal for meeting the particular information demands of the freshwater diversion project. This should not be surprising since these data were generated by different agencies for divergent purposes.

An algorithm for calculating required freshwater discharges must be developed to guide initial structure operations. However, the relatively poor spatial distribution and temporal density of available data make them inadequate for formulation of a reliable algorithm for freshwater discharge rate adjustments. Several iterations of the algorithm development process will be required. One formulation of the algorithm has been completed making best possible use of available data. The process will be repeated using data from hydrologic time series accumulated in a three-year period prior to initiating freshwater diversion. Time series of concurrent observations of salinity at several estuarine locations, wind velocity, rainfall, gulf tide ranges and levels, and estimates of evapotranspiration and freshwater inflows willl be required. The procedure for calculating freshwater discharge rate adjustments, developed with data accumulated during the pre-diversion period, will be used to guide initial operation of the diversion structure.

The mathematical procedure, as currently envisaged, will consist of two basic components: (1) target salinities, as previously described; and (2) a multivariate function that relates expected salinty in a future time period to observed past salinity, current environmental conditions, and current freshwater discharge rate. The future pattern, location, and quantities of freshwater introduced into the estuary will be different from current conditions. Therefore, it is required that a function be developed that has incorporated within its good approximations of factors that will be operative during post-diversion conditions. An approach to developing a multivariate function with the required attributes has been proposed by Dr. William McAnally of

the Waterways Experiment Station. The recommended procedure involves use of the Corps' two-dimensional numerical modeling system, TABS-2. A schematic TABS-2 numerical model of the estuary will be developed and applied with zero salinity assumed at all inflow boundaries and 34 ppt salinity at the gulf boundary. Observed estuary salinity patterns, represented by the multi-location hydrologic time series previously discussed will be reproduced by calibrating the model's time-varying dispersion coefficients. Reproduction of observed salinity time series by trial and error will, in effect, produce sample concurrent time series of dispersion coefficient estimates. These sample series of dispersion coefficients will be a function of hydrologic, hydraulic, and climatic conditions during the period of observation. Analytical expressions will be developed which relate the generated series of dispersion coefficient estimates to the observed series of tide range, gulf level and wind velocity data. These analytical functions will be used to estimate dispersion coefficients applicable to various combinations of tide, gulf, and wind conditions specified in subsequent TABS-2 model runs. The TABS-2 model will be run through various scenarios of boundary conditions, including a range of tides, gulf levels, hydrologic conditions, and freshwater discharge rates. Finally regression or cross- spectral correlation analyses of the results of the multiple TABS-2 runs will be used to define the required relationship between expected salinity, and observed salinity, environmental conditions, and freshwater discharges. This multi-variate function when combined with the seasonally dependent target salinities will constitute the algorithm for discharge rate adjustments. The algorithm will subsequently be refined using data obtained from the initial four years of diversion structure operating experience. Required hydrologic data will be obtained using in-field instrumentation capable of recording instantaneous observations for several parameters at intervals of two to six hours. Sampling locations for hydrologic data are indicated on Figurie 1.

C. Documentation of Induced Environmental Change

Water and sediment quality data indicative of the nature and rates of changes induced in the estuary's aquatic environments will be required. Expected modifications of the general water chemistry of the estuary were delineated in the freshwater diversion feasibility report and environmental impact statement. While the probability of negative environmental impact resulting from diversions of Mississippi River water is low, the potential for negative impact does exist. A comprehensie program of water and sediment analyses must continue as an integral project element if undesirable effects are to be exposed and remedied as expeditously as possible.

III. Cost Estimate

A. Hydrologic Data Collection

1. Materials and Equipment

a. Five locations equipped at $10,000 per site	$50,000
b. Three locations equipped at $12,000 per site	36,000
c. Eight equipment shelters at $1,000 per site	8,000
	$94,000

Cost estimate includes instrumentation for automatic logging of salinity, stage, and water temperature data on cassette tape for each location and precipitation and wind velocity at three locations. The useful life (in terms of reliability and economy of maintenance) of the hydrologic data collection instrumentation is assumed to be seven years; consequently, $94,000 is assumed to be a recurring cost at seven-year intervals throughout the life of the project.

2. Field Installation

a. Instrumentation packages with shelters setup in the field $2,100 per site	$16,800

Field installation costs are also assumed to be recurring at seven-year intervals throughout the life of the project.

3. Instrumentation Maintenance
   a. Labor: Labor requirement is estimated as two persons for two days every two weeks or 104 man-days per year. Labor includes cleaning probes and retrieving data tapes at two-week intervals, replacing probes and circuit boards as necessary, and collecting water samples for laboratory analysis at monthly intervals.
      Labor: $19,000/y
   b. Replacement Components: The replacement components allowance is taken as 3% of labor cost (compounded) for the six years after initial installation of the instrumentation packages. That is, $600 for the first year after installation, $1150 for year 2, $1750 for year 3, $2400 for year 4, $3050 for year 5, and $3700 for the last year before the instrumentation is replaced.

B. Sediment and Water Quality Data Collection
   1. Sediment Sampling and Analysis
      a. Pre-diversion: One-time sediment sampling in Big Mar, the proposed West Flowway area, the proposed South Flowway area, and the Lake Lery area. Twenty samples are to be collected in each of the four areas (80 samples total).
         Analysis cost is estimated at $550 per sample
         80 (550) = $44,000
         Sediment sample collection is estimated
         to require two days at $1000 per day = 2,000
         Total sediment sampling and analysis = $46,000
      b. Post Construction and Long-Term Sediment Sampling and Analysis: Sediment sampling and analysis as described above once per three years of freshwater diversion. Assuming that freshwater would be diverted each year, $46,000 would be expended at three year intervals.
         Total sediment sampling and analysis: (Avg) $15,334/y

2. Water Analysis

Ambient water samples are to be collected at eight locations monthly for analysis. Analysis cost is estimated at $575 per sample.

Water analysis cost: 8(12)(575) = $55,200/y

3. Data Base Maintenance

The cost of screening and preprocessing field data stored on cassette tape and storage of those data onto the STORET data base is estimated as $10,000/yr.

C. Structure Operation Model Development

1. Pre-diversion

a. In-house (labor and equipment)	$52,000
b. Consultation Fee (WES)	25,000
c. Computer time	1,000

2. Post-construction

a. In-house labor	45,000
b. Consultant Fee (WES)	5,000
c. Computer time	1,000

D. Cost Summary

The cost estimate is conservative in that the same level of sampling effort is assumed for the 53 years of monitoring. It is likely that a reduction in sampling effort will be affected when more knowledge of the estuary's behavior is acquired. Since the entire cost of the long-term phase of the program will be borne by the non-Federal sponsor, they will play the major role in scoping the magnitude of this effort.

TABLE 1

LIST OF PROPOSED SEDIMENT PARAMETERS

Sediment Parameter	Estimated Cost
Ammonia	$30.25
Arsenic	35.00
Cadmium	16.50
Chemical Oxygen Demand	33.00
Chloride	20.00
Chlorinated Hydrocarbons or TOX scan	115.00
Copper	20.00
Cyanide	40.00
Lead	20.00
Mercury	35.00
Nickel	20.00
Nitrate	16.50
Nitrite	12.00
Total Kjeldahl Nitrogen	30.25
Phenols	36.50
Total Phosphorus	12.50
Zinc	20.0
Sample Digestion	50.00
TOTAL	$562.50
	Use $550/sample

TABLE 2

LIST OF PROPOSED SURFACE WATER PARAMETERS

Water Parameter	Estimated Cost
Ammonia	$30.25
Arsenic	35.00
Cadmium	16.50
Chemical Oxygen Demand	33.00
Chlorinated Hydrocarbons or TOX scan	115.00
Copper	20.00
Cyanide	40.00
Fecal Coliform Bacteria	45.00
Lead	20.00
Mercury	35.00
Nickel	20.00
Nitrate	16.50
Nitrite	12.00
Total Kjeldahl Nitrogen	30.25
Phenols	36.50
Suspended Solids	13.00
Turbidity	6.00
Zinc	20.00
TOTAL	$544.00
	Use $575/sample

TABLE 3
SUMMARY OF ESTIMATED ANNUAL COST

Phase	Year	HYDROLOGIC DATA ACQUISITION: Material & Equipment	HYDROLOGIC DATA ACQUISITION: Field Installation	HYDROLOGIC DATA ACQUISITION: Sampling & Equipment Maintenance	WATER AND SEDIMENT QUALITY DATA ACQUISITION: Sediment Sampling & Analyses	WATER AND SEDIMENT QUALITY DATA ACQUISITION: Water Analyses	WATER AND SEDIMENT QUALITY DATA ACQUISITION: Data Base Maintenance	OPERATION MODEL DEVELOPMENT: Computer & In-House Labor/Equip	OPERATION MODEL DEVELOPMENT: Consultant Fees (WES)	Annual Total	Phase Total	Cumulati Cost
Pre-	1	94,000	16,800	19,000		55,200	10,000	22,400	4,300	223,700		
	2			19,600		55,200	10,000	15,400	4,300	108,500		
Operation	3			20,150	46,000	55,200	10,000	15,200	8,400	154,950	489,150	489,150
	4			20,750		55,200	10,000	11,500	1,250	98,700		
Post	5			21,400		55,200	10,000	11,500	1,250	99,350		
Construct.	6			22,050	46,000	55,200	10,000	11,300	1,250	146,000		
	7			22,700		55,200	10,000	11,300	1,250	100,450	444,700	933,850
	8	94,000	16,800	19,000		55,200	10,000			195,000		
	9			19,600	46,000	55,200	10,000			130,800		
	10			20,150		55,200	10,000			85,350		
	11			20,750		55,200	10,000			85,950		
	12			21,400	46,000	55,200	10,000			132,600		
	13			22,050		55,200	10,000			87,250		
	14			22,700		55,200	10,000			87,900		
	15	94,000	16,800	19,000	46,000	55,200	10,000			241,000		
	16			19,600		55,200	10,000			84,800		
	17			20,150		55,200	10,000			85,350		
	18			20,750	46,000	55,200	10,000			131,950		
Long-	19			21,400		55,200	10,000			86,600		
Term	20			22,050		55,200	10,000			87,250		
	21			22,700	46,000	55,200	10,000			133,900		
	22	94,000	16,800	19,000		55,200	10,000			195,000		
	23			19,600		55,200	10,000			84,800		
	24			20,150	46,000	55,200	10,000			131,350		
	25			20,750		55,200	10,000			85,950		
	26			21,400		55,200	10,000			86,600		
	27			22,050	46,000	55,200	10,000			133,250		
	28			22,700		55,200	10,000			87,900		
	29	94,000	16,800	19,000		55,200	10,000			195,000		
	30			19,600	46,000	55,200	10,000			130,800		

TABLE 3 (CONTINUED)

		HYDROLOGIC DATA ACQUISITION			WATER AND SEDIMENT QUALITY DATA ACQUISITION			OPERATION MODEL DEVELOPMENT					
Phase	Year	Material & Equipment	Field Installation	Sampling & Equipment Maintenance	Sediment Sampling & Analyses	Water Analyses	Data Base Maintenance	Computer & In-House Labor/Equip	Consultant Fees (45%)	Annual Total	Phase Total	Cumulat Cost
	31			20,150		55,200	10,000			85,350		
	32			20,750		55,200	10,000			85,950		
	33			21,400	48,000	55,200	10,000			132,600		
	34			22,050		55,200	10,000			87,250		
	35			22,700		55,200	10,000			87,900		
Term	36	94,000	16,800	19,000	46,000	55,200	10,000			241,000		
	37			19,600		55,200	10,000			84,800		
	38			20,150		55,200	10,000			85,350		
	39			20,750	46,000	55,200	10,000			131,950		
	40			21,400		55,200	10,000			86,600		
	41			22,050		55,200	10,000			87,250		
	42			22,700	48,000	55,200	10,000			133,900		
	43	94,000	16,800	19,000		55,200	10,000			195,000		
	44			19,600		55,200	10,000			84,800		
	45			20,150	46,000	55,200	10,000			131,350		
	46			20,750		55,200	10,000			85,950		
	47			21,400		55,200	10,000			86,600		
	48			22,050	48,000	55,200	10,000			133,250		
	49			22,700		55,200	10,000			87,900		
	50	94,000	16,800	19,000		55,200	10,000			195,000		
	51			19,600	46,000	55,200	10,000			130,800		
	52			20,150		55,200	10,000			85,350		
	53			20,750		55,200	10,000			85,950	5,418,200	6,352,
Totals				1,985,450		4,237,600		129,000				6,352,
										@i = .08625		PW=1,472, A= 126,

MISSISSIPPI RIVER AND TRIBUTARIES
MISSISSIPPI DELTA REGION, LOUISIANA
SALINITY CONTROL STRUCTURES

CAERNARVON FRESHWATER DIVERSION STRUCTURE

DRAFT BIOLOGICAL MONITORING PROGRAM REPORT

TABLE OF CONTENTS

LIST OF FIGURES

MISSISSIPPI DELTA REGION PROJECT
CAERNARVON FRESHWATER DIVERSION

BIOLOGICAL MONITORING PROGRAM

Draft Report

INTRODUCTION

The proposed project would divert fresh water from the Mississippi River into the Breton Sound Estuary. Water would be diverted via a controlled structure installed in the mainline Mississippi River levee near Caernarvon, Louisiana, at river mile 81.5 (Figure 1). The primary purpose of the project is to establish favorable salinity conditions in the area. Salinities would be managed to reduce saltwater intrusion, enhance growth of vegetation, reduce land loss, and increase production of commercial and recreational fish and wildlife.

Throughout the period of study leading to the recommendation of this project, there was extensive interagency and public involvement. During this period, numerous individuals and agencies recommended that the project be carefully monitored. At first, the driving force behind a monitoring program was concern over the relatively poor water quality of the Mississippi River and the potential for adverse impacts on organisms in the estuary.

However, it soon became apparent that it would be wise to develop a comprehensive monitoring program to include biological, water quality, and hydrological data collection. The overall monitoring program would provide information which could be used to guide structure operation including timing, magnitude, and duration of flow. The biological, water quality, and hydrological monitoring programs are being developed concurrently. Close coordination is being maintained during the development of these programs to avoid unnecessary duplication.

FIGURE 1. Location of proposed freshwater diversion site near Caernarvon, Louisiana.

This report deals specifically with the biological monitoring program, although certain water quality parameters which are routinely sampled in conjunction with biological sampling in aquatic environments are also discussed. The water quality and hydrological monitoring programs are covered in a separate report.

The biological monitoring program would be carried out in three distinct phases: an intensive, 3-year preconstruction program; an intensive, 4-year postconstruction program; and a long-term program which would continue for 46 years, the remainder of the 50-year project life. The objectives of each phase of the program are described below.

Preconstruction Monitoring Program - 3 years

The overall objective of the intensive, 3-year preconstruction biological monitoring program is to establish baseline conditions for the important biological resources in the study area. Data collected in this program will be compared with data from the postconstruction biological monitoring program in order to assess project effects. Specific objectives include:

- Describe prediversion conditions of emergent and submergent vegetation.
- Estimate prediversion populations and areas of concentration for wildlife including furbearers, alligators, and waterfowl.
- Determine preferred habitat and areas of concentration of important finfish and shellfish species prior to diversion.
- Determine as accurately as possible commercial landings of important finfish and shellfish species prior to diversion.
- Determine prediversion contaminant levels for selected parameters in resident finfish and shellfish species.

Postconstruction Monitoring Program - 4 years

The overall objective of the intensive, 4-year postconstruction biological monitoring program is to assess the immediate and "short-term" effects of the diversion on the important biological resources in the study area. This will be accomplished by collecting similar information on the same parameters sampled in the preconstruction program and comparing the two sets of data. Specific objectives include:

- o Describe postdiversion conditions of emergent and submergent vegetation.
- o Estimate postdiversion populations and areas of concentration for wildlife including furbearers, alligators, and waterfowl.
- o Determine preferred habitat and areas of concentration of important finfish and shellfish species following diversion.
- o Determine as accurately as possible commercial landings of important finfish and shellfish species following diversion.
- o Determine postdiversion contaminant levels for selected parameters in resident finfish and shellfish species to determine whether or not unacceptable levels of contaminants are resulting from the diversion.

Long-Term Monitoring Program - 46 years

The long-term monitoring program would continue for 46 years. The overall objective of this program is to assess the long-term effects of the diversion on the biological resources in the study area. The specific objectives and the types of sampling for the long-term program would be similar to the intensive pre- and postconstruction programs discussed above; however, the sampling effort would be scaled down. The intensity of the long-term monitoring program would be determined primarily based on experience gained during the pre- and postconstruction programs.

METHODOLOGY USED TO DEVELOP THE MONITORING PROGRAM

Monitoring effects of the diversion on biological resources is a topic that was discussed on numerous occasions throughout the development of the project. The concept of using an interagency, multidisciplinary approach to develop the monitoring program evolved in the early stages. It is a logical approach for several reasons.

Since the diversion would have a direct effect on the biological resources which several natural resource agencies are mandated to manage, it stands to reason that individuals from these agencies should be involved. These people have expertise in monitoring and management of biological resources and are familiar with the Breton Sound Basin. Several of the agencies have existing monitoring programs in the basin, and it makes sense to take advantage, to the maximum extent practicable, of these programs. Using this approach, the monitoring program could be developed by establishing sampling stations at key locations in relation to the diversion site and by modifying parameters sampled and sampling frequencies as necessary.

Additional support for the interagency approach stems from the fact that many of the agencies and individuals have been involved with this project since the early planning stages. They have a thorough understanding of the proposed project, its anticipated effects, and the types of monitoring that would provide meaningful information that would allow us to assess project effects. They have been very cooperative and supportive of the project since its inception and have formally requested that they participate in the development and implementation of the monitoring program.

The first formal, large-scale meeting to discuss development of the program was held on August 7, 1984 at the New Orleans District (NOD). Representatives from appropriate Federal, state, and local agencies were invited to attend as well as members of the academic community. A Memorandum of Meeting is presented in Attachment 1.

At that meeting, NOD personnel presented a brief history of the project and emphasized that because Caernarvon would be the first of our proposed freshwater diversion projects to come to fruition, it is essential that it be monitored and operated to the best advantage so that the full potential of freshwater diversions in preserving and enhancing estuarine areas be demonstrated. Corps personnel then provided a general overview of the proposed monitoring program and presented ideas on how the program could be developed and implemented. It was noted that the program could be developed most efficiently through a series of meetings/workshops.

Following the presentations by NOD personnel, participants were requested to comment on the sampling schemes and discuss what role their organization would play in development and implementation of the program. After statements from the meeting participants, the group established dates for a 3-day technical workshop to further discuss monitoring needs. Participants were requested to prepare detailed informational packets concerning their existing monitoring programs for presentations at the workshop.

The technical workshop to discuss development of the monitoring program was held on October 9-11, 1984. The primary purpose of the meeting was to assemble a group of multidisciplined individuals representing numerous Federal, state, and local agencies and other interested groups to gather information on existing monitoring programs. Based on this information, they could identify data gaps and recommend sampling programs to collect additional required information. A Memorandum of Meeting for the workshop is presented in Attachment 2.

At the August 7, 1984 meeting, NOD personnel had requested that the various agencies or groups having sampling programs in the Breton Sound Basin prepare information concerning their respective monitoring programs for presentation at this workshop. Representatives from the various groups were asked to present an overview of their sampling programs to the entire working group so everyone would have an idea of the overall extent of sampling efforts in the area. Presentations were made by the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Geological Survey (USGS), Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Department of Health and Human Resources (LDHHR), Plaquemines Parish Environmental Services Laboratory (PPESL), and Coastal Environments, Inc.

Following the presentations, participants divided into two subgroups to discuss existing sampling programs in more detail, identify data gaps, and recommend additional sampling efforts as deemed necessary to monitor effects of the diversion.

The biological subgroup discussed sampling of important fishery resources including oysters, shrimp, blue crab, menhaden, groundfish, red drum, and spotted seatrout. The group determined that LDWF has adequate sampling programs to monitor fishery resources and manage fisheries under existing conditions. However, the proposed diversion would cause changes in distribution and abundance of aquatic organisms and, in order to document project effects, sampling efforts would be required in areas which presently receive little attention. Increased monitoring would be required in the upper basin to document changes and potential adverse impacts, and some monitoring would be required gulfward of existing stations to determine effects of salinity changes in the area.

As far as monitoring of vegetation and wildlife is concerned, LDWF currently flies a series of transects in the Breton Sound Basin to assess marsh types and marsh condition. They also conduct periodic aerial surveys of muskrats, alligators, and waterfowl. Several transects would have to be added to fully assess impacts of the diversion.

The workshop was very successful. Participants demonstrated a sincere interest in the monitoring program, and nearly all of the important parameters to be monitored were discussed. Perhaps one of the most significant accomplishments of the workshop was selection of tentative sites in the basin where the Corps would locate several in situ instrumentation packages to gather hydrological, climatological, and physical water quality parameters. Several individuals at the workshop were familiar enough with the hydrology of the basin to choose these tentative sampling locations (Figure 2). Although these in situ monitors will not collect biological data, they warrant discussion here because many of the biological sampling stations were strategically located in relation to these monitors to allow us to correlate changes in populations of aquatic organisms with hydrology/water quality parameters.

It was determined that the most efficient way to arrive at detailed designs for various types of monitoring would be by working in small subgroups comprised primarily of individuals from the large working group who provided input to development of the overall monitoring program. A list of individuals involved in development of the overall monitoring program, including the biological program, is provided in Attachment 3.

Large-scale meetings/workshops provide an excellent forum for exchange of ideas, discussion of philosophies, and providing the framework for more detailed studies. However, technical details can be worked out more efficiently by small groups of individuals with expertise key to particular areas of interest. The various monitoring programs described in this draft report were designed using the small group approach.

This draft report will be distributed for review by all of the people who have been involved with development of the monitoring program. Based on comments received on the draft report, a final biological monitoring program report will be prepared. Additional meetings to further discuss the monitoring program will be held as deemed necessary.

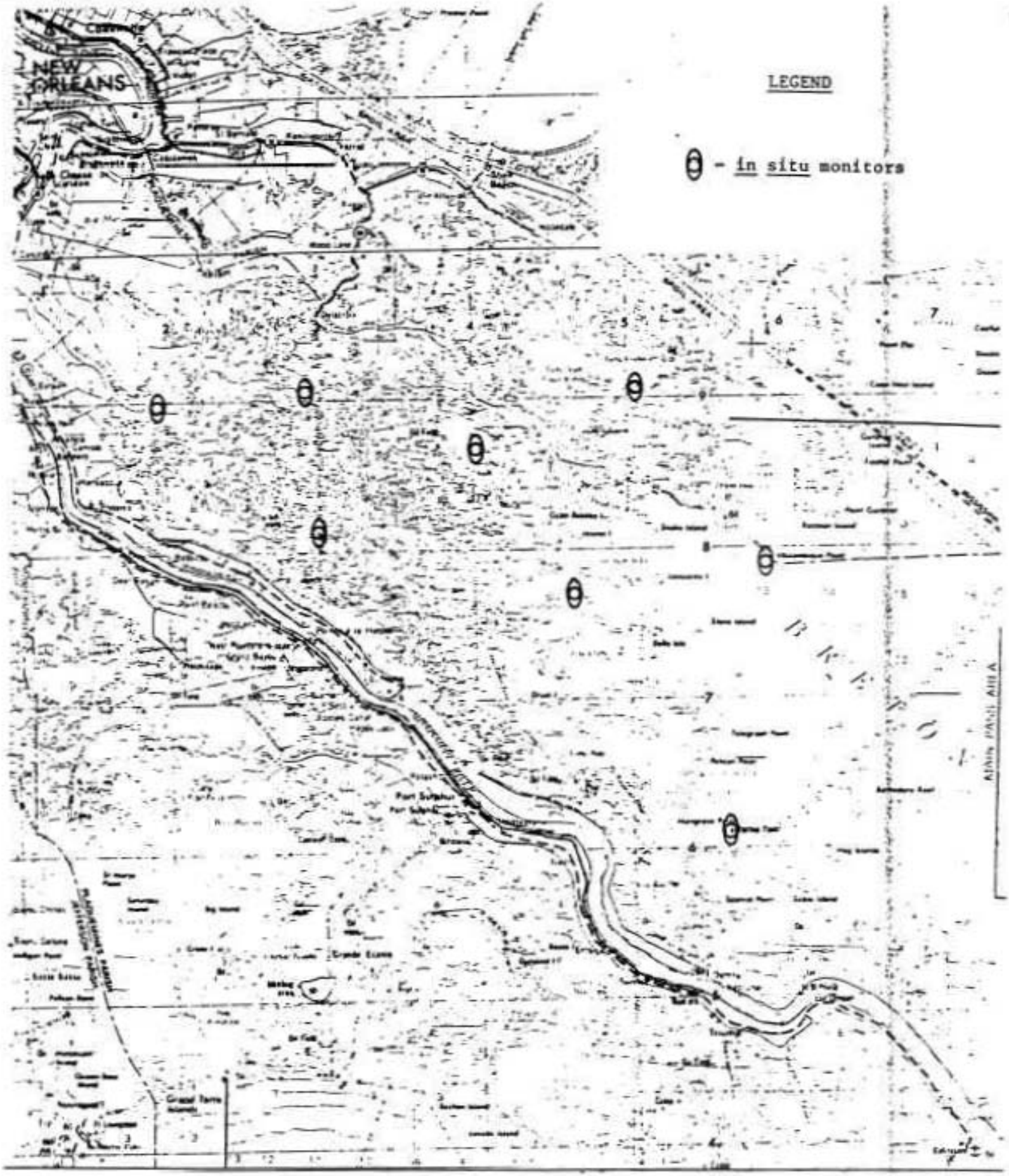


FIGURE 2. Tentative locations of in situ monitoring stations.

The remainder of this draft report discusses the various biological monitoring programs individually. Topics discussed include the reason for monitoring the particular resource, objectives of the monitoring, description of sampling procedures, location of sampling stations, sampling frequencies, time of year the monitoring is conducted, who proposes to conduct the monitoring, preliminary cost esimates, and other pertinent information.

The station and transect locations described in this report are referred to as tentative; however, in most cases, the locations closely approximate where the exact locations will be. Since it is not yet known whether construction funds will be appropriated in 1986, it was not prudent to expend the time and funds necessary to conduct extensive field surveys to precisely position sampling sites. However, before any sampling efforts begin, the coordinates of all new stations will be established. The sampling schemes and station locations described in this report will be identical for both the pre-and postconstruction monitoring program.

It should be emphasized that the monitoring efforts proposed in this report do not necessarily include all of the types of monitoring deemed desirable for a project with such far-reaching potential effects. However, as always, there are certain budgetary constraints which had to be considered. The total annual cost of the proposed program is nearly double the estimate ~~in the Final Feasibility Report~~ originally developed in interim studies (September 1984). Additional funds for monitoring were made available from within the amount currently available for the project. All factors considered, it is felt that the sampling proposed herein represents a reasonable monitoring program.

MONITORING PROGRAM DESIGNS

MARSH VEGETATION

The Breton Sound Estuary has experienced marsh loss and dramatic changes in marsh types due to saltwater intrusion into the area. Historically, fresh/intermediate marshes occupied a large area in the upper portion of the estuary. Due to a variety of factors, salt water has penetrated into these fresher marshes and brackish marshes are now present as far north as Big Mar.

The primary effect of the proposed diversion would be lowered salinities in the marshes. Increased nutrient and sediment input into the marshes would also occur. It has been projected that the rate of marsh loss would be reduced and that some areas of brackish marsh would revert to fresh/intermediate marsh over time.

In order to assess changes in the marsh, it will be necessary to monitor marsh vegetation. Because of the size of the area to be sampled and the limited access, a helicopter is the only practical means of transportation for the marsh monitoring. Sampling would be conducted along predetermined north-south transect lines established from original transects used by Chabreck (1968) and Chabreck and Linscombe (1978) in making Louisiana coastal vegetative type maps. A total of 100 miles of transects would be flown in the study area. The sampling stations would be located at 0.25 or 0.50 mile intervals along these transects, depending on sampling intensity needed. The transects to be used for this monitoring would be selected from among the transects already established by Chabreck and Linscombe. However, it is proposed that two additional transects be established to properly assess the effects of the diversion. The established and proposed transects are shown in Figure 3. A Loran C unit would be utilized in the helicopter to maintain a true line, making it possible to repeat this line from year to year. At each sampling station an ocular estimate would be made with the helicopter landing or hovering.

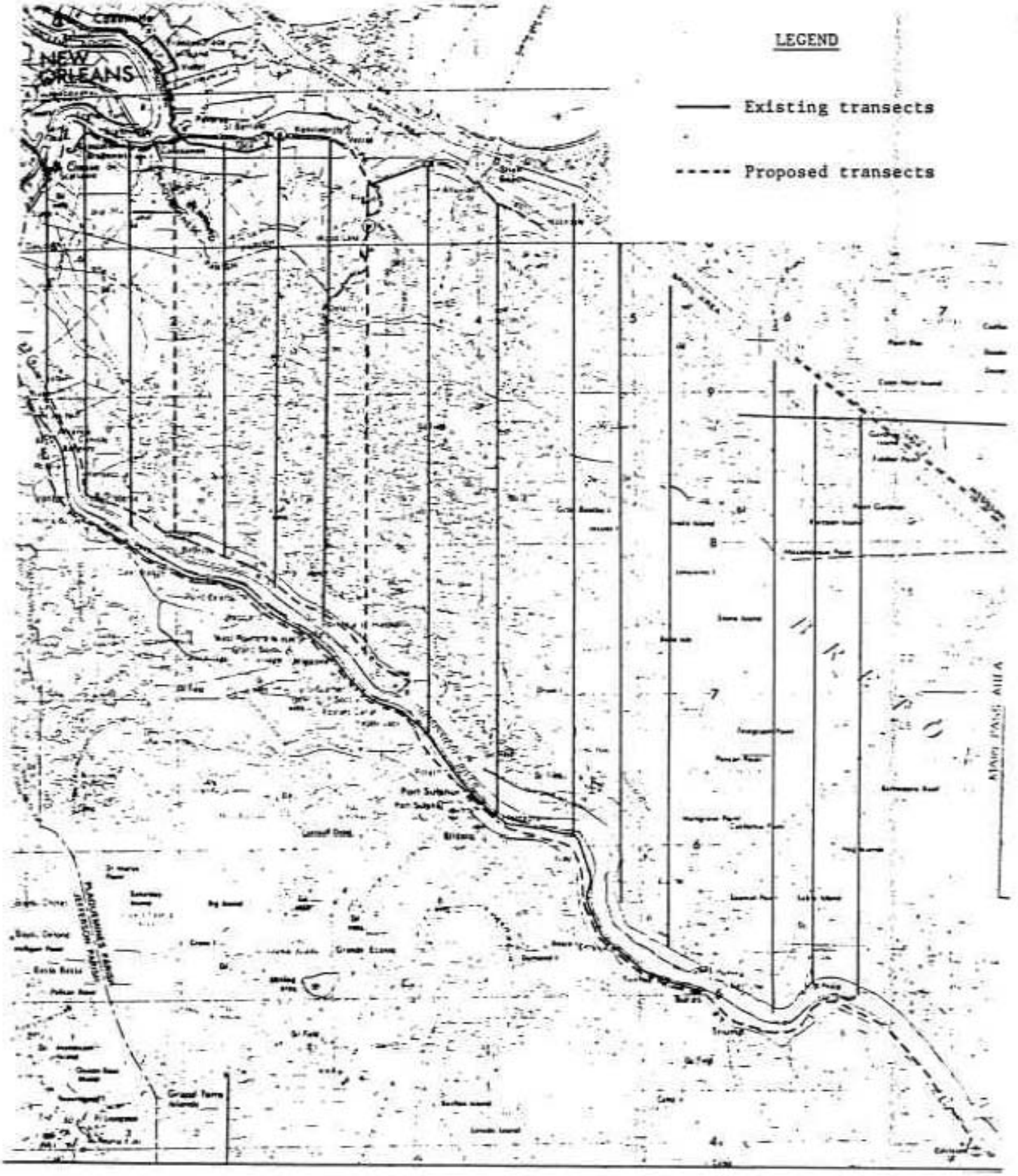


FIGURE 3. Existing and proposed transects for monitoring vegetation, muskrats, and alligators.

All marsh species present and percent composition would be recorded at each station. Observations concerning submerged aquatic vegetation would also be recorded. Sampling would be conducted in late July or early August when most species are mature and easier to identify. The vegetation monitoring would be conducted with a 206B jet ranger helicopter, pilot, one biologist to navigate, and one biologist to identify vegetation and record. The data would be compiled and compared from year to year and between or along transect lines to measure changes related to environmental conditions associated with the freshwater introduction.

It is proposed that vegetation monitoring be conducted by LDWF. It is currently estimated that the monitoring would cost about $12,000 per year. This cost is largely attributable to helicopter flight time. The cost of monitoring muskrat and alligator populations, the next two topics of discussion, are included in the $12,000 per year estimate.

The vegetation monitoring proposed above would provide information primarily concerning qualitative changes in marsh vegetation. It would not provide information which would allow quantification of changes in marsh acreage. However, it is highly probable that aerial photography and habitat mapping of the study area will be conducted by Federal and/or state agencies within the next few years. This would make it possible to express the anticipated habitat changes in quantitative terms.

WILDLIFE

Muskrats

Muskrat population density in coastal brackish marsh is related to a number of environmental parameters including vegetation, salinity, and nutrients. Muskrat populations appear to obtain high densities in brackish marsh dominated by three-cornered grass (Scirpus olneyi), a preferred food of the muskrat. It has been observed in the past that muskrat populations often demonstrate a dramatic increase during high water years when marsh salinities are reduced in some areas. Three-cornered grass is more abundant in low-salinity brackish marshes. The proposed project would expand the area of these marshes.

A count of muskrat houses can be used as an index to muskrat numbers. However, it is necessary to know the past history of the population in order to correctly interpret aerial house counts. Aerial counts would be made using the same north-south transects chosen for the vegetation monitoring (Figure 3). Counts would be made from a helicopter flying at an altitude of approximately 100 feet and a speed of 80 mph. The strip counted would be 300 feet wide. This survey would be conducted in late February after green-up has begun. Muskrat houses at this time are still dry and highly visible because of the contrast with green vegetation. A total of 100 miles of transect line would be flown. This survey would be conducted with a 206B jet ranger helicopter, pilot, one biologist to navigate and record, and one biologist to act as observer (counting houses). Data would be compiled by line and/or marsh type and compared annually to detect trends.

It is proposed that monitoring of muskrat populations be conducted by LDWF. The cost is included in the estimate for vegetation monitoring.

Alligators

Alligators are most abundant in fresh/intermediate marshes. Their numbers are reduced as marsh salinities increase; however, they do occur in brackish marsh situations. The LDWF currently surveys alligator populations across the state out to the 10 ppt isohaline.

The marsh alligator population in the Breton Sound Estuary would be censured by aerial nest inventory. Such an inventory would index population levels and measure population variation by marsh or habitat type and through time. The aerial nest censuses would be conducted in late June or early July after nesting is complete. The alligator nests would be counted along permanently established north-south transects using the same lines used for vegetation monitoring and muskrat population surveys (Figure 3). A flight speed of approximately 80 mph and an altitude of 200 feet are considered optimum. An observer would count nests within a transect line width of 350 feet. Data would be recorded by marsh type and transect line.

This survey would also utilize a 206B jet ranger helicopter, pilot, one biologist to observe, and one to navigate and maintain records. A total of 100 miles of transect line would be flown.

It is proposed that the monitoring of alligator populations be conducted by LDWF. The cost is included in the estimate for vegetation monitoring.

Waterfowl

Historically, the Breton Sound Estuary provided habitat for large concentrations of waterfowl. The conversion of fresh/intermediate marshes to more saline habitat types has resulted in a significant decline in waterfowl populations in the area. It is expected that the proposed diversion would enhance the suitability of waterfowl habitat in the area. It is important that waterfowl populations be monitored to assess these changes.

The LDWF began using periodic aerial surveys to estimate migration chronology, size, and distribution of coastal waterfowl populations in 1951. In 1968, the Department altered the original survey and began using the present inventory procedure in the coastal region. The present methods were adapted from a sampling technique designed by Chabreck, Palmisano and Joanen (1968) to type map the Louisiana coastal marshes. The survey consists of 27 north-south transect lines which cover the entire Louisiana coastal zone. The sampling rate is greater in the western half of the state since duck populations there are normally twice as large as those observed in the east.

Figure 4 shows the transects which would be used to monitor waterfowl populations in the study area. Two transects are already flown under their current monitoring program. It is proposed that an additional transect be added in the upper part of the estuary to better assess effects of reduced salinities an waterfowl use in the area.

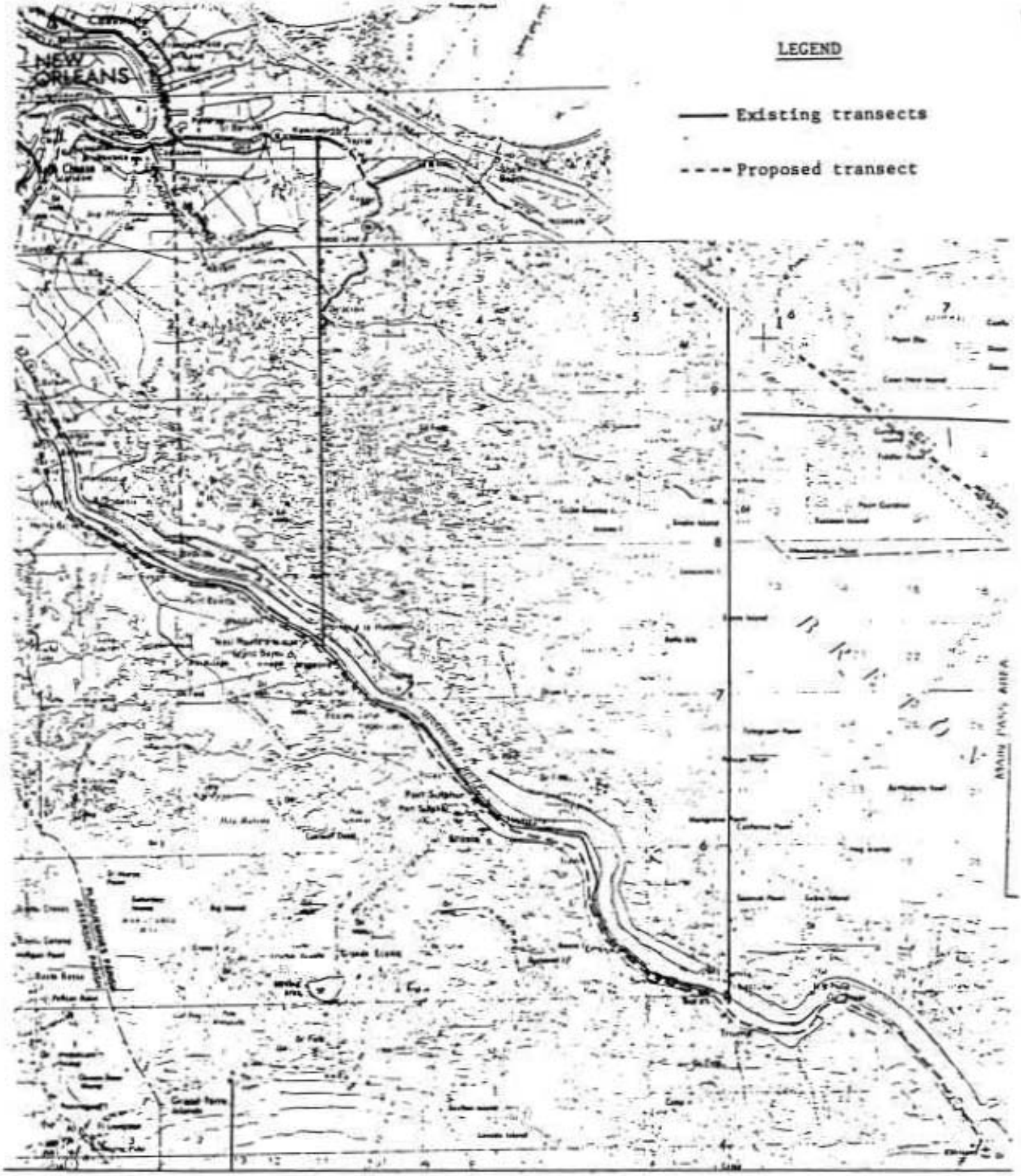


FIGURE 4. Existing and proposed transects for waterfowl monitoring.

Aerial surveys would be conducted using a twin-engined Partenavia 68C aircraft, a high wing monoplane with an unobstructed downward view owned and operated by the LDWF. The aircraft is equipped with a LORAN-C navigation system to ensure accurate repeatability of aerial transects throughout the duration of the study. Aerial transects would be flown at approximately 90 mph and 150 feet altitude.

Numbers of each species observed from both sides of the aircraft would be estimated and recorded as the aircraft moves across the vegetation types along each transect line. A detailed vegetation type map overlaid with the transect lines would allow observers to record bird numbers in each of the major habitat types. Species to be included in the survey are listed below.

Mallard	Pintail
Mottled duck	Coots
Gadwall	Scaup
Wigeon	Ring-necked duck
Green-winged teal	Canvasback
Blue-winged teal	Hooded merganser
Shoveler	Geese

LDWF has indicated that the additional monitoring required to assess the impacts of the diversion on waterfowl could be accomplished at no significant additional cost.

FISHERIES

The proposed diversion would, of course, alter the distribution of aquatic resources in the Breton Sound Estuary. It is essential that these resources be monitored.

Oyster, brown and white shrimp, crab, and finfish populations would be surveyed during the pre-and postconstruction monitoring phases. The Seafood Division of LDWF has in place extensive management-oriented monitoring programs for these resources. The objectives of the proposed diversion monitoring program can be met with relatively minor additions to the existing monitoring effort. Discussions of existing monitoring efforts for each resource, along with suggested additions, are presented below.

Oysters

At present, weekly deployments are made from March through November of spat collecting plates (Butler Plates) at five stations on the Public Oyster Seed Grounds and one station on the Bay Gardene Seed Oyster Reservation (Figure 5). Spat set intensities are expressed in spat/cm^2/week. Bottom salinity and temperature are measured weekly at all six stations year round. The information gathered is used in the selection of cultch plant sites and in the prediction of the ensuing year's seed production.

Yearly seed and sack oyster density estimates on the seed grounds and reservation are made by means of meter square (M^2) sampling with SCUBA. Three replicate M^2 samples are taken at each of 23 stations in June of each year (Figure 6). Total seed and sack oyster availability on the seed grounds is determined by extrapolating from the sample results.

Harvest estimates are made from daily boarding surveys (weather permitting) of boats fishing on the Public Oyster Seed Grounds or Reservation. Observations recorded include location, method of harvest (one dredge, two dredges, tong, etc.), the number of sacks or barrels of oysters taken, and size of the vessel.

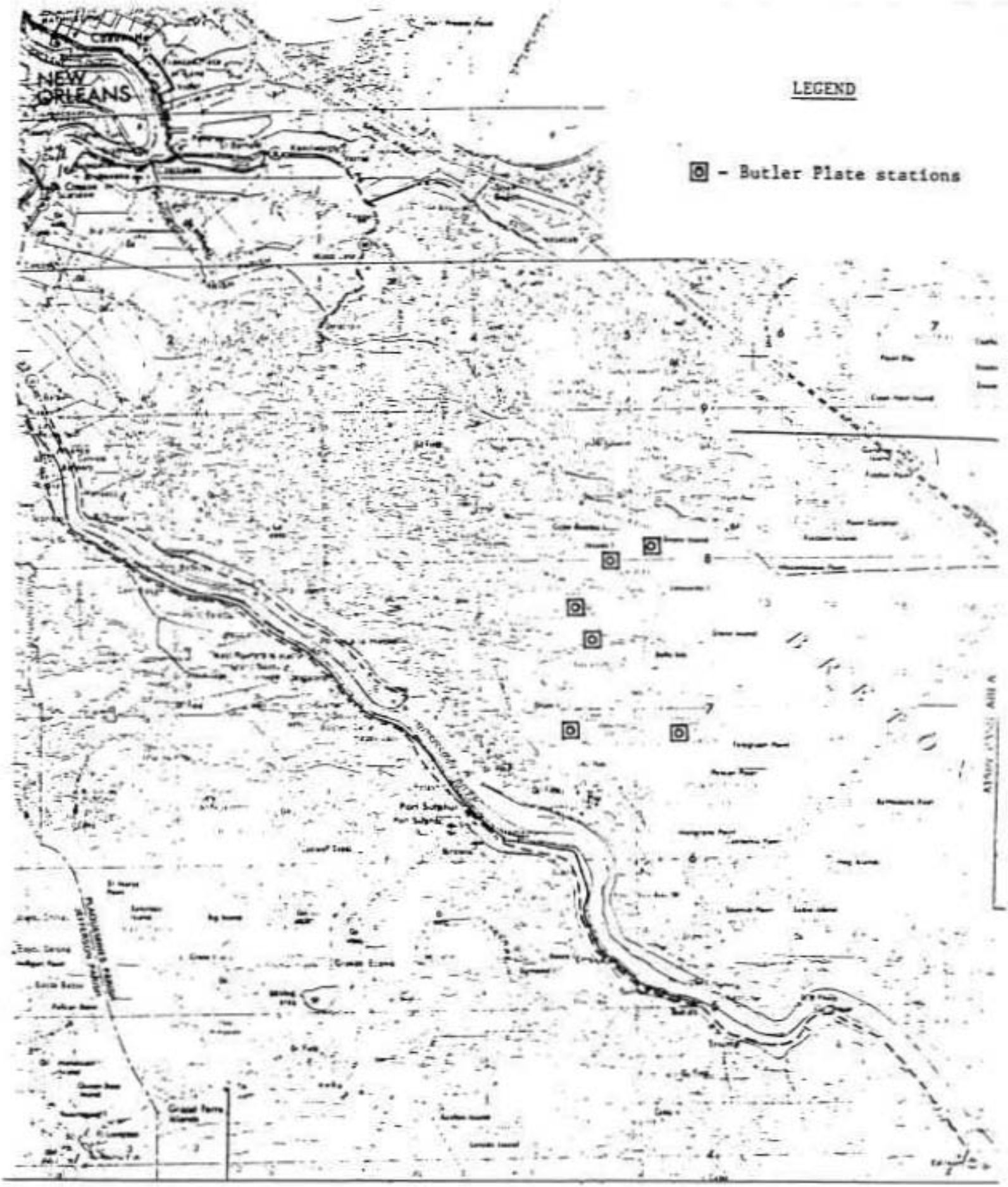


FIGURE 5. Existing Butler Plate stations for monitoring spat set intensities.

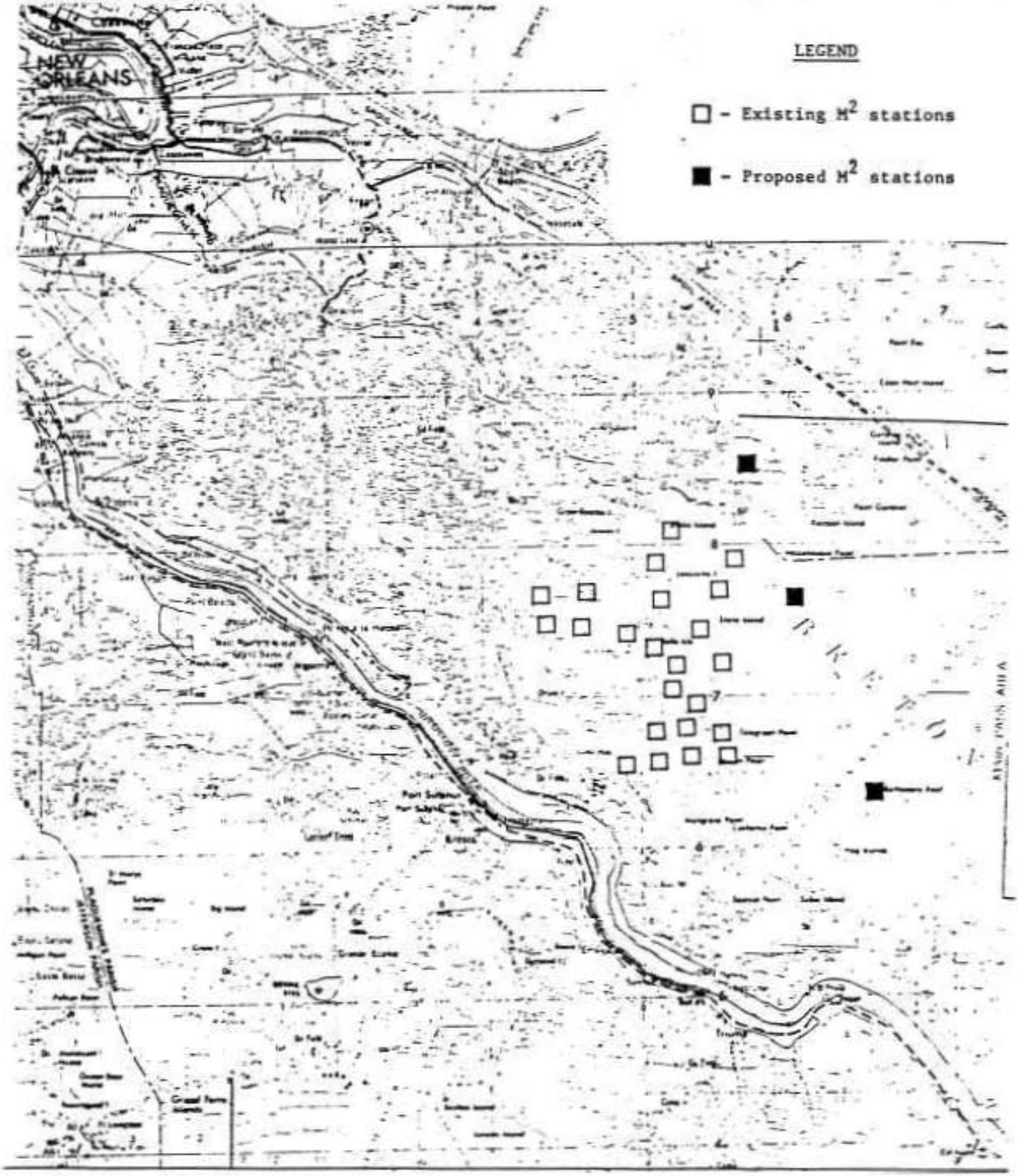


FIGURE 6. Existing and proposed M^2 stations for determining seed and sack oyster density estimates.

For purposes of the proposed monitoring program, the above procedures for measuring spat set intensities, seed and sack oyster density, and harvest would be continued in full with the addition of three M^2 sampling sites on the seaward portions of the seed grounds (Figure 6).

Currently, there is no consistent sampling of oyster populations on the privately leased water bottoms in the Breton Sound Basin. For this reason, and since the leased waterbottoms would be affected by the proposed diversion, it was necessary to design a monitoring scheme that would yield information as to the productivity of leased waterbottoms. The information generated should enable identification of the geographical limits of the productive oyster zone pre- and postdiversion. The design for this program is discussed below.

Fourteen stations were chosen within the Breton Sound Basin to represent the complete range of currently productive and potentially productive oyster growing areas (Figure 7). Sampling devices would consist of Nestier grow-out trays. These trays are constructed of heavy-duty plastic and are 70 cm by 70 cm in dimension. Each tray would contain 25 oysters 50 to 75 mm in height. The 25 oysters would be arranged in five rows of five oysters each and attached to the trays so that growth and survival records can be maintained for each individual oyster. Two such trays would be placed on the bottom at each of the 14 stations during the last two weeks in January of each year.

During the last week of every ensuing month, all sampling stations would be visited. Bottom salinity and temperature would be recorded and the oysters measured. Oyster mortalities and kinds and numbers of oyster predators and fouling organisms would also be noted. As an index of recruitment, the number of oyster spat which sat and survived on the sample oysters during the year of deployment would be counted and measured.

All trays would be removed from the field during the first two weeks in January, approximately one year after deployment. These procedures would be carried out in full for each year of the monitoring program. These trays have been used very successfully by the LDWF in similar growth and survival studies in Barataria Bay.

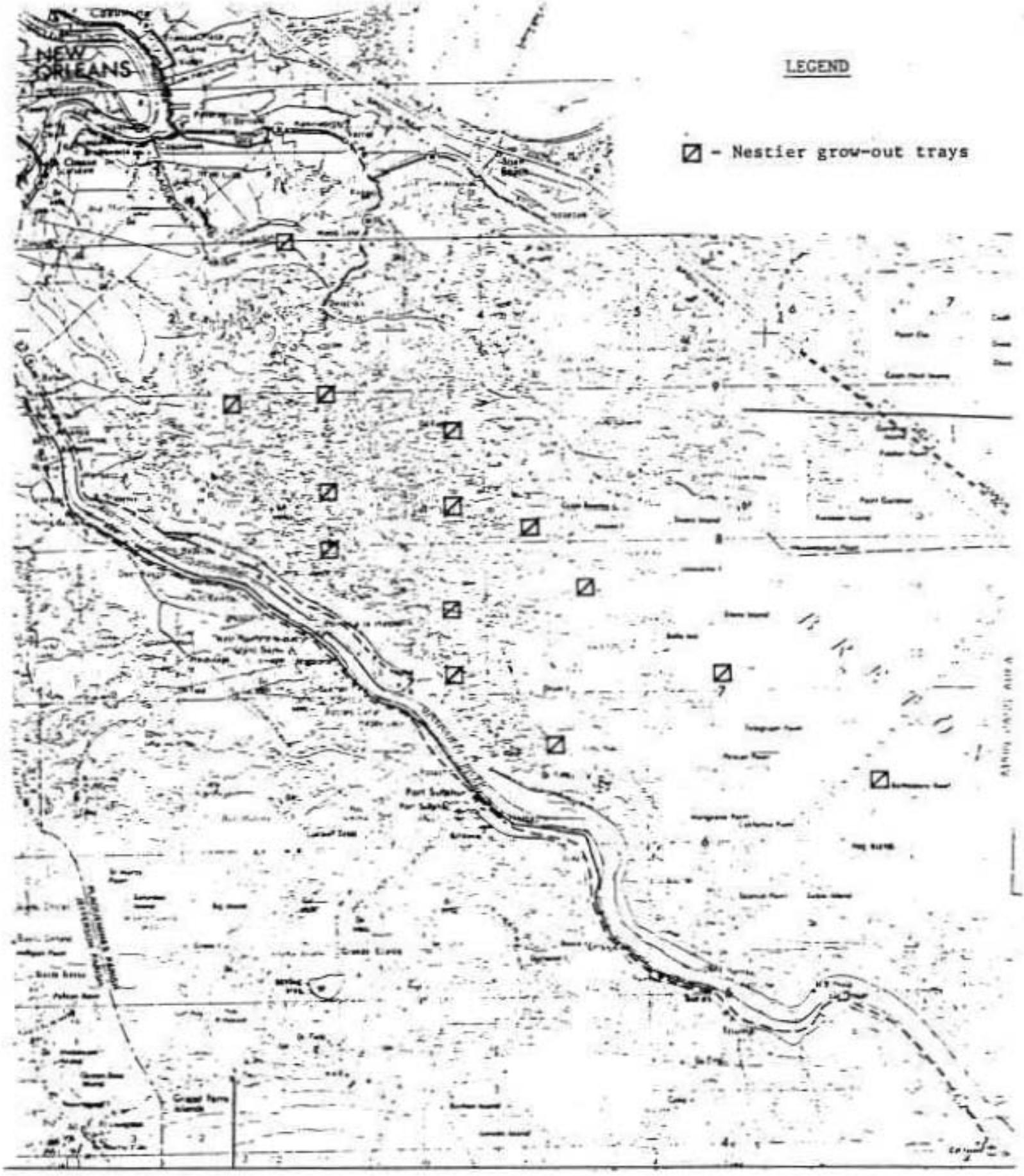


FIGURE 7. Tentative locations of Nestier grow-out trays for oyster growth and survival studies.

Shrimp

The Seafood Division of LDWF uses 6-foot and 16-foot flat otter trawls to monitor brown and white shrimp populations in the Breton Sound Basin. The 6-foot trawls with 5/8" bar wings and 1/4" bar tail are used to sample shallow bayous and bays. In the deeper inshore areas, 16-foot trawls with 3/4" bar wings and 1/4" bar tail are used. All trawl samples are of 10-minute duration. All shrimp collected are identified, counted, and a random sample of 50 of each species is measured in 5 mm groups.

Five stations are sampled weekly with a 6-foot trawl from March through October and five additional stations (crash stations) are sampled with a 6-foot trawl during the last two weeks of April for purposes of setting the brown shrimp season (Figure 8).

Two inshore stations are sampled weekly with a 16-foot trawl from March through October and bi-weekly from November through February. Each time a sample is taken, salinity, water temperature, sea state, cloud cover, and wind speed and direction are recorded.

For purposes of the diversion monitoring program the above efforts should be continued with the additions discussed below.

Four of the five 6-foot crash stations that are currently sampled only during the last two weeks of April should be sampled every week from March through October. In order to ensure adequate sampling of presently unsampled areas, three additional 6-foot trawl stations and two additional 16-foot trawl stations should be established and sampled weekly from March through October. The two additional 16-foot trawl stations should also be sampled bi-weekly from November through February. The additional proposed shrimp sampling stations are shown in Figure 9.

FIGURE 8. Existing 6-foot and 16-foot trawl stations.

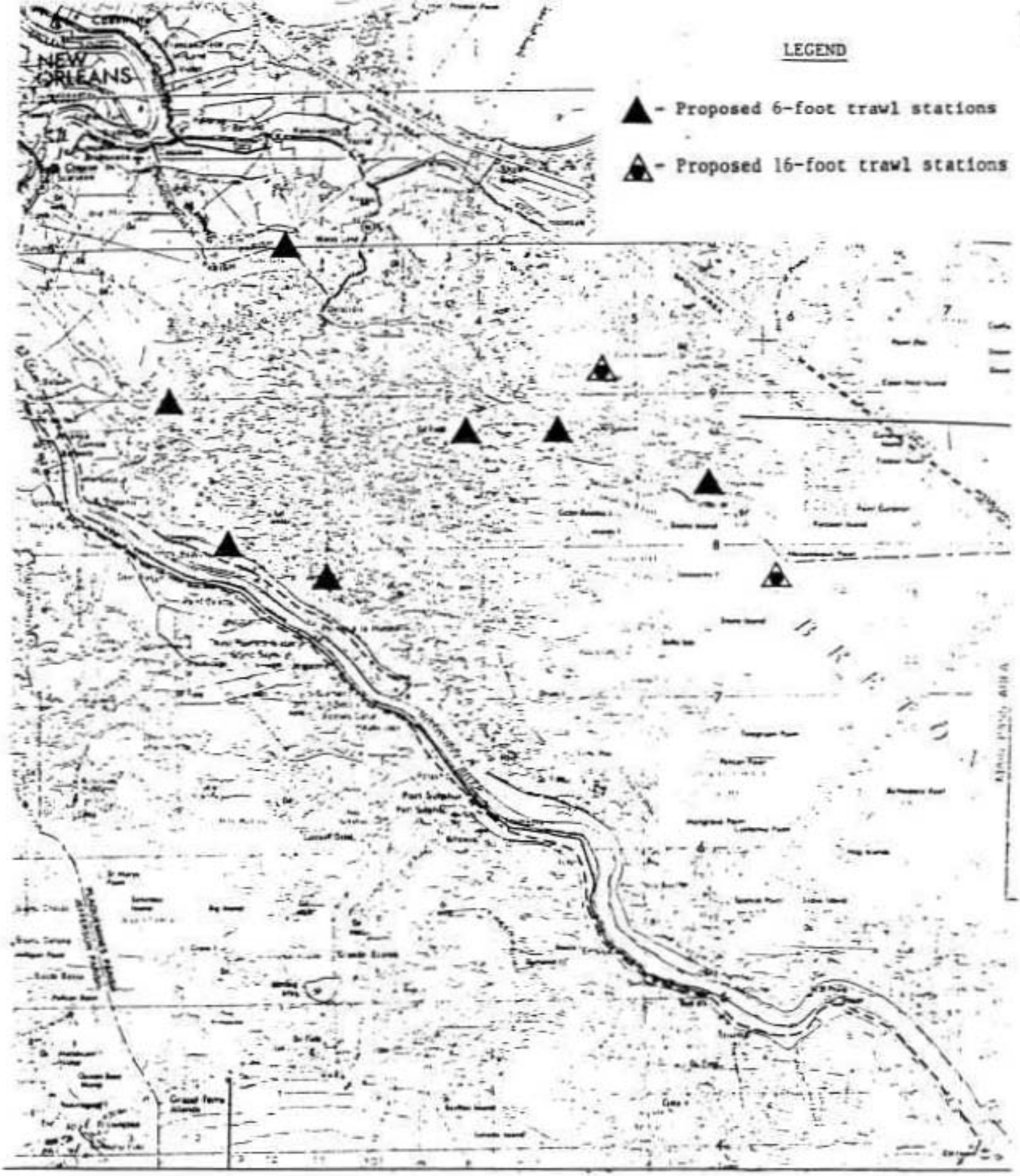


FIGURE 9. Locations of proposed 6-foot and 16-foot trawl stations.

Blue Crab

Monitoring the blue crab resource in the Breton Sound Basin is done in conjunction with the existing shrimp monitoring program. In all 16-foot trawl samples, blue crabs are counted and a random sample of 50 are measured, sexed, and berried females noted.

It is proposed that these procedures be continued for the diversion monitoring program. Additionally, crab data would be obtained whenever a 6-foot or 16-foot trawl sample is taken. This includes existing as well as all proposed trawl stations (Figures 8 and 9).

Finfish

Finfish monitoring in the Breton Sound Basin is also currently conducted in conjunction with the existing shrimp monitoring program. In the 16-foot trawl samples, all fish are identified to species, counted, and a random sample of 50 measured. These procedures would be continued for the diversion monitoring program. Additionally, data on all fish would be obtained whenever a 6-foot or 16-foot trawl sample is taken. This includes existing as well as all proposed trawl stations.

The Department of Wildlife and Fisheries has recently created a special Finfish Section within the Seafood Division. The Section has plans to sample commercially and recreationally important finfish in the Breton Sound Basin, with special emphasis on spotted seatrout and red drum.

At this time, it is envisioned that sampling gear would include 50-foot nylon bag seines with 1/4" bar mesh, 750-foot monofilament gill nets composed of five panels of varying mesh size (1" bar to 3" bar), and 750-foot nylon trammel nets with a 2:1 sag and 1 5/8" bar inner wall and 6" outer wall.

All fishes collected would be identified to species, counted, and a random sample of 50 measured in 5 mm groups. For certain species, additional information on sex, gonadal condition, and stomach contents would be recorded.

Several meetings have been held with personnel from the new Finfish Section. Although the station locations, number of stations, and sampling frequencies have not been finitely determined, it is believed that the finfish sampling to be conducted by LDWF would satisfy our finfish monitoring needs. Efforts are being made to choose sampling stations that would satisfy the requirements of both the LDWF and the proposed freshwater diversion monitoring program.

Personnel from the Plaquemines Parish Environmental Services Laboratory have provided a list of 13 potential sampling sites for finfish monitoring (Figure 10). Most of these sites appear to be very good. It is unlikely that all of the suggested sites would be utilized; however, some of the sites could certainly be integrated into the program.

It is proposed that the LDWF conduct the fisheries monitoring including oysters, shrimp, blue crabs, and finfish. It is currently estimated that the annual cost for the 7 years of intensive fisheries monitoring would be about $45,000 per year. The funds would be used to hire a biologist and a marine resources specialist to conduct the additional sampling, and to purchase additional sampling equipment.

ISOHALINES

In addition to salinity data gathered at the various biological sampling stations, the LDWF monitors salinities in the Breton Sound Basin at 15 separate isohaline stations (Figure 11). These stations are visited weekly and have been monitored an a regular basis since 1974. In addition to salinity, water temperature (^{o}C) and conductivity (mmhos/cm) are also measured. The Department uses the data to plot isohalines which provide valuable information concerning the effects of salinity an fishery resources, particularly oysters.

FIGURE 10. Potential sites for finfish sampling.

FIGURE 11. Existing and proposed isohaline stations.

The salinity data collected at these isohaline stations would complement the salinity data gathered under the water quality monitoring program for the proposed diversion. It is proposed that an additional isohaline station be established in Lake Fortuna (Figure 11). Since the proposed diversion would likely exert some secondary effects on the salinity regime on that side of the estuary, additional salinity data from that area would be useful. In addition, as discussed under oyster monitoring, it is proposed that a M^2 station be established in the Lake Fortuna area for oyster monitoring (Figure 6). The year round salinity data from the new isohaline station would be valuable in assessing the oyster data from the new M^2 station.

CONTAMINANT UPTAKE ANALYSIS

One of the greatest concerns related to the proposed diversion of Mississippi River water is the potential adverse impacts due to high levels of pollutants in the River. The River often contains high levels of heavy metals, phenolic compounds, pesticides, PCBs, and other compounds. Monitoring of contaminants in the water column and sediments would be conducted under the water quality/hydrology monitoring programs. However, in order to determine the effects of contaminants on fishery resources, it is proposed that tissue analyses be performed for selected aquatic resources.

In any contaminant uptake study, it is important to monitor the same species at the same locations throughout. Otherwise, if any changes in analyses results occurs, one does not know if the levels are different due to switching sites or species, or to an actual change in contamination. Thus, selection of animals for contaminant uptake monitoring presents a problem in that most estuarine-dependent animals are highly migratory due to seasonal salinity changes and varying habitat requirements at different life stages. It is essential that resident species be chosen that would be available under both pre-and postdiversion conditions. The oyster is an ideal candidate for analysis since it is sessile, in contact with the sediments, a filter feeder, and is the commercial species expected to be most greatly affected by the diversion project.

Blue catfish, an important freshwater commercial fish that also enters low salinity estuaries, would be selected as a representative bottom feeding fish for analysis. Since some contaminants are also known to biomagnify in predator species, a predator such as spotted gar would also be collected. Spotted gar are known to occur over a wide range in the estuary.

In order to ensure that the analysis is statistically meaningful, three composite samples consisting of five individual fish per sample would be collected at each sampling station. These numbers are based on experience gained from the National Pesticide Monitoring Program. Three composite samples consisting of 200 grams of oyster meats from each station would also be collected. The oysters would probably be collected in conjunction with the Louisiana Department of Wildlife and Fisheries studies on oyster survival, growth, and abundance.

Four contaminant monitoring areas have been tentatively chosen (Figure 12). Samples would be collected in the Mississippi River just upriver from the diversion site, the Upper Basin area near Big Mar, the expected northernmost area of oyster production after diversion (perhaps the Grand Lake area), and an open bay area close to the diversion structure. Oysters, of course, would be lacking at the first two stations, and freshwater fish may not be present at the lower most station prior to diversion.

Animals would be collected in the late fall (probably October). This would allow five to ten months for any contaminants introduced into the estuarine ecosystem to be accumulated in the tissues. Since it is not known what contaminants may be found in the diverted waters, it is recommended that chlorinated hydrocarbons; phenolic compounds; aliphatic, aromatic, and polynuclear aromatic hydrocarbons; selenium; and heavy metals be monitored. It is estimated that this analysis would cost about $1,000 per sample and that the results of the contaminant analysis would be available about 90 to 120 days after collection.

FIGURE 12. Tentative areas for contaminant uptake monitoring.

The U.S. Fish and Wildlife Service proposes to conduct the contaminant uptake monitoring including collection of the organisms and the analytical laboratory analysis. The current estimated costs for this monitoring are presented below.

Estimated Cost Summary

Analytical Laboratory Analysis

Oysters-2 sites x 3 composites/site @ $1,000/sample	= $ 6,000
Bottom feeding fish-4 sites x 3 composites/site @ $1,000/sample	= $12,000
Predatory fish-4 sites x 3 composites/site @ $1,000 sample	= $12,000
Analysis subtotal	= $30,000

Annual Field Office Sampling Costs

Collecting, shipping, data analysis, and reporting	= $ 6,000
Annual Grand Total	= $36,000

FISHERY HARVEST (LANDINGS)

The overall objective of the proposed diversion is to produce a healthy estuarine ecosystem in the Breton Sound Basin. Marsh productivity and concomitant fish and wildlife production would increase. Since the benefits of the project are primarily attributable to increased production of oysters and other commercially and recreationally important finfish and shellfish species, it is important that the harvest of these resources be carefully monitored. Additionally, some changes could occur in the fisheries harvested in the Basin. For example, in years of large diversions, there may commercially harvestable catfish populations in the Upper Basin, as well as a shad fishery in the tailwaters of the diversion.

The National Marine Fisheries Service (NMFS) gathers harvest information in the area. However, their fishery reporting specialists are assigned to rather large geographical areas, and it is often difficult for them to obtain detailed coverage for localized areas. In addition, it is sometimes difficult for them to obtain accurate information from fishermen, seafood dealers, and processors because these people often harbor an innate distrust of anyone gathering statistics which concern their livelihood.

In order to improve upon the harvest data collected in the area affected by the diversion, it is proposed that a fishery reporting specialist be hired to concentrate efforts on the Breton Sound Basin. In several discussions with NMFS personnel, this was the recommended approach. NMFS has indicated that the additional information would be helpful to them and they are willing to provide guidance to the program based on their extensive data gathering experience. It is believed that by assigning an individual to concentrate full time on the Breton Sound Basin, that individual would develop a rapport with members of the fishing industry, thereby enabling collection of more accurate data.

The proposed fishery reporting specialist would concentrate an commercial harvest. However, data could also be gathered on recreational harvest of important species in the area. The major duties of the reporting specialist would include the following:

- collects commercial and/or recreational catch, effort, biological, environmental, and socioeconomic data on important species of marine organisms.
- collects and compiles landings and value of fishery products from dealers in assigned area, including the collection of economic data.
- performs continuing survey of ports, number and types of gear and craft used, number of fishermen employed, products manufactured, lists of wholesale dealers, and employment in shore-based plant facilities.
- prepares a monthly report of fisheries in assigned area.
- obtains data from fishermen at dockside, aboard fishing vessels, or at fish processing plants.

- o keeps detailed records of work accomplished and reports data.
- o assists in developing summary reports.

The individual hired for the position would have a knowledge of fisheries to include:

- o ability to identify various types of fish and shellfish.
- o ability to identify various types of equipment used on commercial and recreational fishing boats and vessels.
- o knowledge of seafood harvesting and processing.
- o skill in making measurements and recording data accurately for marine organisms.
- o ability to express technical fishery data information in a written format clearly and concisely.
- o ability to make computations and compile and tabulate numerical and/or statistical data.
- o skill in developing and maintaining personal contacts.

It is proposed that the fishery reporting specialist would be hired by the LDWF. The current estimated cost is $22,000 per year.

DATA MANAGEMENT

The proposed monitoring program would generate a large amount of data. The value of the data would be dependent upon the quality of data management practices. It is essential that a logical, integrated data management program be implemented. Data management would constitute a large-scale effort and would justify a full-time position to oversee the program.

It is proposed that the LDWF hire an individual for this task. The Department proposes to conduct all of the biological sampling except the tissue analysis. For all practical purposes, the additional biological monitoring recommended for the proposed diversion is merely an extension of existing monitoring conducted by the LDWF. The Department already has a data management program in effect. All of their important data is stored on magnetic tapes and their hardware capability is sufficient to accommodate the additional data. They currently use a Sperry Univac 1100 computer. Additionally, the LDWF has arrangements which allow them to interface with Louisiana State University's Department of Experimental Statistics for both computer capability and assistance with statistical analyses.

The individual hired for the position would preferably have an understanding of both biology and data management, including computer programming and basic statistics. The current cost estimate for this position is $28,000 per year.

MONITORING PROGRAM COSTS

Costs for the various types of monitoring have been discussed throughout the report. The following table provides a summary of the current cost estimates on a year by year basis.

Biological Monitoring Program

Current Cost Estimate

Preconstruction Monitoring Program

Items	Year 1	Year 2	Year 3
Biologist II	$ 22,000	$ 22,000	$ 22,000
Marine Resource Specialist	15,000	15,000	15,000
Sampling Equipment	30,000	5,000	5,000
Fishery Reporting Specialist	22,000	22,000	22,000
Data Manager	28,000	28,000	28,000
Flight Time (Helicopter)	12,000	12,000	12,000
Tissue Analysis (Fish & Shellfish)	36,000	36,000	36,000
Totals	$ 165,000	$ 140,000	$ 140,000

Postconstruction Monitoring Program

Items	Year 1	Year 2	Year 3	Year 4
Biologist II	$ 22,000	$ 22,000	$ 22,000	$ 22,000
Marine Resource Specialist	15,000	15,000	15,000	15,000
Sampling Equipment	5,000	5,000	5,000	5,000
Fishery Reporting Specialist	22,000	22,000	22,000	22,000
Data Manager	28,000	28,000	28,000	28,000
Flight Time (Helicopter)	12,000	12,000	12,000	12,000
Tissue Analysis (Fish & Shellfish)	36,000	36,000	36,000	36,000
Totals	$ 140,000	$ 140,000	$ 140,000	$ 140,000

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

REPLY TO
ATTENTION OF

September 14,1984

Engineering Division
Projects Engineering Section

Dear

Thank you for your recent attendance at the monitoring program development meeting for the Mississippi Delta Region Project (Caernarvon Freshwater Diversion Structure). The meeting was a good start towards the development of the monitoring program, and the contribution of your time and expertise towards making the meeting and the program a success is appreciated.

One of the questions brought up at the meeting was how the funding of the program would be handled. Total project costs including engineering and design and construction will be split on a 75% Federal-25% non-Federal basis. The State of Louisiana is currently the non-Federal sponsor for this project and will be responsible for 25% of the cost. Costs for the 3-year pre-and the 4-year post-construction monitoring are included under engineering and design and as such are subject to the 75-25 split. Various state and local agencies already have monitoring programs in the Breton Sound area and some of these programs are required by law. During future workshops the pre-construction monitoring programs will be designed and will determine what will be monitored and where. Existing stations and methods used by the state and local agencies will be used as much as practicable. If additional work is determined necessary for our programs at an existing location, or if local or state agencies install new stations in the area, this additional work will be credited toward the State's 25% obligation. Work that is done by these agencies as

ATTACHMENT 1

part of their normal data gathering programs will not be eligible for credit. No transfer of Federal Funds to State and Local agencies will occur.

We have enclosed for your information a copy of the Memorandum of Meeting and accompanying enclosures.

We look forward to seeing you at the first workshop to be held at the Lyle St. Amant Marine Laboratory on Grand Terre Island on October 9-11, 1984. If we can be of any further assistance, please do not hesitate to let us know.

Sincerely,

Frederic M. Chatry
Chief, Engineering Division

Enclosure

MEMORANDUM OF MEETING

SUBJECT: Monitoring Program Development Meeting
Mississippi Delta Region Project
(Caernarvon Freshwater Diversion)

The meeting to discuss development of the monitoring program for the Caernarvon Freshwater Diversion Project was convened at 10:00 a.m. on August 7, 1984. The meeting was held in Conference Room 1 at the New Orleans District (NOD). It was well-attended and basically followed the agenda provided in enclosure 1. The working group for development of the monitoring program is provided in enclosure 2. Most of the individuals on the group or their representative(s) attended the meeting. A list of meeting attendees is provided in enclosure 3. Mr. Fred Chatry, Chief of the Engineering Division at NOD, delivered the welcoming remarks. He pointed out that this project is actually under design and moving to construction. He stated that this project had its genesis as a specific proposal in the 1950's, but was not authorized by Congress until 1965. Even though the project has always been strongly supported by Federal and state biologists, we were unable to obtain the non-Federal sponsorship required by Congress. We now have support from the State of Louisiana and are optimistic that construction will begin in November 1986. Mr. Chatry emphasized that because Caernarvon will be the first of our freshwater diversion projects to come to fruition, it is essential that it be monitored and operated to best advantage so that the full potential of freshwater diversions in preserving and enhancing estuarine areas be demonstrated. He then turned the meeting over to Mr. Carl Anderson, the overall project manager.

Mr. Anderson asked each attendee to state their name, the organization they represent, and what they foresee as their primary role in the development and implementation of the monitoring program. Mr. Anderson then provided an overview of the history of the project, a general project description, and the current status of the project.

Mr. Anderson then introduced Mr. James Warren from NOD's Hydraulics and Hydrology Section who gave a general overview of the hydrologic and water quality monitoring programs.

Mr. Warren suggested that an objective of collecting hydrologic data is to monitor principal factors that determine water movements and the present salinity regime of the Breton Sound Estuary. It was noted that concurrent measurements of tide fluctuations, precipitation, significant freshwater discharges, air temperature, wind and current velocities, and salinity at critical locations will be required to develop predictive and operational models. Mr. Warren suggested that most of the desired hydrologic data might be most efficiently obtained using in-situ data recording monitors.

Mr. Warren noted that an objective of the water and sediment quality monitoring program is to define mean levels and variability (i.e. probability distributions) of selected parameters before initiating freshwater diversion. It was suggested that data generated by water and sediment quality monitoring would form a base condition to which post-freshwater diversion parameter levels could be compared. Generalized lists of water and sediment quality parameters that could be monitored were presented.

Mr. Warren stressed the need to have one data management system that would allow easy access and manipulation and analysis of data generated by the various monitoring agencies. Use of the Environmental Protection Agency's STORET system was suggested. Finally, Mr. Warren noted the desirability of standardizing sample collection and analysis procedures.

Mr. Warren then turned the meeting over to Mr. Dennis Chew from NOD's Environmental Quality Section to provide a general overview of the biological monitoring program. Mr. Chew stated that we wanted to take advantage, to the maximum extent practicable, of existing monitoring programs carried out by Federal, state, and local entities and to utilize the expertise of individuals familiar with the Breton Sound Basin and/or appropriate monitoring techniques to develop the program.

He said that the purpose of the monitoring program is to establish baseline conditions in order to assess effects of the diversion on biological resources including vegetation, furbearers, alligators, waterfowl, finfish, shellfish, and other important biota. The reasons for the program are to determine if the project is actually doing what we have predicted; to help guide operation of the structure including timing, magnitude, and duration of flow; and to insure that the diversion is not contributing to unacceptable levels of contaminants in vegetation, fish, wildlife, and ultimately humans. Mr. Chew then provided some general guidance on the approach to monitoring the various biological resources. Information in Dr. William L. Klesch's October 5, 1983, Memo for Record entitled "Conceptual Monitoring Activities for Freshwater Diversions within the Coastal Areas of Louisiana and Mississippi" was used in part in the presentation (enclosure 4). Mr. Chew reiterated the importance of sound data management practices and standardization of sampling and analytical techniques. He also emphasized that the monitoring program concentrate on parameters that would yield definitive information on project effects and not just provide a lot of disjunct, meaningless data. Mr. Chew pointed out that NOD envisions the actual technical development of the monitoring programs would be carried out through a series of workshops.

Following the presentations by NOD personnel, each participant was requested to comment on the overall schemes as presented and how they could assist in refinement and implementation of the program. Mr. Chew and Mr. Warren served as facilitators to field and record comments and questions.

Mr. Walter Morse from the Louisiana Department of Health and Human Resources (DHHR) said that they had data on fecal coliforms and some other parameters in the Breton Sound area and that the data is available. He indicated that they would continue to monitor the area and would work with NOD in the monitoring endeavor.

Mr. John Musser of the U. S. Geological Survey (USGS) said they would work with NOD and emphasized the importance of monitoring the

water quality of the river adjacent to the structure. USGS has 10 to 11 years of data from stations at Violet and Belle Chasse. Their data is in the STORET data base.

Mr. Gerald Bodin of the U. S. Fish and Wildlife Service (USFWS) said they would continue to work with NOD in the development of the program. The USFWS has some highly rated contaminant laboratories and should be able to conduct some tissue analyses.

Mr. Mark Chatry of the Louisiana Department of Wildlife and Fisheries (LDWF) said their Seafood Division is in a position and has a desire to play the leading role in monitoring of the seafood resources that LDWF is charged with managing. LDWF is in the process of developing a data management system and putting computers on line.

Messrs. Roy Giardina and Clarence Louvet, Jr., biologists from LDWF Area 2 (Breton Sound), indicated that biological, hydrological, and water quality data exist dating back to the early 1960's. This data varies considerably in degree of accessability.

Dr. Ray Varnell of Plaquemines Parish stated that the parish has several years of continuous data, much of it collected on a weekly basis. Some of this information has already been obtained by NOD and all of their data is available.

Mr. Dave Roberts from Coastal Environments, Inc. (CEI) indicated that they have gathered a substantial amount of data under a study conducted for Plaquemines Parish in order to design an outfall management plan for the Caernarvon Project. Based on his experience in the basin, Mr. Roberts emphasized the importance of monitoring wind speed and direction. He also said that improved methods are needed for establishing elevations in estuarine areas.

Messrs. Dugan Sabins and Michael Schurtz from the Louisiana Department of Environmental Quality (DEQ) said they have up to 10 years of good data on the Mississippi River. Between St. Francisville and

Pointe-a-la-Hache, DEQ has six stations monitored for trace metals on a monthly basis. They have recently added 12 stations for organics and other parameters. Most of the data is in STORET. DEQ has stations in Little Lake and Bay Gardene which have been monitored for the last 5 years. They will cooperate in the program as much as possible.

Mr. Chuck Killebrew from LDWF suggested that everyone put together a summary of their monitoring programs for use at future meetings or workshops. This matter is discussed in more detail later in this memorandum. Mr. Killebrew requested some information on funding for development and implementation of the monitoring program. Further information on this subject is included in the transmittal letter accompanying this memorandum.

Dr. James Geaghan of the LSU Department of Experimental Statistics said he would provide statistical guidance. He presently does statistical work for LDWF and can provide guidance on the monitoring program through that agency.

Mr. Barney Barrett of the LDWF suggested that we establish definitive criteria and objectives for the monitoring program to insure we do not monitor a vast array of items that would give us no concrete answers.

Dr. Robert Engler from the U. S. Army Engineers Waterways Experiment Station (WES) acknowledged that contaminants are certainly a valid concern, but not an insurmountable problem. We will be diverting water from a high energy to low energy system and big Mar could potentially become an area of high pollutant concentrations. However, many techniques are available to monitor effects of contaminants including tissue analyses and plant and animal bioassays. Certain types of laboratory studies could be used to narrow down field monitoring requirements. Dr. Engler noted that the influx of nutrients into the basin via the diversion would be beneficial as marshes are generally nutrient limited.

Allan Ensminger, Chief of the Fur and Refuges Division for LDWF, said that they currently monitor vegetation, furbearers, alligators, and waterfowl. Due to the benefits of the diversion to these resources, it would be essential to continue such monitoring and to increase the monitoring effort in some cases, particularly for waterfowl.

Dr. Tom Pullen from the Army Corps of Engineers Lower Mississippi Valley Division (LMVD) noted that low-altitude infrared photography may prove to be a useful tool in assessing vegetation changes in the basin.

Following the statements from the meeting participants, Mr. Chew indicated that NOD proposed to actually develop the monitoring program through a series of technical workshops. It was generally agreed that this would be a logical approach. The dates for the first workshop are October 9-11, 1984. LDWF has offered the use of the Lyle St. Amant Marine Laboratory on Grand Terre Island for this first workshop. As suggested by Mr. Chuck Killebrew, participants were asked to prepare informational packets concerning their monitoring programs, and have them available at the workshop. The packets should contain specific information concerning hydrologic data collection, water and sediment quality data, tissue analyses, and biological sampling for the Breton Sound Estuary. The packet should include, but not be limited to, the following:

1. Agency, division, section, group, etc.

2. Monitoring program designation and type of monitoring conducted.

3. For each parameter normally monitored under this program please list:

   a. parameter

b. sampling frequency and type of sample, e.g. surface composite, depth-integrated composite, shrimp, oysters, benthic sample, etc.

c. analytical method, normal detection limit, documentation source for laboratory analyses or instrument make, model, and specifications for field observations, gear type, etc. (see Table 1 for examples)

4. How are the data generated by the monitoring program?

a. If the data are put into a computer system, please list system make and model.

b. Would your agency be willing to generate a tape record of several years of observations to be input into a central data management system?

c. If the data are tabulated and stored, please provide a copy of a typical tabulation sheet.

5. List currently active sampling/monitoring locations in the Breton Sound Estuary (Plaquemines and St. Bernard Parishes). Please provide maps and a short descriptive paragraph of each sampling location including approximate latitude and longitude coordinates and any other information that would help field personnel pinpoint the sampling site.

NOD thanked the group for their participation and cooperative spirit. The meeting was adjourned at approximately 1:00 p.m.

CARL E. ANDERSON

4 Incl
as

MEMORANDUM OF MEETING

SUBJECT: Monitoring Program Workshop
Mississippi Delta Region Project
(Caernarvon Freshwater Diversion)

The first workshop to discuss development of the monitoring program for the Caernarvon Freshwater Diversion Project was held on October 9-11, 1984, at the Lyle St. Amant Marine Laboratory on Grand Terre Island, Louisiana. The facility was made available to the group by the Louisiana Department of Wildlife and Fisheries. The hospitality and assistance extended by the Laboratory staff was greatly appreciated. The purpose of the meeting was to assemble a group of multi-disciplined individuals representing numerous federal, state, and local agencies and other interested groups to gather information on existing biological, hydrological, and water quality monitoring programs. Based on this information, the group would be able to identify data gaps and recommend sampling programs to collect the additional required information. There was a great deal of interest in the workshop and most of the agencies on the working group were represented. Enclosure 1 is an updated list of the individuals and agencies comprising the working group with current mailing addresses, telephone numbers, and their primary role in development of the program. Enclosure 2 is a list of workshop participants. Some of the people were not able to attend the workshop for the entire 3-day session and the number of participants at any given time varied from about 20-30 individuals. The workshop was moderated by Mr. Dennis Chew and followed an informal and flexible agenda to provide an efficient forum for exchange of information and ideas among participants. The following is an overview of what transpired at the workshop. More detailed information on existing sampling efforts and additional monitoring needs are being generated by various agencies and will be forwarded to the working group as they are developed.

The workshop was convened after lunch on Tuesday, October 9. It began with a brief overview of the status of the project followed by a summary of results of the August 7, 1984, monitoring meeting which was held at the New Orleans District (NOD). At that meeting, NOD personnel had requested that the various agencies having sampling programs in the Breton Sound Basin prepare informational packets concerning their respective programs. In the September 14, 1984, Memorandum of Meeting, we provided examples for presenting the information and requested that it be ready for presentation at this workshop. Mr. Chew asked the agency representatives to present an overview of their sampling programs to the entire working group so everyone would have an idea of the overall extent of sampling efforts in the study area. Most agencies had copies of their informational packets and distributed them to the participants. Agencies making presentations on Tuesday afternoon included the Louisiana Department of Wildlife and Fisheries (LDWF), Plaquemines Parish Environmental Services Laboratory (PPESL), U. S. Fish and Wildlife Service (USFWS), U. S. Geological Survey (USGS), and National Marine Fisheries Service (NMFS).

Messrs. Mark Chatry and Robert Ancelet from LDWF presented information on their monitoring of fishery resources including oysters, shrimp, and other finfish and shellfish species. Their sampling gear includes trawls, plankton nets, pound nets, gill nets, hook and line, meter square sampling, Butler plates, and hand dredges. LDWF also conducts boarding surveys of oyster harvesting vessels on the state seed grounds. A great deal of their data dates back to the late 1960's and early 1970's. In addition to sampling aquatic organisms, LDWF collects a variety of water quality, hydrological, and climatological data at many of the sampling stations. Much of their data is now stored on magnetic tapes and they plan to have all of their data computerized in the near future.

Dr. Ray Varnell presented on overview of the PPESL's sampling programs which include a variety of biological, water quality, and hydrological parameters. They monitor water quality at about 20 stations in the Breton Sound area. A number of these stations are inland of the stations of other

resource agencies and provide information on the upper basin. Their program includes analyses of volatile priority pollutants, pesticides, and heavy metals. Most of their sampling has been conducted over the last 4-5 years. The parish is playing a very active role in the development of the program.

Messrs. Gerry Bodin and Wilfred Kucera from the USFWS discussed the contaminant monitoring conducted by their agency. USFWS, under their National Contaminant Biomonitoring Program, collects fish samples in the Mississippi River at Luling and analyzes contaminant levels in fish tissue. The purpose of the program is to monitor contaminant trends over a long-term period. Sampling began in 1969 and has continued basically on an annual basis to the present.

Messrs. Duane Everett and Charles Demas of the USGS discussed their sampling programs. The USGS, in cooperation with the Corps and Office of Public Works, presently collects water and sediment samples from three sites on the Mississippi River in the vicinity of New Orleans. The three sites are Luling, New Orleans, and Belle Chasse. The period of record for these sites are: Luling, 1973 to present; New Orleans, 1967 to present; and Belle Chasse, 1978 to present. Samples are analyzed for an extensive list of physical and chemical parameters. The USGS presently does not collect samples in the Breton Sound area. However, they have a large amount of historical data for the Mississippi River-Gulf Outlet and Baptiste Collette areas.

Ms. Peggy Keney informed the group that NMFS collects commercial fisheries landings data for the area. However, based on our needs, there are some problems with the data because landings for the Breton Sound and Chandeleur Sound areas are lumped together. With the present method, it is not possible to determine landings just from Breton Sound.

After the agency presentations, the participants divided into two subgroups to discuss existing sampling programs in more detail, identify

data gaps, and recommend additional sampling efforts as deemed necessary to adequately monitor effects of the diversion. Mr. Chew led the subgroup on biological sampling and Mr. Warren led the subgroup on water quality/ hydrology.

The biological subgroup discussed sampling of important resources including oysters, shrimp, blue crab, menhaden, groundfish, red drum, and spotted seatrout. The group determined that LDWF has adequate sampling programs to monitor fishery resources and manage fisheries under existing conditions. However, the proposed diversion would cause changes in distribution and abundance of aquatic organisms and, in order to document project effects, sampling efforts would be required in areas which presently receive little attention. Increased monitoring would be required in the upper basin to document changes and potential adverse impacts, and some monitoring would be required gulfward of existing stations to determine effects of salinity changes in the area.

LDWF currently monitors oyster production on the state-managed areas that produce significant quantities of oysters. They do not normally sample oysters on private leases located inland of the public seed grounds, nor do they routinely monitor production seaward of currently productive areas. The subgroup felt it was very important to document project impacts on oysters in these areas and discussed sampling efforts to accomplish this goal. They suggested that trays of oysters could be placed along transects in the mid to upper basin to monitor spat set, growth, and survival rates. Data from this sampling could be used to establish mortality lines and document any adverse impacts caused by overfreshening. Fourteen stations were tentatively selected. It was also recommended that additional meter square and Butler plate samples be taken on the public oyster grounds to monitor a broader area to assess oyster density, size, and spat set. This would help to determine the extent to which the project is affecting production of oysters gulfward of current oyster producing areas. Boarding surveys of oyster vessels would also be increased.

It was determined that additional sampling would be required to monitor impacts on shrimp resources as a result of the diversion. LDWF currently conducts shrimp sampling to manage the fishery under existing conditions in the basin. An expanded shrimp sampling program would be needed to assess project impacts. It was suggested that several 6- and 16-foot trawl stations be established in the mid to upper basin and gulfward of areas currently sampled. Tentative station locations were selected.

With regard to blue crabs, menhaden, groundfish, and other finfish and shellfish species, they would also be monitored at the trawl stations established for shrimp. These other species are currently identified, weighed, and measured at most LDWF sampling stations.

Red drum, spotted seatrout, and other finfish species are currently monitored through creel surveys. These surveys, as well as other sampling efforts, are being expanded by the recently established Finfish Section of LDWF. Data collected by this section will provide useful information on numerous species of commercial and recreational importance. Mr. John Roussel from LDWF has been added to the working group to represent the Finfish Section.

The water quality/hydrology subgroup discussed existing monitoring programs and their adequacy as related to documentation of project impacts. Since reduction of salinities is the primary purpose of the project, the subgroup agreed that salinity should be the most important parameter to monitor in the basin. The group discussed acquisition of two distinct types of data, i.e., data obtained using in situ data gathering packages and data obtained from laboratory analyses of samples collected in the field. Generally, data derived using in situ monitors would consist of climatological, hydrological, and physical water quality parameters. This information would be used primarily to develop a regression model to guide operation of the structure. Data derived from laboratory analyses would consist principally of measurements of water column, bottom sediment, and plant and animal tissue contaminants.

Members of the subgroup discussed in more detail the sampling programs which they had summarized for the entire group. Dr. Varnell from Plaquemines Parish stated that their sampling efforts, as well as data provided by Coastal Environments, Inc., indicate the area is very homogenous and that few water quality monitoring stations would be necessary. However, most others in the subgroup felt that even if the area is fairly homogenous now, it would not be so predictable once the diversion is initiated. Mr. Kenneth Fox, representing the oyster fishermen in the area, expressed concern over increased levels of fecal coliform bacteria. Mr. Kucera discussed the results of the USFWS monitoring at Luling. Dr. Varnell discussed the results of monitoring conducted by Plaquemines Parish, and Mr. Everett discussed the results of the USGS monthly water quality sampling in the Mississippi River. It appears that most of these sampling results reveal very low levels of contaminants in the water. Generally, members of the subgroup expressed little concern about measurements of metals, nutrients, pesticides, and other parameters in the water column. However, due to the public concern which has been expressed throughout development of the project, it was agreed that limited monitoring of water for contaminants is essential. It was suggested that a water quality monitoring station be established upstream from the diversion structure to detect contaminants, thus allowing the structure to be closed during undesirable conditions. However, continuous monitoring and rapid analysis of the extensive list of contaminants which could be found in the river is not practical. Therefore, it was decided that closure of the structure would have to rely on the existing early warning program used for municipal water supply systems.

Since the list of contaminants found in the water column is very extensive, their levels are generally undetectable or very low, and it is difficult to predict what impact, if any, these levels will have on any living organisms, it was suggested that scans for priority organic pollutants and metals would be a logical approach. Further analyses would be conducted in the event significant levels of contaminants were detected

in the scan. Members of the subgroup decided that water column contaminants be monitored once a month in the pre- and post-monitoring programs.

It was agreed that analysis of sediments, vegetation, and fish and wildlife contaminant levels would provide more useful information concerning contaminant effects than merely analyzing water samples. Dr. Bobby Folsom from WES explained the plant bioassay techniques he has been using to assess uptake of metals by marsh vegetation. He stated that these, as well as selected animal bioassays, would yield valuable information on potential contaminant uptake by organisms in the basin. However, it was noted that most contaminants in the diverted water would be attached to clay particles and would soon settle out. Most metals settling in the marsh would be in a reduced state and largely unavailable to the biota. Nonetheless, it was decided that consideration would be given to employing some of these bioassay techniques as part of the monitoring program.

Following the subgroup meetings, the entire working group briefly discussed what had transpired in the individual sessions. The workshop was adjourned at 5:00 p.m.

The workshop reconvened at 8:00 a.m. on Wednesday morning. Some of the other members of the working group arrived early in the morning and those having information concerning additional existing monitoring programs were asked to address the overall working group.

Mr. Walter Morse of the Louisiana Department of Health and Human Resources (LDHHR) presented information concerning their monitoring program, particularly that related to shellfish harvesting areas. LDHHR has about 70 stations in the study area and samples are generally taken monthly. Samples are analyzed for fecal coliform bacteria and occasionally other microbes. Salinity readings are also taken from these stations. In

addition, LDHHR also conducts periodic tissue analyses of various fishery resources.

Mr. Greg Linscombe of LDWF's Fur and Refuge Division briefed the group on their surveys of vegetation and various wildlife resources. They currently fly a series of transects in the Breton Sound area to assess marsh types and marsh condition. They also conduct periodic aerial surveys of muskrat and alligator populations along the same transects. Several transects would have to be added to fully assess impacts of the diversion. It is estimated that about $10,000 per year would be required for the additional surveys. LDWF also conducts waterfowl surveys in the area. It is likely that the waterfowl survey effort in the area would also require some expansion to properly assess project impacts. This will be discussed further with one of the Department's waterfowl specialists.

Mr. Dave Roberts from Coastal Environments, Inc., (CEI) then explained the studies they conducted for Plaquemines Parish in the area. The Parish intends to implement an outfall management plan to maximize benefits to be realized from the diversion. In order to devise the managment scheme, it was necessary for CEI to conduct some hydrological surveys of the area and model water budgets for the basin. The basic intent of the outfall plan is to spread the flow at the top of the basin to disperse the flow and increase retention time in order to maximize benefits to the marsh while still achieving the other project objectives.

Following the presentations, the group began discussing selection of key locations for placement of a number of in situ data gathering packages in the basin. Data gathered by these instrumentation packages would be crucial to development of an operational model for the structure. A rather lengthy discussion was held concerning whether or not the hydrology of the area was understood well enough to wisely choose station locations without further studies. It was ultimately agreed that general knowledge of the area's hydrology gained by CEI and LDWF during field investigations was sufficient to allow tentative selection of station locations. Monitoring

the success of project objectives and the presence of platforms or other foundations to facilitate installation of the instrumentation packages played a role in the selection. A total of seven stations was selected, although several more would be desirable. Those stations are shown in Enclosure 3. Six of the stations would be established at new locations. One of the stations (#5) would be located at the existing LDWF camp at Bay Gardene. Cost was a major consideration in selecting the number of stations. The instrument packages alone could cost about $20,000 each. If a platform has to be constructed, the cost would be much greater. It was acknowledged that some modification of station locations may be required in the future. Serious consideration was given to placing a station in St. Bernard Parish. Although this area would not be directly affected by the diversion, several people in the group felt the area would be indirectly affected and the impact should be assessed. No final decision was made concerning this matter.

Once the station locations had been selected, discussions began concerning what parameters should be monitored. An extensive list of climatological, hydrological, and physical water parameters was put on the blackboard. The list was screened and prioritized by the entire working group. Efforts were concentrated on selecting parameters which would be used to drive the operational model as well as assess impacts of the project. The original list was tentatively narrowed to nine parameters ranked as follows:

1. conductivity @ 25°C
2. water temperature
3. water level
4. current velocity
5. rainfall
6. wind velocity
7. air temperature
8. relative humidity
9. turbidity

It was agreed that it would not be necessary to monitor all of the chosen parameters at every station. The group tentatively decided to monitor the various parameters as indicated on the next page:

Station Number	Parameter Number
1	1, 2, 3, 9
2	1, 2, 3, 9
3	1, 2, 3
4	1, 2, 3
5	1, 2, 3, 5, 6, 7, 8
6	1, 2, 3, 4
7	1, 2, 3, 4

There was some discussion concerning the feasibility of monitoring turbidity (parameter number 9) with the in situ monitors. The issue is still undecided. It was decided to monitor most parameters at Station 5, since the instrumentation would be located at the LDWF camp. The instruments would be well protected and easily accessible at this location. Dr. Varnell recommended that we contact the National Weather Service (NWS) and ask if they would include this station under their program. If so, it is likely that the NWS would monitor numerous other parameters as well.

Data collected at the seven stations could be integrated with similar data collected at the many stations sampled by the various agencies as described earlier in this memorandum. This data could be used to model and guide operation of the structure. In addition, the hydrological and water quality data could be coupled with information collected through the biological sampling program to assess project impacts and determine causal effects.

The selection of the stations and choice of parameters was a lengthy process and included input from virtually everyone in the group. There was considerable discussion over how the data would be used, how it would interface with data gathered in other sampling programs, and who would actually use the information. This led into discussions concerning data management, including development of field data sheets, data storage, and

computer analysis of the data. Numerous opinions, ideas, and recommendations were brought forth for deliberation by the group. The workshop was adjourned at 5:00 p.m.

On Thursday morning, Mr. Judd Pollard explained the development and status of LDWF's data management system which has been underway for several years. LDWF has a massive amount of information which has been collected over the years. They have been working tediously to computerize this information. They currently have data on the computer for sampling through 1979 and plan to have all of their data on line in the near future. Mr. Pollard's presentation rekindled the data management discussions of the previous day. He explained some of the problems they encountered. He indicated that a data management consultant such as Computer Services Corporation could help overcome some of the problems. Dr. Wiley Kitchens noted that the USFWS has used data management consultants with success. Personnel from LMVD and WES related experiences with data management problems and recommended that serious consideration be given to the idea of using a consultant. The concern of the working group was that data management could pose the most difficult problem in carrying out the extensive monitoring program proposed for the project. No decisions were made concerning the data management issue. Mr. Chew recommended that a task force be assembled to investigate the problem in more detail. The task force would consist primarily of individuals with expertise in data collection, storage, and manipulation and would report to the working group at a future workshop. It was agreed that this would be a logical approach to assess this complex problem.

After completing the data management discussions, we discussed monitoring of contaminants in water, sediments, and plant and animal tissues. This data collection effort would be separate from the data collected by the <u>in situ</u> monitors. Due to concerns over water quality of the River, it was agreed that monitoring changes in contaminant levels as compared to pre-diversion conditions should be an integral part of the overall monitoring program. As discussed previously in this memorandum, it was agreed that monitoring contaminant levels in sediment and plant and

animal tissues would provide more meaningful data on project effects than monitoring of contaminant levels in the water column. However, it was agreed that a limited quantity of water column samples should be taken.

Dr. Bobby Folsom from WES explained, in more detail, the plant bioassay techniques used to measure the potential uptake of ten heavy metals including Zn, Cd, Cu, Fe, Mn, As, Hg, Ni, Cr, and Pb. He said that these techniques could be used to document what effects the project would have on heavy metal uptake by plants in the basin. Dr. Folsom stated that most contaminants in the diverted water would be attached to sediment and clay particles and would tend to settle out in Big Mar or in the upper marsh. Most metals settling in the marsh would be in a reduced state and not readily available to biota. It was agreed that implementation of the bioassay techniques is worthy of further consideration. One problem is they are rather expensive. It was estimated it would cost about $60,000 per year to conduct the studies for this project.

No firm decisions concerning contaminant monitoring were made at the meeting. It was decided that a task force be assembled to discuss this issue and report back to the working group at a future meeting.

A number of meeting participants had expressed a need to depart the island by 11:00 a.m. on Thursday. As this time was approaching, Mr. Chew thanked the participants for their interest and cooperation in the project and the development of the monitoring program. Special thanks were directed to the Laboratory staff for their assistance and hospitality.

It was acknowledged that members of the working group need to maintain direct communication during development of the monitoring program and that individuals would be contacted requesting their involvement in various task force meetings. No firm dates were established for the next full-scale workshop. Dr. Varnell suggested that the next workshop be held in the vicinity of Braithwaite in Plaquemines Parish near the Caernarvon site.

It was agreed that this would be an appropriate location. At this time, it appears the next workshop will be held sometime in January 1985. All members of the group will be contacted to confirm exact dates for the workshop.

The meeting was adjourned at 11:00 a.m.

Dennis Chew
DENNIS CHEW

MISSISSIPPI DELTA REGION PROJECT
CAERNARVON FRESHWATER DIVERSION
MONITORING PROGRAM
WORKING GROUP

NAME	ORGANIZATION/ADDRESS/PHONE
Dennis L. Chew	U. S. Army Corps of Engineers New Orleans District, LMNPD-RE P. O. Box 60267 New Orleans, LA 70160-0267 (504) 838-2523
Carl Anderson Pam Deloach	U. S. Army Corps of Engineers New Orleans District, LMNPD-SP P. O. Box 60267 New Orleans, LA 70160-0267 (504) 838-2610/2621
Burnell J. Thibodeaux James Warren Tony Drake	U. S. Army Corps of Engineers New Orleans District, LMNED-HH P. O. Box 60267 New Orleans, LA 70160-0267 (504) 838-2445/1933/2532
Tom Pullen Gene Buglewicz	U. S. Army Corps of Engineers Lower Mississippi Valley Division LMVPD-R P. O. Box 80, Vicksburg, MS 39180 (601) 634-5851/5856
James O. Farrell	U. S. Army Corps of Engineers Lower Mississippi Valley Division LMVED-WR P. O. Box 80, Vicksburg, MS 39180 (601) 634-5890
Bill Klesch	U. S. Army Corps of Engineers Office of the Chief, DAEN-CWP-P Casimir Pulaski Bldg. 20 Mass. Ave., N.W. Washington, D. C. 20314 (202) 272-0130
Thomas D. Wright	U. S. Army Corps of Engineers Waterways Experiment Station, WESER P. O. Box 631, Vicksburg, MS 39180 (601) 634-3708

ATTACHMENT 3

NAME	ORGANIZATION/ADDRESS/PHONE
William H. McAnally	U. S. Army Corps of Engineers Waterways Experiment Station, WESHE P. O. Box 631, Vicksburg, MS 39180 (601) 634-3822
Bobby L. Folsom, Jr.	U. S. Army Corps of Engineers Waterways Experiment Station, ERSD P. O. Box 631, Vicksburg, MS 39180 (601) 634-3720
Clark Lozes Ray Varnell	Plaquemines Parish Environmental Services Laboratory Route 1, Box 207 Braithwaite, LA 70040 (504) 682-0081, Ext-2260/2262
Johannes van Beek Dave Roberts	Coastal Environments, Inc. 1260 Main Street Baton Rouge, LA 70802 (504) 383-7455
Bruce Wright	St. Bernard Parish Planning Commission 8201 Judge Perez Blvd. Chalmette, LA 70093 (504) 277-6371
Donald Moore Peggy Keney	National Marine Fisheries Service Environmental Assessment Branch 4700 Avenue U Galveston, TX 77550 (409) 766-3699
Thomas R. Dawley	National Marine Fisheries Service Room 1000 600 South Maestri Place New Orleans, LA 70130 (504) 589-6151
Gerald Bodin Wilfred Kucera	U. S. Fish and Wildlife Service P. O. Box 4305 Lafayette, LA 70502 (318) 264-6630
Wiley Kitchens	U. S. Fish and Wildlife Service National Coastal Ecosystems Team 1010 Gause Blvd. Slidell, LA 70458 (601) 255-6511

NAME	ORGANIZATION/ADDRESS/PHONE
Charles R. Demas Duane Everett John Musser	U. S. Geological Survey 6554 Florida Blvd. P. O. Box 66492 Baton Rouge, LA 70896 (504) 389-0281
Chuck Killebrew	Louisiana Department of Wildlife and Fisheries P. O. Box 15570 Baton Rouge, LA 70895 (504) 342-9273
Ron Dugas	Louisiana Department of Wildlife and Fisheries 400 Royal Street New Orleans, LA 70130 (504) 568-5685
Mark Chatry Rick Kaspezak Joseph Shepard Charles Dugas Ann Bull	Louisiana Department of Wildlife and Fisheries P. O. Box 37 Grand Isle, LA 70358 (504) 568-7620
Mike Windham Johnny Tarver	Louisiana Department of Wildlife and Fisheries P. O. Box 15570 Baton Rouge, LA 70895 (504) 342-5874
Bob Ancelet Roy Giardina Clarence Louvet, Jr.	Louisiana Department of Wildlife and Fisheries 400 Royal Street New Orleans, LA 70130 (504) 568-5688
Greg Linscombe	Louisiana Department of Wildlife and Fisheries Route 4, Box 78 New Iberia, LA 70560 (318) 369-3807
Barney Barrett Ron Gouguet Robert Ganczak	Louisiana Department of Wildlife and Fisheries P. O. Box 15570 Baton Rouge, LA 70895 (504) 342-5860

NAME	ORGANIZATION/ADDRESS/PHONE
Judd Pollard	Louisiana Department of Wildlife and Fisheries P. O. Box 15570 Baton Rouge, LA 70895 (504) 342-9275
Dave Chambers	Louisiana Department of Natural Resources Louisiana Geological Survey 2133 Silverside Drive Baton Rouge, LA 70808 (504) 342-8785
Dale Givens Dugan Sabins Michael H. Schurtz	Louisiana Department of Environmental Quality Water Pollution Control Division P. O. Box 44066 Baton Rouge, LA 70804 (504) 342-6363
George Robichaux Walter Morse	Louisiana Department of Health and Human Resources Room 103 P. O. Box 60630 New Orleans, LA 70160 (504) 568-5110
James P. Geaghan	Louisiana State University Department of Experimental Statistics Baton Rouge, LA 70803 (504) 388-8303
Kenneth Fox	Fox Seafood, Inc. Point a la Hache, LA 70082 (504) 525-6175
Donald Ansardi	Delacroix Corporation 206 Decatur Street New Orleans, LA 70130 (504) 523-6906
Chuck Smith	Louisiana Department of Wildlife and Fisheries P. O. Box 15570 Baton Rouge, LA 70895 (504) 342-9249

NAME	ORGANIZATION/ADDRESS/PHONE
John Roussel	Louisiana Department of Wildlife and Fisheries P. O. Box 15570 Baton Rouge, LA 70895 (504) 342-9252
Robert Helms	Louisiana Department of Wildlife and Fisheries P. O. Box 15570 Baton Rouge, LA 70895 (504) 342-9248
W. Waynon Johnson	U.S. Fish and Wildlife Service Richard B. Russell Federal Bldg. 75 Spring St., SW, Suite 1276 Atlanta, GA 30303 (404) 221-6343