

**PLAN OF OPERATIONS AND ENVIRONMENTAL ASSESSMENT
FOR A PROPOSED THREE DIMENSIONAL SEISMIC SURVEY
WITHIN AND NEAR THE BARATARIA PRESERVE OF JEAN
LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE**

Jefferson and St. Charles Parishes, Louisiana

Prepared For:

U.S. NATIONAL PARK SERVICE

U. S. DEPARTMENT OF THE INTERIOR

Submitted By:

**SEITEL DATA, LTD.
50 Briar Hollow Lane
Houston, Texas 77027**

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LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE

Jefferson and St. Charles Parishes, Louisiana

INTRODUCTION

Seitel Data, Ltd. (hereafter alternately referred to as Seitel) is proposing to conduct a large three dimensional seismic survey covering approximately 105 square miles, predominantly in Jefferson and St. Charles Parishes, Louisiana. The area to be surveyed includes the northernmost 1500.35 (plus or minus) acres of the Barataria Preserve of Jean Lafitte National Historical Park and Preserve. This Preserve acreage is located near the southeastern corner of the total survey area and is located in Township 14 South, Range 23 East, Jefferson Parish, Louisiana (See Location Map-Figure 1). The east to west dimensions of this survey area is approximately 14 miles with twelve of these being to the west of Barataria Preserve lands. The following Plan of Operations details how this seismic survey is to be conducted in the field while at the same time making every effort to avoid and/or minimize adverse impact to the environment, historical and archeological sites, ongoing recreational activities and facilities, and scenic features of the Barataria Preserve (or commonly hereafter referred to simply as the Preserve or the Park). Environmental and ecological concerns include all aspects of a hydrologic nature and the flora and faunal resources located here. This effort has been coordinated with parish, state, and federal regulatory agencies. All other state and federal research agencies maintaining operational facilities or jurisdiction within the Preserve and adjacent lands have also been consulted.

Seitel is in the process of procuring all necessary seismic permits, lease options, letters of no objection and required regulatory permits which will allow for initiation and completion of the proposed operations. They have completed that portion of this effort which pertains to Park lands and have provided the National Park Service with this information.

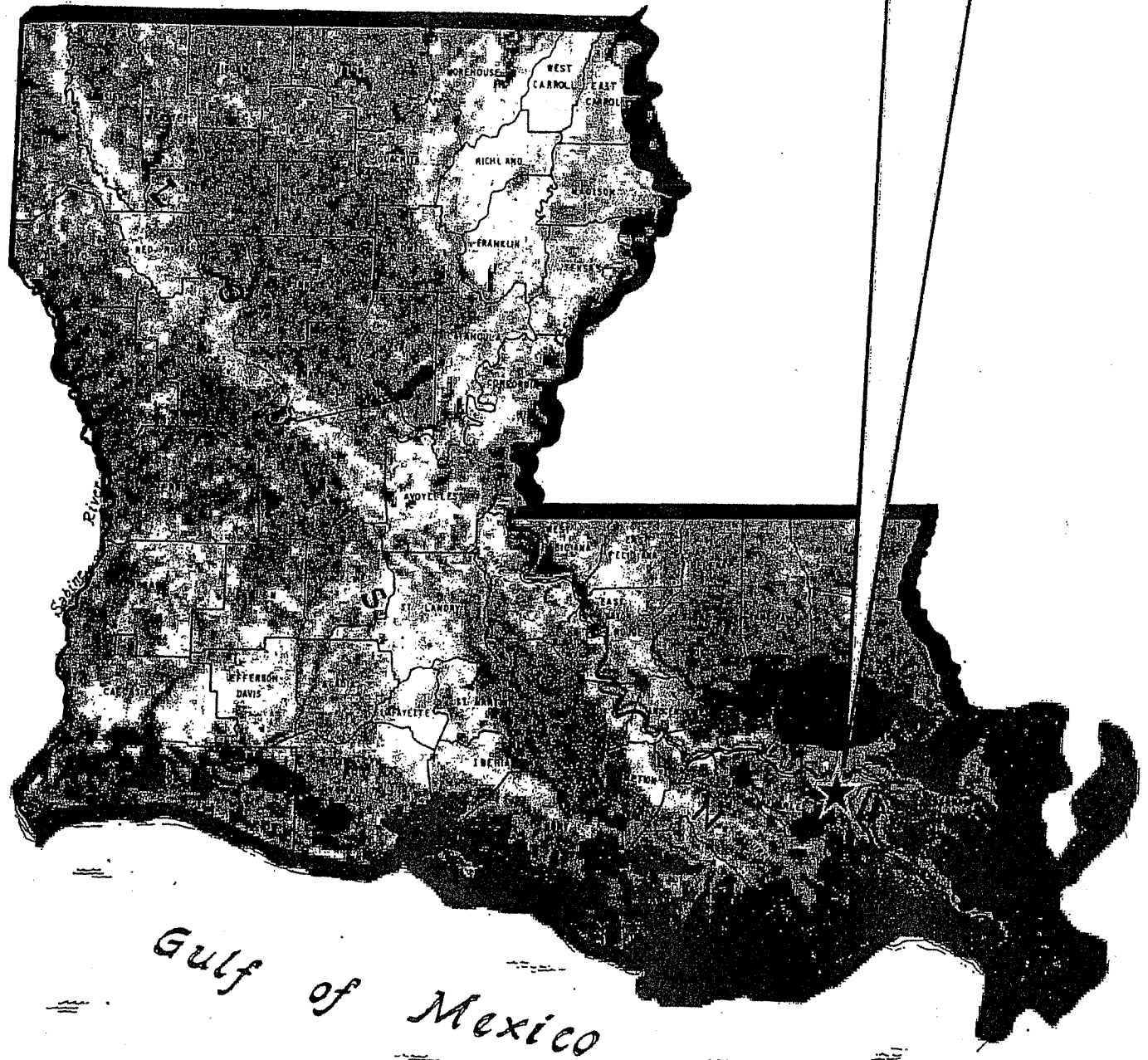
Seitel's operations will adhere to and comply with all the provisions of the Code of Federal Regulations 36 CFR, section 9.30 *et sequentia* which pertains to surface activities on National Park lands having non-federal oil and gas rights. Seitel's purpose and intent coincides with that of the National Park Service as stated in 36 CFR section 9.30 ("purpose and scope"). Said stated purpose being: "to insure that activities undertaken pursuant to these rights" (rights reserved by private mineral owners) "are conducted in a manner consistent with the purposes for which the National Park System and each unit thereof were created, to prevent or minimize damage to the environment and other resource values, and to insure to the extent feasible that all units of the National Park System are left unimpaired for the enjoyment of future generations".

Prior to initiating operational activities within the Jean Lafitte National Historical Park and Preserve, Seitel will supply the Superintendent with the following data, documents and information:

Newly flown, high resolution aerial photographs of that portion of the Barataria Preserve to be surveyed. These photos will show all existing roads, canals and waterways to be utilized for the survey. They will also document currently existing natural features, the location of any threatened or endangered species and historical sites, cultural sites, areas of existing disturbance and their boundaries, and location of all surface features. Figures 2.2.1 and 2.3.1 reflect these parameters as of 1998. The new photos will represent a baseline (pre job inventory) in reference to similar photos to be taken after operations and reclamation work have been completed and after one growing season has passed (post operations/reclamation inventory). These pre-job-flown photos or an accompanying map exhibit will display the proposed seismic grid (points). This grid will reflect any location adjustments decided on subsequent to the preparation of this report. Such adjustments could be caused by the recognition of inaccessibility due to physical, environmental, or cultural resource barriers.

A list of all mineral owners associated with Preserve lands, along with a map depicting each owner's tract, as well as copies of all applicable leases, permits, lease options, etc. that were obtained in conjunction with the proposed seismic survey and upon which

Jean Lafitte National
Historical Park & Preserve
Barataria Preserve
Jefferson Parish, Louisiana



Location Map
Figure 1

the operator's right to conduct operations is based. (Note: These agreements were completed and copies were delivered to Jean Lafitte National Historical Park and Preserve on April 6, 2001).

A list and copies of all permits, approvals, and/or letters of no objection from all pertinent and necessary governmental regulatory agencies as regards access to the proposed seismic survey area and in particular to that portion of this area represented by the Barataria Preserve. (Note: These have now been procured and copies were delivered to Jean Lafitte National Historical Park and Preserve on April 6, 2001).

A list of contact persons and their names, addresses and telephone numbers. This will include the operator's designated agent(s), field representative(s) and alternate emergency contact person(s). Notification to the Park will be kept up to date as to any contact personnel changes or as new individuals are assigned to the survey project.

A list of all pipeline and utility companies with right-of-ways or easements on the Barataria Preserve lands and any associated seismic permits or agreements. It is Seitel's understanding that the rights by such utilities or pipelines within the Park consist of only easement rights. The common procedure, in this case, is for the geophysical contractor to contact all utility and pipeline companies via the internet of their plans to operate in the area. This is usually done just prior to initiating the survey phase in an area. Subsequently any company involved will meet with the contractor and pinpoint the exact location(s) of their facilities, structures, etc. This is done prior to any drilling or recording operations. It is also at this time that the determination is made as to whether or not the pertinent standard geophysical offset distances (as shown in Table 4.1) are acceptable to each utility and pipeline company. If they are not, such distances are adjusted accordingly to the greater distance acceptable to all parties.

An affidavit of compliance for legally binding Seitel Data, Ltd. with regulations of the National Park Service and other applicable Federal, state and parish laws and regulations. A copy of Seitel's Affidavit of Compliance document is included in the Compliance

and Coordination section of this report. (Note: Two signed originals of this document were mailed to National Park Service representative, Bill Hulslander, on April 20, 2001. These were confirmed, by telephone the following week, as having been received by him).

A performance bond of an amount to be determined in accordance with 36 CFR Section 9.48(d). The National Park Service recommends a total performance bond amount of \$68,500.00 which is acceptable to Seitel Data, Ltd. (Note: This bond has now been delivered to the NPS).

The main sections of this Plan of Operations and Environmental Assessment report address, in the following order:

Section 1- The framework of operations and procedures to be utilized in the acquisition of the proposed three dimensional data. This includes a discussion of ingress and egress routes into and from the area, detailed description of field procedures, and all measures to be taken during operations to alleviate or minimize adverse impact on the environment of the Preserve in compliance with 36 CFR 9.30 *et sequentia*;

Section 2- The current environmental conditions existing in the survey area and that portion of the Preserve that is included in the proposed seismic survey area with an emphasis on threatened or endangered species of flora and fauna and environmentally sensitive areas;

Section 3- An analysis and interpretation of expected impact on currently existing environmental conditions as a result of conducting the proposed three dimensional seismic survey;

Section 4- Other practices and procedures designed to further reduce negative environmental impacts due to the proposed three dimensional seismic survey;

Section 5- Seitel's proposed reclamation plan and an estimate of the cost and time to implement the reclamation of any adverse impacts on the environment within the Barataria Preserve caused by the subject survey; and

Section 6- Compliance and Coordination with governmental agencies and regulatory bodies. Also included is the required Affidavit of Compliance document, and a statement by the National Park Service.

FRAMEWORK

1.1 GENERAL FRAMEWORK OF OPERATIONS

The proposed three dimensional seismic program encompasses an area of approximately 105 square miles and will consist of a grid pattern of source and receiver lines. Source lines will extend in an east to west direction while receiver lines will extend in a north to south direction. Paralleling source lines will be separated by 2200 feet with individual source points being located every 220 feet. Paralleling receiver lines will be separated by 1760 feet and individual seismometers on these lines will be placed every 220 feet. Plus or minus 1500.35 acres of the currently federally-owned Barataria Preserve lands are included within the perimeter of the proposed survey. Location of this acreage is in the southeastern portion of the survey area. It represents approximately 2.2 percent of the total area to be surveyed. Twenty three (23) "staggered" source lines consisting of approximately 6.5 linear miles and eight (8) receiver lines consisting of approximately 7.1 linear miles will be located on Barataria Preserve acreage. These are comprised of approximately 167 source points and 174 recording seismometer locations.

The proposed seismic program represents Seitel's initial operations and upon completion, should suffice to fulfill Seitel's evaluation needs in this area. Therefore, no additional operations are anticipated or planned within the confines of the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve by Seitel Data, Ltd.

1.2 PURPOSE AND NEED FOR OPERATIONS

The purpose of Seitel's program is to acquire and then utilize the latest in exploration technology to attain high resolution information pertaining to the subsurface geology of this sub regional area and thus further evaluate the hydrocarbon potential that may exist here. The extremely limited amount of well control between the few known

producing fields in this area, in conjunction with the high cost of exploration drilling, necessitates that such additional measures be taken. Said measures are meant to define and interpret the subsurface structure and stratigraphy that exists within the objective 9,000' to 16000' plus sub sea interval prior to the consideration of any possible drilling operations.

It is understood that Seitel's operations shall adhere to and comply with all the provisions of the Code of Federal Regulations 36 CFR, section 9.30 *et sequentia* which pertains to surface activities on National Park lands having non-federal oil and gas rights. Seitel's purpose and intent coincides with that of the National Park Service as stated in 36 CFR section 9.30 ("purpose and scope"). Said stated purpose being: "to insure that activities undertaken pursuant to these rights" (rights reserved by private mineral owners) "are conducted in a manner consistent with the purposes for which the National Park System and each unit thereof were created, to prevent or minimize damage to the environment and other resource values, and to insure to the extent feasible that all units of the National Park System are left unimpaired for the enjoyment of future generations".

1.3 CONSIDERATION OF ALTERNATIVE ACTIONS

1.3.1 No Action Alternative

Under the No Action Alternative, the proposed three-dimensional seismic operation would not take place within the Preserve, and there would be no associated impacts to Park resources. This alternative, however, would fail to provide for the lawful exercise of nonfederal mineral rights to the subsurface lease holders as directed by 36 CFR section 9B. Without the acquisition and interpretation of new subsurface information within the Preserve, the geological and geophysical information currently available is inadequate to meet basic industry standards for hydrocarbon exploration.

1.3.2 Use of Existing Geophysical Data

The only available 3-D seismic shot on or near the Preserve is insufficient in coverage for Seitel's needs and purposes here. The only other existing and available seismic data sources are represented by two-dimensional (2D) surveys. The superiority of three-dimensional seismic to older two-dimension seismic has become quite obvious to the oil industry. In fact it is now standard practice to require three-

dimensional seismic evaluation of essentially any oil and/or gas prospect as a prerequisite for consideration as a drilling project. Thus the purchase of various "disjointed" 2-D seismic information will not provide the necessary high resolution data recognized and acceptable to industry nor enhance, to a significant degree, Seitel's interpretation of the subsurface geology here. Even in the event such inadequate to erroneous data was utilized in the location and drilling of an initial exploratory well, the chances are greatly enhanced for the drilling of an unsuccessful dry hole and the possible subsequent drilling of additional unnecessary wells in the "search" for the optimum target location. This would result in far greater impacts on Park resources than those represented by the proposed operations.

1.3.3 Less Dense Grid (of Source and Receiver Lines and Consequently Fewer Source and Receiver Locations)

The source and receiver grid as proposed herein is considered to represent the minimum spacing and spreads necessary to acquire the specific resolution and quality of data needed. To survey with less dense spreads on Barataria Preserve land only would produce inferior (possibly inconclusive) data under the Preserve and nearby adjacent lands. This data would also not be readily compatible with the high quality data collected over the remainder of the survey area. As discussed above under paragraph 1.3.2 "Use of Existing Geophysical Data", the use of lower resolution data here could result in the drilling of unsuccessful and an unnecessary number of wells. This would result in disturbances and impacts of Park resources far in excess to those imposed by the additional shot holes required by the proposed seismic grid. Thus, this alternative does not appear to be a viable option as concerns acquisition of the necessary and potentially beneficial data while, at the same time, minimizing the potential impacts within the Preserve.

The impacts of the above three alternative actions are individually discussed in the Analysis and Interpretation of Survey Impact section (Section 3) of this report for each resource located within the Park and adjacent lands.

1.3.4 Environmentally Preferred Alternative

The proposed 3D seismic survey program is considered the "Environmentally Preferred Alternative". This program, as proposed, should result in the least damage to the biological and physical

environment within the Barataria Preserve, while providing for the lawful exercise of nonfederal oil and gas rights within federally controlled lands. The proposed 3D seismic survey program has been designed to prevent or minimize damage to Park resources by limiting impacts to the fullest extent, utilizing a third party environmental monitor, and providing a reclamation plan to mitigate impacts at the conclusion of the project.

1.4 DETAILED DESCRIPTION OF FIELD OPERATIONS AND PROCEDURES

1.4.1 Ingress and Egress of the Area of Planned Operations

Pier 90 Marina, located on U.S. Highway 90, between Avondale and Boutte, is planned as the primary staging area. From the marina, travel to the marshlands just west of the Preserve will be along Bayou Verret, Lake Cataouatche, Bayou Bardeaux, Bayou Segnette and Bayou Bouef. In the marshlands offsetting and encompassing the Barataria Preserve, Bayou Bouef, man-made canals and natural waterways will be utilized to get as close as possible to the vicinity of each specific day's work. If permission can be obtained, use of the radio tower road coming off of Highway 45 on the east side is also planned. These routes represent currently existing roads, trails, canals and natural waterways. These also represent those routes to be utilized in the event that hurricanes or other meteorological events necessitate the evacuation of personnel and equipment. Figure 1.4.1 is a USGS topographic quad (1:12,000 scale) depicting these planned routes of access to and through the Preserve. Also plotted on this map are the proposed lines of source and receiver points. These lines are the planned routes to be traversed during operations.

Access from canals and waterways into the work sites within the marsh will be across carefully determined and monitored agreed upon locales. Natural drainage cuts or other low natural crossing points will be used wherever present in the vicinity. Unavoidable passageways across spoil banks and levee embankments will be protected from soil and vegetation damage to every extent possible. Where cutting or rutting of the soils and/or significant disturbance of vegetation appear likely, these entry points shall be overlain with protective sheeting such as plywood, teflon metal sheets, or other commonly used materials.

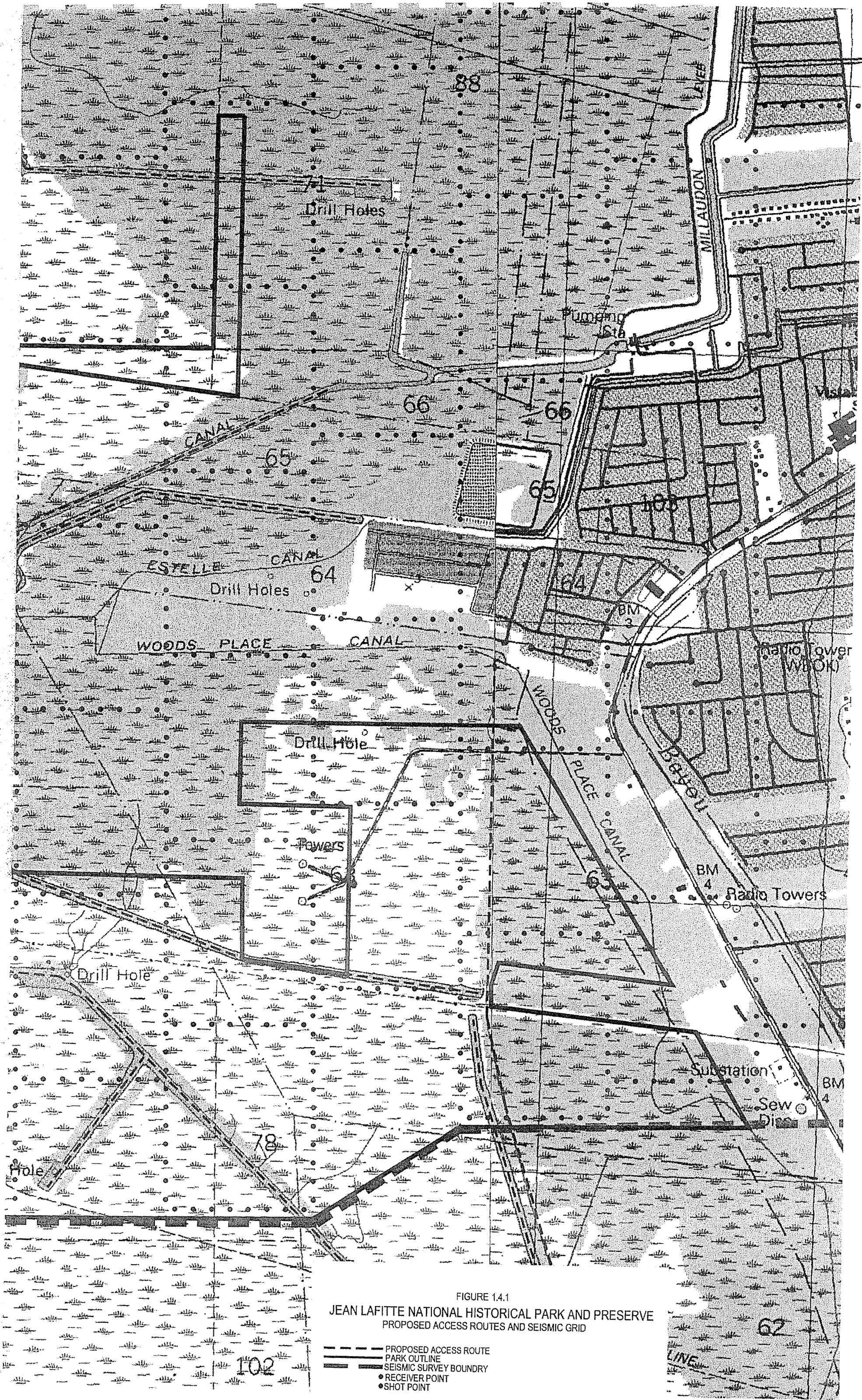
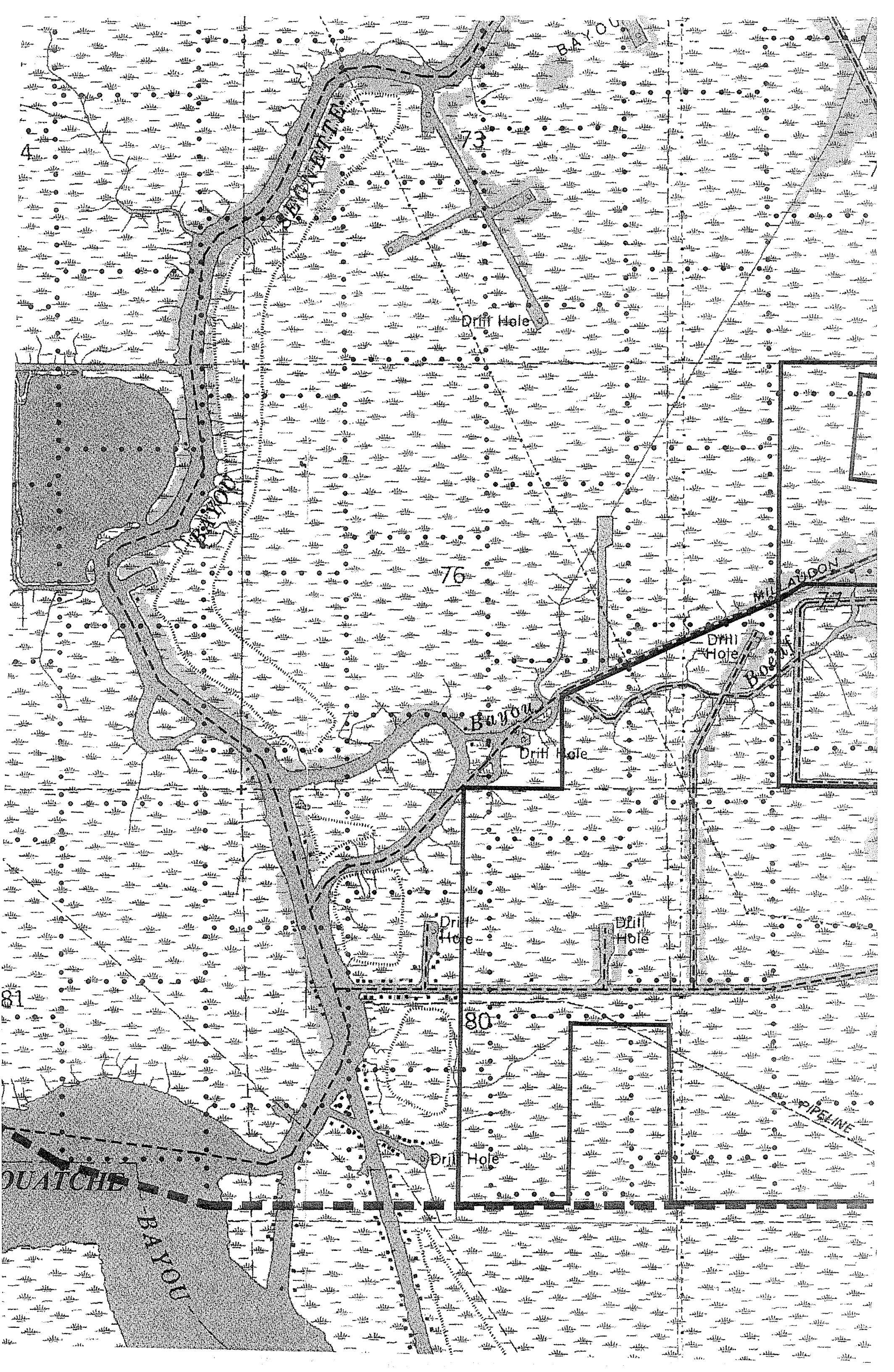


FIGURE 14.1
 JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE
 PROPOSED ACCESS ROUTES AND SEISMIC GRID



1.4.2 Methods of Transportation to and from the Area of Proposed Operations

Small Jon boats and air boats will be used in open water, canals and other waterways to transport personnel to and from work locations. In open marsh, airboats will be used to transport surveyors, shooting personnel, geophone and cable layout crews, and drilling and other equipment. Lightweight aluminum marsh buggies, wherever possible and whenever available, will be used in open marsh to transport drilling equipment. In swamp environments swamp buggies will be used to transport surveyors and cable layout personnel and equipment. Lightweight marsh buggies are wider and lighter than swamp buggies and are designed to minimize the impact on marsh surfaces and marsh vegetation. Their tracks are as much as twice the width of those found on the swamp buggy. The drilling unit with a fold down derrick or mast of approximately 20 feet or less in length, when extended, is mounted within the marsh buggy. On the other hand, swamp buggies are narrower in order to move between trees associated with a swampland environment. They are normally made of steel and thus heavier than marsh buggies and have narrower tracks. The drilling unit is located on a flat bottom "pull boat" which is towed behind the swamp buggy unit.

The swamp and forested areas within the Barataria Preserve are largely confined to the easternmost portion of the property. It appears at this time that many of the initially plotted shot holes here, as shown on Figure 1.4.1, can be offset so as to be relocated to the least sensitive locales as possible. These shot holes will be offset out of the swampland or outside of the Park boundary wherever possible.

1.4.3 Estimated Dates for Accessing the Barataria Preserve

Seitel plans to initiate their operations on the far west side of the overall survey area shortly after January 20, 2001. It is anticipated that surveying on Park lands would begin in the latter part of August or early September of 2001. Drilling operations would probably start on or about the middle of September with recording operations starting near the end of September 2001. Total estimated time for operations within the Preserve is 38 days. At this time (late June, 2001) it would appear that Seitel will be ready to begin surveying immediately upon approval and receipt of the subject 3D seismic permit.

1.4.4 Use of Water

Water necessary for drilling operations will be obtained from the nearest open water, by running necessary hoses, wherever possible in order to eliminate any damage to marsh vegetation. If open water is not available, a small hole will be cut in the marsh vegetation and a screened hose will be used to pump water to the drilling vehicle. In order to have water puddle into this hole at a rate sufficient to keep up with pump flow may require lifting out a portion of the marsh vegetation measuring as much as 4 to 5 feet in aerial dimension and from 2 to 3 feet in thickness. This lifted out material will be set back in its original place as soon as drilling is complete. If open water is not available and monitors decide that marsh vegetation cannot be removed, small tender air boats will be used to supply water. Assuming 50 holes per day would be drilled in the marsh environment with 150 gallons of water required per hole drilled to a depth of 100 feet, would require 7500 gallons of water per day.

1.4.5 Seismic Field Operations Within the Barataria Preserve and Associated Procedures of Compliance with 36 CFR 9B

Prior to the beginning of operations within the Barataria Preserve, the National Park Service will be provided with newly flown or very late vintage, high resolution, aerial photographs. The proposed seismic grid will be depicted on these or an accompanying map or overlay. The seismic grid will reflect any changes and offsets to seismic points as of that date. These photos will also depict pertinent vegetation communities, natural drainage, surface facilities and any existing surface disturbances or adverse conditions. Reference is made here to Figure 2.2.1 which is a fairly recent aerial photo reflecting these parameters as of 1998.

The seismic survey as proposed herein will consist of three phases: surveying, drilling and recording. Once the initial survey phase is underway and far enough along to be followed by the drilling phase and subsequently the recording phase these three activities will be ongoing as essentially one continuous effort. During the survey phase, the shot holes and receiver stations will be located and marked. Next, the shot holes will be drilled and loaded with explosive charges. Finally, the recording phase will comprise deploying the recording equipment, detonating the charges and recording the reflected energy.

Initially surveying will begin by locating and flagging shot holes and receiver points primarily using a global positioning system. This methodology reduces cutting vegetation to the maximum extent possible because line-of-sight is not required to determine a point. In high canopy and wooded areas, the conventional optical survey method will be required. Biodegradable flagging will be used to mark these points. Shot hole locations in standing water will be marked with cane poles. Cane poles, flagging and any other debris will be removed as source holes are shot and while receiver lines are being retrieved and any related adverse impacts will be mitigated at that time. Any alligator nests, mammalian dens, study and research areas, or known cultural sites will be avoided by offsetting the shot hole or receiver points. All environmentally sensitive areas traversed by source and receiver lines will be so noted by flagging with biodegradable tape of a unique color, and the tape removed as these lines are shot and receivers retrieved.

The shot hole drilling crew will follow the survey crew. Any drilling in open water will be accomplished by airboat, while in the predominating marsh area drilling will be accomplished utilizing, wherever possible, lightweight, wide-track, narrow, aluminum vehicles designed to minimize impacts on marsh vegetation. Such vehicles allow for vegetation to return to position following vehicle passage. Heavier and narrower swamp buggies will be used in overstory swamps and firmer transitional upland terrain. In standing or flowing water, drills will be fitted with silt curtains to minimize turbidity flow to the surrounding environment. Drilling will require a water source to supply a fluid medium to assist the process and this is discussed above in the "Use of Water" section.

For each source point, energy will be derived by the detonation of a nine pound charge of biodegradable dynoseis explosive which will be placed approximately 100 feet below the surface of the ground. The charges will be double capped to insure detonation of the explosive. In the event of a misfire no attempt to re-drill, reload and detonate any source point will be made.

Most of the proposed source points are located in the floating marsh environment. Only at those locales with firm substrate, where the source hole does not naturally close up, will bentonite be added to direct the force of the detonation downward. In these locales the

remainder of the shot hole will be backfilled with drill cuttings. If insufficient substrate exists to totally backfill a hole, a plastic "spider" or metal "hat" will be placed at a depth of 24 inches to bridge the hole. Native soil and/or vegetation will then be used as the top component of fill. Any remaining substrate will be spread around the hole in such a manner as to not to alter the original ground elevation by more than .25 inches. Where applicable, to prevent excessive settling, compaction and/or rutting of soils and vegetation, drilling units will be placed on planking.

After drilling personnel have completed the shot holes, the receiving line crew will deploy seismometers, recording boxes and cables along the surveyed receiver lines. The receiving and recording method to be utilized here is the Opseis Eagle Telemetry System. This system allows less cable to be spread by using relatively small recording boxes along the lines. Utilizing radio telemetry allows for the primary recording unit to be placed well away from the receiving lines. Therefore, this unit will be positioned outside the boundaries of the Preserve. Seismometers are encased within a cylindrical, waterproof housing and measure two inches in diameter with a height of six inches.

During receiver line deployment, the first priority is to avoid any sensitive area or location either by offsetting the line and/or by seeking to pass through areas where exotic species predominate. Clearing small passageways through tree and brush lines, including sensitive Wax Myrtle thickets, may be unavoidable at times. Said passageways will not exceed 36 inches in width. Branches of wetland vegetation having a diameter of two inches or greater will not be cut. Any cuts will be made flush with main stems. No cutting or impacts to baldcypress trees will be allowed. The deployment, maintenance and recovery of the receiver line equipment used in the seismic survey should require less but no more than eight passes on any one line. Equipment positioned on-line will move in one direction only and not move past or go by other equipment. Immediately prior to detonation, personnel will visually inspect the area to make certain there are no visible signs of people or wildlife near the source point. After detonation of the explosive charge, personnel will remove all markers and flagging, inspect the location for any other debris and correct any adverse impacts. As work progresses and the recording of seismic data

is completed, all equipment will be removed from the inspected area and moved forward in the survey.

Recording instruments, battery charging generators and antenna mast will be placed on a lift barge. As mentioned above, this platform will be located outside of the boundaries of the Preserve.

Surveying work within the boundary of the Preserve will utilize three surveying crews. It is estimated that it will take these crews, with no inclement weather, two weeks to complete their work here. After the survey crews have identified approximately six lines of source points, drilling operations will commence. The drilling phase could commence as early as 6 to 10 days after the initiation of the survey effort. Using two drilling crews to excavate shot holes, place charges and cap the shot holes will require a total of approximately 10 days in the field. After approximately six shot lines have been drilled up, the detonating and recording crews will be deployed and the recording phase will be initiated. Detonation and receiver line crews could conceivably be deployed as early as 15 days after the initiation of survey operations. Total time for recording activities is estimated to be 21 days. After initiation of the recording phase, there should be continuous ongoing activities of surveying, drilling and recording of data within the Preserve. Total estimated time that operations would be ongoing within the Preserve's boundary is 38 days.

1.4.6 Hurricane Evacuation

The proposed survey will be conducted and completed within the middle of the 2001 hurricane season. Should the threat of a hurricane occur during the survey and drilling phases of the project, equipment and personnel can be evacuated from the area in just a few hours. Egress from the Park to the Pier 90 Marina would use the same route as described for access to the Park (Figure 1.4.1). The evacuation would begin while the storm is in the Gulf and 24 to 36 hours before it is forecast to move onshore. Equipment would be loaded aboard trailers or truck transportation at the Pier 90 Marina and moved inland via Highway U.S. 90.

Should the threat occur while recording operations are in progress, the evacuation would have to begin earlier. When a spread is fully deployed, several days are required to recover all of the cables, recording boxes and geophones that are on the ground. This work

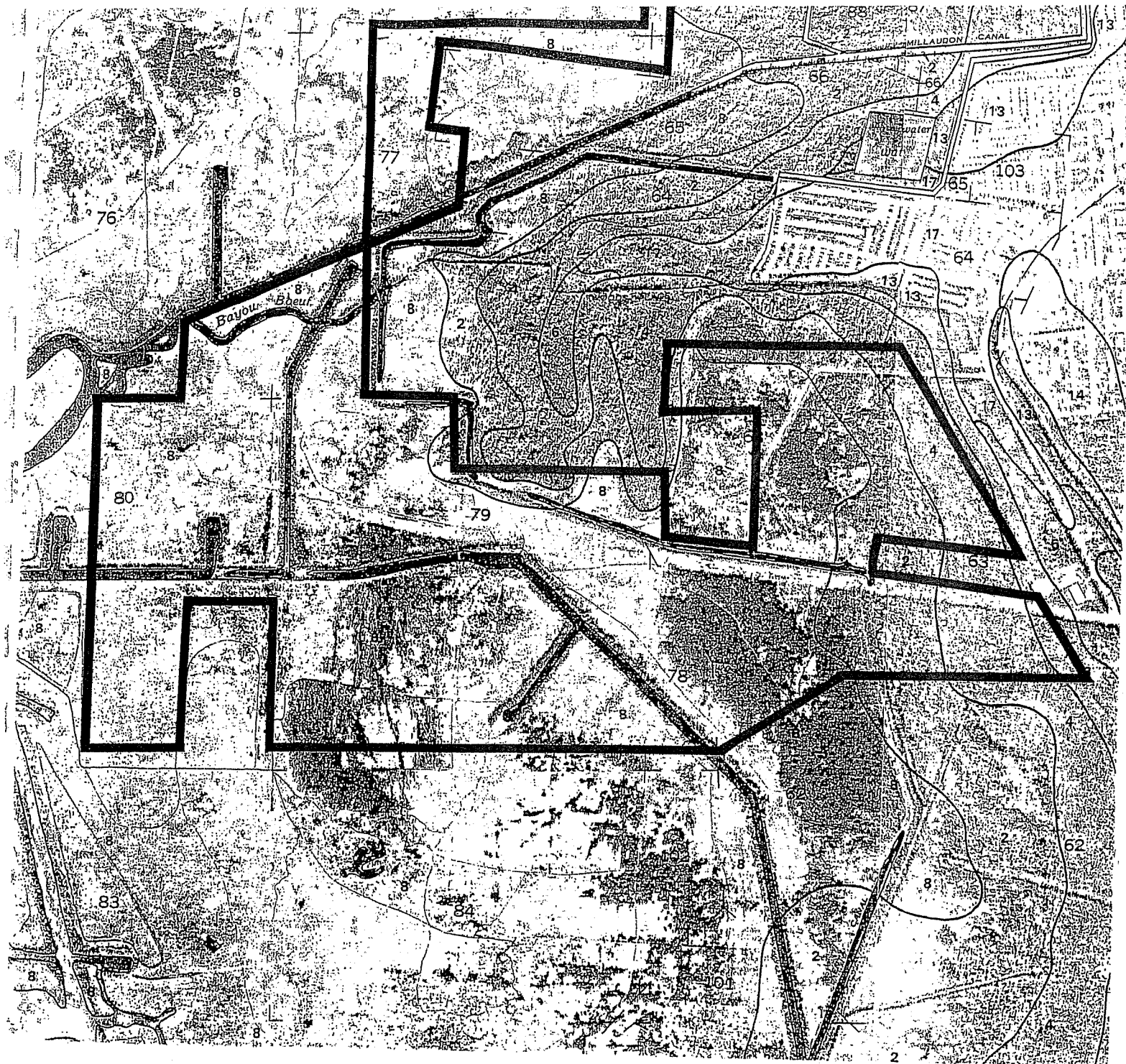
would begin after the storm enters the Gulf of Mexico and is forecast to strike the Alabama, Mississippi, or Louisiana coast. Personnel would first pick up the boxes containing recording and telemetry electronics and return them to their storage trailers. They would then begin picking up cables and geophones. This equipment would be transferred to the docks where it would be loaded onto trucks so that it can be removed farther inland if necessary. All of these operations must be completed at least eight hours prior to the hurricane's first squalls are due to appear. At that time, all equipment not recovered will remain on the ground.

CURRENTLY EXISTING ENVIRONMENTAL CONDITIONS IN THE BARATARIA PRESERVE AND ADJACENT AREAS

This section represents an assessment of environmental conditions currently existing in the Preserve. This assessment covers inherent geology, soils, water quality, aquatic environment, terrestrial environment, air quality, cultural resources, threatened or endangered species, species of special concern and sensitive environmental areas, all of which could potentially be impacted by the proposed seismic survey.

2.1 GEOLOGY AND SOILS

The proposed seismic survey is located near the outer margin of the Gulf Coastal Plain that dips seaward toward the Gulf of Mexico at three to six degrees. The dominant structural feature within the Gulf Coastal Plain is the Mississippi Embayment. This broad area of subsidence has more or less coincided with the Mississippi drainage system since at least the Jurassic Period. Sedimentation along the gulf coast as result of this large drainage system and the resultant downwarping due to sediment loading has resulted in an abnormally thick sedimentary section here. Sedimentary thickness may approach 50,000 to 100,000 feet in the project area. This zone of thickening runs parallel to the continental shoreline and is known as the Gulf Coast Geosyncline. (Murray, 1961). This extraordinary accumulation of sediments, including abundant reservoir quality sands, in conjunction with dynamic structural deformation accounts for south Louisiana being one of the largest oil and natural gas provinces in the nation.



LEGEND

	Outline of Barataria Preserve Survey Area
8	Kenner Muck
2	Allemands Muck
4	Barbary Muck
6	Commerce Silty Clay Loam
13	Sharkey Clay
17	Commerce Silt Loam

Figure 2.1 Soils Present in and Around the Barataria Preserve Survey Area
(Soil Survey of Jefferson Parish, Louisiana, 1983)

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The present deltaic plain of the proposed seismic survey area was fairly recently reworked during the Pleistocene and Holocene epochs of the Quaternary Period by fluvial action of the Mississippi River and by sporadic incursions of marine sedimentary influences. A primary factor in the development of the survey area's geology and topography has been the ongoing process of diversion of the Mississippi River. River diversion occurs when overbank flows breach the natural levee system and create a major new crevasse splay of sediment and distributary channels. At least six of these geologically recent events are recognized as specific Mississippi River deltaic lobes. Of these, the St. Bernard and Lafourche ancestral deltas had the greatest impact upon the survey area's distributary pattern. (Baumann and Adams, 1981).

These distributary channels and sporadic marine incursions were primary factors in the formation of the soil types presently found within this general area. Soil formation and type are determined by a combination of parent material, topography, climate, soil organisms, vegetation and time. As defined and depicted by the U.S. Department's soil survey of Jefferson and St. Charles parishes, the preponderant soil in this large general area, including the Preserve, is the Kenner muck, a unit of the Kenner series (Figure 2.1). This is level, very poorly drained, semi fluid, organic soil common to freshwater marshes. It is flooded or ponded most of the time. The Kenner series of soils are rapidly to very rapidly permeable and formed from herbaceous plant material in freshwater marshes. The extreme northeastern portion of the current Preserve area lies along the edge of rising higher land to the north. The eastern margin of the Preserve is also represented by higher forested swampland. Here the soils present, along with the Kenner muck, include the Allemand muck and the Barbary muck. The Allemand muck is level, very poorly drained semifluid organic soil common to marshland. The Allemand series of soils are very slowly permeable and formed from moderately thick accumulations of decomposed herbaceous material and the underlying clayey alluvium. The Barbary muck is level, very poorly drained, semifluid mineral soil common to swamps and commonly parallels natural levees. The Barbary series of soils formed from clayey alluvium and are very slowly permeable. Both are flooded or ponded most of the time. As land elevation rises just to the north of and along the east edge of the Preserve, other soils present include the Commerce silty clay loam, Commerce silt loam, and Sharkey clay. These level, elongated, poorly

to somewhat poorly drained, firm mineral soils occur in low to intermediate positions along natural levees. The Commerce series of soils are moderately slow permeable and formed from loamy alluvium while the Sharkey series are very slowly permeable and formed from clayey alluvium. All soil series and associations in this area are hydric soils and therefore possess redoximorphic features common to this parameter of wetlands (U.S. Department of Agriculture, 1983 and 1987).

The pedogenic process within the proposed survey area has been altered due to man-made flood control initiated in the early part of this century. This included the placement of levees along the present Mississippi River. Soil forming sediments from the fluvial action of overbank discharges have been replaced by pedogenic attributes of decomposing vegetation, especially in the interior freshwater marshes. Beneath the floating mat of vegetation, a zone of colloidal suspension comprised of decomposing plant debris exists which varies from 3 to 10 feet deep. The greater depths of this colloidal suspension are typically found in the freshwater marsh's interior.

2.2 TERRESTRIAL AND AQUATIC ENVIRONMENTS

2.2.1 Vegetation

Three hundred thirty-five species of herbaceous and woody plants are known to exist within the Jean Lafitte National Historical Park and Preserve; however, a small number of species account for the majority of the vegetative cover (White, 1988). Table 2.2.1 lists the most common species encountered in the survey's predominant environment which is represented by freshwater marsh, canals and canal spoil banks. Appendix 1, included in the back of this report, is an extensive list of plants species of known or probable occurrence within Jean Lafitte National Historical Park and Preserve. This list was derived from the National Park Service's Park Species database on March 13, 2001.

Within the Barataria Preserve survey area there are four primary vegetative land cover classifications. These and their approximate proportional percentage are bulltongue/spike-rush in the predominant freshwater marshes (70%), wax myrtle in the scrub-shrub wetlands (20%), and forested transitional overstory along natural levees, spoil



LEGEND



Outline of Barataria Preserve Survey Area



Wax Myrtle Scrub/shrub Wetlands



Wooded Overstory and Swamplands



The Remaining Predominant Vegetation Cover is
Bulltongue/spikerush in a Freshwater Marsh Setting

Figure 2.2.1 Primary Vegetation Cover Within and Around the Barataria Preserve Survey Area

[illegible]

banks and particularly along the east side of the Preserve (less than 10%). (Figure 2.2.1)

TABLE 2.2.1

PLANT SPECIES THAT MAY COMMONLY INHABIT THE FRESHWATER MARSHES, CANALS AND CANAL SPOIL BANKS WITHIN THE BARATARIA PRESERVE OF THE JEAN LAFITTE NATIONAL HISTORIC PARK AND PRESERVE.	
Scientific Name	Common Name
<i>Polygonum punctatum</i>	Dotted smartweed
<i>Sagittaria lancifolia</i>	Bulltongue
<i>Vigna luteola</i>	Deerpea
<i>Eleocharis fallax</i>	Spikerush
<i>Phyla lanceolata</i>	Frog-fruit
<i>Panicum hemitomon</i>	Maidencane
<i>Aster tenuifolius</i>	Aster
<i>Lemna sp.</i>	Duckweed
<i>Sabal minor</i>	Dwarf palmetto
<i>Eleocharis flavescens</i>	Spikerush
<i>Eichhornia crassipes</i>	Water hyacinth
<i>Acer negundo</i>	Boxelder
<i>Sapium sebiferum</i>	Chinese tallow
<i>Myrica cerifera</i>	Wax myrtle
<i>Salix nigra</i>	Black willow
<i>Quercus nigra</i>	Water oak
<i>Quercus virginiana</i>	Live oak
<i>Acer Rubrum</i>	Red Maple
<i>Taxodium distichum</i>	Bald cypress
<i>Nyssa aquatica</i>	Water tupelo
<i>Ceratophyllum demersum</i>	Coontail
<i>Cabomba caroliniana</i>	Carolina fanwort
<i>Azolla caroliniana</i>	Mosquito fern

The dominant community within the proposed project area is freshwater marsh subtended by a floating mat. Primary species of the marsh community include bulltongue and maidencane with interspersed assemblages of wax myrtle. Other small, isolated assemblages include cattail and possibly some saltmeadow cordgrass. The herbaceous species listed in table 2.2-1 cover over 80% of the surface area within the Park's freshwater marshes.

Open waters of canals possess floating aquatic vegetation such as water hyacinth, duckweed and mosquito fern. Dominant submerged aquatic plants include coontail and Carolina fanwort. Interior open water areas within the freshwater marsh sporadically contain white water lily.

The majority of the overstory vegetation in the immediate area occurs just north of the Preserve. A portion of this higher forested area to the north and east extends into the northern edge of and along the eastern margin of the Preserve. Palustrine, forested, permanently flooded areas commonly contain baldcypress, water tupelo and red maple in the overstory with dwarf palmetto locally in the understory. Linear-aligned overstory communities are common along natural levees and spoil banks of canals within the proposed project area. Species here include red maple, boxelder, black willow, water oak, live oak, water tupelo, and baldcypress. A pure stand of Chinese tallow tree exists along the northern half of Bayou Segnette as well as being widespread throughout the park. This exotic species also exists within many areas of the wax myrtle thickets found throughout the proposed project area.

2.2.2 Hydrology and Water Quality

During modern time the hydrology and chemistry of the Barataria Basin have been altered by both natural and anthropogenic changes in the basin. Elimination of overbank flooding, levee construction, canal construction, and agriculture have combined to alter the basin from a flow-through estuary to an estuary where hydrology and chemistry are largely determined by precipitation and tides. Elimination of overbank flooding by levees along the Mississippi River has reduced the sedimentary input to the detrital based food chain of these coastal freshwater marshes. Canal construction has increased flow through rather than across the freshwater marsh and circumvented the natural assimilative capacity of these marshes. Spoil banks associated with dredged canals further exacerbate the lack of natural sheet flow over the marshes additionally reducing assimilative capacity. These hydrological alterations are subsequently passed on through the trophic levels of the existing food chain. Presently, re-suspended bay bottom sediments and decomposing vegetation are the major sources of detrital input to these marshes. The abnormally low amounts of rainfall the past few years, including the year 2000, within

the southeastern United States, has undoubtedly, added to the stress on coastal wetlands.

Due to urban development and agriculture to the north of the proposed survey area, high levels of nutrients and sediments have been introduced into upland runoff. Urbanization has altered the natural hydrology of the basin by increasing upland runoff volumes as a result of the construction of impervious man made surfaces. Increased runoff volume, sediment loads, and available nutrients have led to the eutrophication of the waters of the upper Barataria Basin and in some areas has led to hypereutrophication (Conner and Day, 1987).

The middle basin, such as that in the area of Lake Salvador, and southwest of the Park, experiences tidal effects that act to flush the marshes more efficiently than the non-tidal upper basin. This effective flushing works to reduce the trophic state from eutrophic in the upper basin to mesotrophic in the middle basin areas.

Surface water assessments performed in 1996 by the Louisiana Department of Environmental Quality for the Barataria Basin designated water body segment 020701 (Segnette Bayou near Westwego) as water quality limited. Designated uses of water are ranked according to "Degree of Support." Degree of support represents the overall uses that a water body can support based on the numerical average of values assigned to individual use categories. These use categories include primary contact recreation, secondary contact recreation, and fish and wildlife propagation. Bayou Segnette near Westwego was designated as not supporting primary contact recreation, partially supporting secondary contact recreation, and not supporting fish and wildlife propagation. Suspected causes were linked to organic enrichment, low dissolved oxygen, pathogenic indicators, and oil and grease.

Additionally, water quality parameters and biological information for the Jean Lafitte National Historical Park and Preserve were collected monthly between April, 1981 and March, 1982 (Garrison, 1982). Four sampling location areas were within or adjacent to the proposed project area. Two of these locations were on Bayou Segnette and two were on the Kenta Canal. Dissolved oxygen concentrations ranged from 0.8 to 13.1 parts per million (i.e., mg/L). Dissolved oxygen is a measure of the balance between oxygen

producing organisms and oxygen consuming organisms and is one of the most important parameters affecting a freshwater aquatic ecosystem. Sufficient concentrations of dissolved oxygen are necessary to sustain a healthy and diverse assemblage of invertebrates and fish. The Environmental Protection Agency criteria for dissolved oxygen is 5 parts per million for most warm water organisms. Below this level impairment in reproduction and life stages occur. Concentrations below 4 parts per million can cause acute mortality in many freshwater aquatic organisms (United States Environmental Protection Agency, 1986).

Average dissolved oxygen concentrations for the two sites along the Kenta Canal were 5.3 and 5.2 parts per million respectively. One of these sites fell below this threshold level for acute mortality to fish and macroinvertebrates on four occasions during July and August of 1981 and February of 1982. The other location also dropped below this minimum level from July through September of 1981. Sampling along the Segnette Canal possessed higher dissolved oxygen concentrations averaging 7.5 and 7.9 parts per million annually; however, both fell below or equaled this threshold limit causing acute mortality to fish and macroinvertebrates from July to September of 1981.

Other physiochemical constituents of the water column here were in acceptable ranges according to the standards set by the United States Environmental Protection Agency (1986). These water quality parameters include turbidity, pH, biochemical oxygen demand and nitrates. Phosphorus, however, was above the limits prescribed by the United States Environmental Protection Agency (1986).

Average annual phosphorus concentrations for the two locations along the Kenta Canal were 0.79 and 1.22 parts per million and 0.63 and 2.2 parts per million along the Segnette Canal. The Environmental Protection Agency standards for total phosphates as phosphorus should not exceed 0.05 parts per million in any stream at the point where it enters a lake or reservoir (United States Environmental Protection Agency, 1986). Elevated levels of phosphorous can stimulate excessive or nuisance growth of algae and lead to accelerated eutrophication. Phosphorus concentrations above 0.001 parts per million have been reported as lethal levels for important marine and estuarine species and also may result in significant bio-accumulation (United States Environmental Protection Agency, 1976).

Phytoplankton numbers were relatively low at all sites ranging from 1.8 cells/Liter to 1,700 cells/Liter in the Segnette Canal. By comparison approximately 1,000,000 cells/Liter constitutes an algal bloom. Overall community diversity for phytoplankton was low at all three sites, and all sites were dominated by a small number of genera. These included Cyclotella sp., Agmenellum sp., Anacystis sp., Oscillatoria sp., Scenedesmus sp., Melosira sp., and Lyngbya sp. which are moderately pollution tolerant organisms (United States Environmental Protection Agency, 1973).

Benthic macroinvertebrates are organisms that live at least part of their life attached or resting on available substrates in an aquatic environment. Like phytoplankton, species of the benthic community have been used as indicators of water quality. Sampling locations in the Kenta and Segnette Canals were dominated by Bezzia sp., Probezzia sp., Chaoborus sp., Garnmarus sp., Chironomus sp., and Gleodichironomus sp. that may tolerate somewhat degraded environments. This does not unequivocally mean the canals and open water areas are excessively polluted; however, it is notable that the obligate aquatic organisms present here are those near the base of the food web which are able to tolerate adverse conditions.

2.2.3 Fish

The Jean Lafitte National Historical Park and Preserve's database provides documentation of those ichthyofaunal species that have been found within the park; however, documentation relative to habitat for these obligate aquatic species remain unknown. Table 2.2.3 lists those species that may occur within the major portion of the Preserve which is represented by freshwater marshes, canals and canal spoil banks. This list includes forty-six freshwater and euryhaline species. Appendix 2, included in the back of this report, is a list of fish species of known or probable occurrence within Jean Lafitte National Historical Park and Preserve. It was provided by the National Park Service's Park Species database on March 13, 2001. The assemblage of fish species here may be limited in part to those possessing the ability to withstand reduced or low oxygen concentrations, especially during the summer and early fall. Other species such as killifish may also inhabit these areas at any time due to their ability to obtain oxygen from the air-water interface (i.e. meniscus).

TABLE 2.2.3

FISH SPECIES THAT MAY OCCUR IN THE FRESHWATER MARSHES AND CANALS WITHIN THE BARATARIA PRESERVE OF THE JEAN LARITTE NATIONAL HISTORIC PARK AND PRESERVE.	
Scientific Name	Common Name
<i>Dasyatis sabina</i>	Atlantic stingray
<i>Lepisosteus oculatus</i>	Spotted gar
<i>Lepisosteus spatula</i>	Alligator gar
<i>Amia calva</i>	Bowfin
<i>Elops saurus</i>	Lady fish
<i>Anguilla rostrata</i>	American eel
<i>Brevoortia patronus</i>	Gulf menhaden
<i>Dorosoma cepedianum</i>	Gizzard shad
<i>Anchoa mitchilli</i>	Bay anchovy
<i>Cyprinus carpio</i>	Common carp
<i>Notemigonus crysoleucas</i>	Golden shiner
<i>Ameiurus melas</i>	Black bullhead
<i>Ameiurus natalis</i>	Yellow bullhead
<i>Ictalurus furcatus</i>	Blue catfish
<i>Ictalurus punctatus</i>	Channel catfish
<i>Ptyodictis olivaris</i>	Flathead catfish
<i>Aphredoderus sayanus</i>	Pirate perch
<i>Strongylura marina</i>	Atlantic needlefish
<i>Cyprinodon variegatus</i>	Sheepshead minnow
<i>Fundulus chrysotus</i>	Golden topminnow
<i>Fundulus confluentus</i>	Marsh killifish
<i>Fundulus grandis</i>	Gulf killifish
<i>Fundulus pulvereus</i>	Bayou killifish
<i>Lucania parva</i>	Rainwater killifish
<i>Gambusia affinis</i>	Western mosquito fish
<i>Heterandria formosa</i>	Least killifish
<i>Poecilia latipinna</i>	Sailfin molly
<i>Menidia beryllina</i>	Tidewater silverside
<i>Centrarchus macropterus</i>	Flier
<i>Elassoma zonatum</i>	Banded pygmy sunfish
<i>Lepomis cyanellus</i>	Green sunfish
<i>Lepomis gulosus</i>	Warmouth
<i>Lepomis humilis</i>	Orange spotted sunfish
<i>Lepomis macrochirus</i>	Bluegill
<i>Lepomis microlophus</i>	Redear sunfish
<i>Lepomis punctatus</i>	Spotted sunfish

<i>Lepomis symmetricus</i>	Bantum sunfish
<i>Micropterus salmoides</i>	Largemouth bass
<i>Pomoxis nigromaculatus</i>	Black crappie
<i>Cynoscion nebulosus</i>	Spotted sea trout
<i>Leiostomus xanthurus</i>	Spot
<i>Sciaenops ocellatus</i>	Red drum/Red fish
<i>Mugil cephalus</i>	Striped mullet
<i>Dormitator maculatus</i>	Fat sleeper
<i>Paralichthys lethostigma</i>	Southern flounder
<i>Trinectes maculatus</i>	Hogchoker

2.2.4 Herpetofauna

Seventy-four species of amphibians and reptiles are known to inhabit or have ranges encompassing the Park. Thirty-two of these species (43%) may be found in the majority of the Preserve survey area which is represented by freshwater marsh or canal habitats and are listed in Table 2.2.4. Appendix 3 and Appendix 4, included in the back of this report, is a list of amphibian and reptilian species, respectively, of known or probable occurrence within Jean Lafitte National Historical Park and Preserve. This list was obtained from the National Park Service's Park Species database as of March 13, 2001. Herpetofaunal species, like mammals, are more abundant along spoil banks and levees

TABLE 2.2.4

HERPETOFAUNAL SPECIES THAT MAY INHABIT THE FRESHWATER MARSHES AND CANALS WITHIN THE BARATARIA PRESERVE OF THE JEAN LAFITTE NATIONAL HISTORIC PARK AND PRESERVE.	
Scientific Name	Common Name
<i>Siren intermedia</i>	Lesser siren
<i>Notophthalmus viridescens louisianensis</i>	Eastern newt
<i>Amphiuma triadactylum</i>	Three-toed amphiuma
<i>Ambystoma texanum</i>	Small-mouth salamander
<i>Desmognathus auriculatus</i>	Southern dusky salamander
<i>Eurycea quadridigitata</i>	Dwarf salamander
<i>Bufo valliceps</i>	Gulf coast toad
<i>Bufo w. woodhouseii</i>	Woodhouse's toad
<i>Acris c. crepitans</i>	Northern cricket frog
<i>Hyla cinerea</i>	Green treefrog
<i>Hyla squirella</i>	Squirrel treefrog
<i>Pseudacris crucifer</i>	Spring peeper
<i>Pseudacris triseriata</i>	Striped chorus frog

<i>Gastrophryne carolinensis</i>	Eastern narrow-mouthed toad
<i>Rana catesbeiana</i>	Bullfrog
<i>Rana c. clamitans</i>	Bronze frog
<i>Rana grylio</i>	Pig frog
<i>Rana utricularia</i>	Southern leopard frog
<i>Kinosternon subrubrum</i>	Eastern mud turtle
<i>Sternotherus odorata</i>	Common musk turtle/stinkpot
<i>Chelydra s. serpentina</i>	Common snapping turtle
<i>Macrolemys temminckii</i>	Alligator snapping turtle
<i>Chrysemys picta</i>	Southern painted turtle
<i>Dieröchlus r. reticularia</i>	Eastern chicken turtle
<i>Graptemys kohnii</i>	Mississippi map turtle
<i>Graptemys pseudogeographica</i>	False map turtle
<i>Malaclemys terrapin pileata</i>	Mississippi diamondback terrapin
<i>Pseudomys c. concinna</i>	Eastern river cooter
<i>Trachemys scripta elegans</i>	Red-eared slider
<i>Terrapene carolina</i>	Eastern box turtle
<i>Trionyx spinifer</i>	Spiny softshell
<i>Anolis carolinensis</i>	Green anole
<i>Eumeces fasciatus</i>	Five-lined skink
<i>Eumeces laticeps</i>	Broad-headed skink
<i>Scincella lateralis</i>	Ground skink
<i>Coluber constrictor lantrunculus</i>	Black-masked racer
<i>Elaphe obsoleta lindheimeri</i>	Texas rat snake
<i>Farancia abacura reinwardtii</i>	Western mud snake
<i>Lampropeltis getula holbrooki</i>	Speckled kingsnake
<i>Lampropeltis triangulum amaura</i>	Louisiana milk snake
<i>Nerodia cyclopion</i>	Western green water snake
<i>Nerodia fasciata confluens</i>	Broad-banded water snake
<i>Nerodia erythrogaster flavigaster</i>	Yellow-bellied water snake
<i>Nerodia r. rhombifer</i>	Diamondback water snake
<i>Opheodrys a. aestivus</i>	Rough green snake
<i>Regina rigida</i>	Delta crayfish snake
<i>Regina grahamii</i>	Graham's crayfish snake
<i>Storeria dekayi linnetes</i>	Marsh brown snake
<i>Thamnophis proximus orarius</i>	Gulf Coast ribbon snake
<i>Thamnophis s. sirtalis</i>	Eastern garter snake
<i>Agkistrodon piscivorus</i>	Western cottonmouth
<i>Sistrurus miliarius streckeri</i>	Western pygmy rattlesnake
<i>Alligator mississippiensis</i>	American alligator

rather than in the marsh proper. These higher areas provide needed dry ground for adults and are the preferred sites for basking and hibernation (Conner and Day, 1987).

2.2.5 Birds

The Park's wildlife is clearly dominated by its inherent avifauna. Three hundred twenty-six species are known to inhabit or have geographic ranges encompassing the Park. Sixty-nine species (21%) may commonly inhabit the freshwater marshes and canals which comprise most of the proposed Preserve survey area (Table 2.2.5). These chiefly consist of native and migratory waterfowl and wading birds. The rest, associated with freshwater marshes and canals, are considered to be rare migrants or uncommon residents (Daily field list for the birds of the Barataria Preserve, Jean Lafitte National Historical Park). Appendix 5, included in the back of this report, is a list of bird species present at least part of the year in Jean Lafitte National Historical Park and Preserve as presented in the National Park Service's Bird Check List database as of March 13, 2001.

Waterfowl begin arriving in the Barataria Basin about mid-August with the appearance of blue-winged teal, but the majority of the waterfowl do not begin arriving until October with numbers continuing to increase into mid-winter. The mottled duck which is common in freshwater marshes and the wood duck that prefers wooded streams or swamps, are the only species of waterfowl nesting in the Barataria Basin (Conner and Day, 1987).

Because the mottled duck is commonly found in freshwater marshes, its nesting and food habits will be discussed briefly. Ducklings most commonly feed on scuds (Amphipods) and midge larvae (Chironomids) for the first two weeks of life. At three to nine weeks of age the diet consists primarily of seed material from bullrush, widgeon grass (*Ruppia* sp.), southern water nymph, and spike rush. Late summer food for mottled ducks of all ages is composed primarily of rice. Fall and winter food sources vary greatly, and change quickly in response to sudden changes of habitat with most feeding occurring in recently inundated marshes or prairies after significant rain events (Stutzenbaker, 1988).

Mottled ducks nest in a variety of habitats but most often choose well-drained sites where large, grassy areas of saltmeadow cordgrass

and rough cordgrass (*Spartina spartinae*) are dominant. The peak nesting period for mottled ducks occurs between March and May but may extend as late as October or coinciding with the occurrence of the first frost. Mottled ducks are determined nesters and utilize their lengthy breeding season to compensate for earlier nesting failures. Mottled duck females have been known to re-nest as many as four times during one breeding season (Stutzenbaker, 1988).

The Barataria Preserve of the Jean Lafitte National Historical Park and Preserve supports limited numbers of mottled ducks. The inherent vegetation is not a primary food source. Therefore, disturbance of nesting ducks or feeding habitat within the project area will be minimal.

The migratory or over-wintering puddle ducks (e.g. mallards, and green-winged and blue-winged teal) are most common in shallow, fresh and intermediate marsh ponds surrounding Lake Salvador, Lake Boeuf, and Lac des Allemands (Conner and Day, 1987). Jean Lafitte National Historical Park and Preserve is preponderantly comprised of freshwater marsh subtended by a floating mat. Open water of the interior is typically less than one-tenth of an acre in size, thereby limiting the habitat available for use by these puddle ducks.

TABLE 2.2.5

AVIAN SPECIES THAT MAY COMMONLY INHABIT THE FRESHWATER MARSHES AND CANALS WITHIN THE BARATARIA PRESERVE OF THE JEAN LAFITTE NATIONAL HISTORIC PARK AND PRESERVE DURING AT LEAST PART OF THE YEAR	
Scientific Name	Common Name
<i>Podilymbus podiceps</i>	Pied-billed grebe
<i>Phalacrocorax auritus</i>	Double-crested cormorant
<i>Ardea herodias</i>	Great blue heron
<i>Botaurus lentiginosus</i>	American bittern
<i>Bubulcus ibis</i>	Cattle egret
<i>Butorides striatus*</i>	Green-backed heron
<i>Casmerodius albus</i>	Great egret
<i>Egretta caerulea</i>	Little blue heron
<i>Egretta tricolor</i>	Tricolored heron
<i>Ixobrychus exilis*</i>	Least bittern
<i>Nyctanassa violaceus</i>	Yellow-crowned night heron
<i>Nycticorax nycticorax</i>	Black-crowned night heron

<i>Eudocimus albus</i> *	White ibis
<i>Plegadis chihi</i>	White-faced ibis
<i>Plegadis falcinellus</i>	Glossy ibis
<i>Aix sponsa</i>	Wood duck
<i>Anas acuta</i>	Northern pintail
<i>Anas americana</i>	American wigeon
<i>Anas fulvigula</i> *	Mottled duck
<i>Anas crecca</i>	Green-winged teal
<i>Anas discors</i>	Blue-winged teal
<i>Anas platyrhynchos</i>	Mallard
<i>Anas strepera</i>	Gadwall
<i>Cathartes aura</i>	Turkey vulture
<i>Coragyps atratus</i>	Black vulture
<i>Pandion haliaetus</i>	Osprey
<i>Accipiter cooperii</i>	Cooper's hawk
<i>Accipiter striatus</i>	Sharp-shinned hawk
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Buteo platypterus</i>	Red-shouldered hawk
<i>Circus cyaneus</i>	Northern harrier
<i>Falco sparverius</i>	American kestrel
<i>Fulica americana</i>	American coot
<i>Gallinula chloropus</i> *	Common moorhen
<i>Porphyryla martinica</i> *	Purple gallinule
<i>Porzana carolina</i>	Sora
<i>Rallus elegans</i> *	King rail
<i>Rallus limicola</i>	Virginia rail
<i>Charadrius vociferus</i>	Killdeer
<i>Himantopus mexicanus</i> *	Black-necked stilt
<i>Actitis macularia</i>	Spotted sandpiper
<i>Calidris alpina</i>	Dunlin
<i>Calidris fuscicollis</i>	White-rumped sandpiper
<i>Calidris himantopus</i>	Stilt sandpiper
<i>Calidris mauri</i>	Western sandpiper
<i>Calidris melanotos</i>	Pectoral sandpiper
<i>Calidris minutilla</i>	Least sandpiper
<i>Calidris pusilla</i>	Semipalmated sandpiper
<i>Gallinago gallinago</i>	Common snipe
<i>Limnodromus griseus</i>	Short-billed dowitcher
<i>Limnodromus scolopaceus</i>	Long-billed dowitcher
<i>Tringa flavipes</i>	Lesser yellowlegs
<i>Tringa melanoleuca</i>	Greater yellowlegs

<i>Tringa solitaria</i>	Solitary sandpiper
<i>Sterna forsteri</i>	Forster's tern
<i>Bubo virginianus</i>	Great horned owl
<i>Ceryle alcyon</i>	Belted kingfisher
<i>Tyrannus tyrannus</i>	Eastern kingbird
<i>Tachycineta bicolor</i>	Tree swallow
<i>Cistothorus palustris</i>	Marsh wren
<i>Cistothorus platensis</i>	Sedge wren
<i>Anthus rubescens</i>	American pipet
<i>Lanius ludovicianus</i>	Loggerhead shrike
<i>Geothlypis trichas*</i>	Common yellowthroat
<i>Ammodramus leconteii</i>	Leconte's Sparrow
<i>Melospiza georgiana</i>	Swamp sparrow
<i>Melospiza melodia</i>	Song sparrow
<i>Agelaius phoeniceus*</i>	Red-winged blackbird
<i>Quiscalus major*</i>	Boat-tailed grackle
* Denotes species that have been known to breed in the park.	

Common diving duck species of the area (i.e. redhead, ring-necked duck, canvasback, and lesser scaup) feed in a variety of habitats including the shallow freshwater marshes where molluscs and insects are their main source of food. However, the preponderant diet of these species consists of leaves and stems of aquatic plants found in deeper, open waters (Kortright, 1967).

Wading birds are found in a variety of habitats throughout the year, but their nesting habits are quite specific. Great egrets and great blue herons nest in mature cypress trees and water tupelo. Smaller egrets, herons and ibis prefer to nest in smaller trees and shrubs near ponds and swamps (Portnoy 1977). Avian species that are secretive and nest in deep freshwater marsh areas are likely to be more disturbed by the proposed seismic survey than those more arboreal nesting species. These species include the red-winged blackbird, king rail, and American bittern. Some disruption of nesting, loss of eggs or fledgling mortality will possibly occur due to air boat or light weight aluminum vehicle trampling effect. If these nesting disruptions do occur, there should be no significant effects to local populations due to re-nesting potential. Furthermore, survey crews will mark all visible nests along ingress and egress areas to minimize and avoid impacts to the extent practicable for these inherent nesting avian species.

2.2.6 Mammals

Fifty-nine species of mammals are known to inhabit or have ranges that encompass Jean Lafitte National Historical Park and Preserve. Thirteen species (21 % of the total species) may be found in or near that major portion of the Preserve survey area which is represented by freshwater marshes and/or canals (Table 2.2.6), and six of the thirteen species (10% of the total species) have been documented in freshwater marsh habitats within the park (Rossman and Demastes, LSU Museum of Natural History). Appendix 6, included in the back of this report, is a list of mammal species of known or probable occurrence within Jean Lafitte National Historical Park and Preserve as presented in the National Park Service's Park Species database on March 13, 2001.

Small mammals are found throughout Barataria Basin and are most common along ecotones (Conner and Day, 1987). Most dens and nest sites are found on the higher ground of levees and the spoil banks of canals. Such higher ground areas represent a relatively small portion of the Preserve's seismic survey area.

TABLE 2.2.6

MAMMALS THAT MAY INHABIT THE FRESHWATER MARSHES AND CANALS WITHIN THE BARATARIA PRESERVE OF THE JEAN LAFITTE NATIONAL HISTORIC PARK AND PRESERVE DURING AT LEAST PART OF THE YEAR	
Scientific Name	Common Name
<i>Didelphis virginiana</i>	Opossum
<i>Dasyus novemcinctus</i>	Nine-banded armadillo
<i>Canis latrans</i>	Coyote
<i>Procyon lotor</i>	Raccoon
<i>Mustela vison</i>	North American mink
<i>Lutra canadensis latrix</i>	River otter
<i>Sus scrofa</i>	Wild boar
<i>Odocoileus virginianus</i>	White-tailed deer
<i>Castor canadensis</i>	American beaver
<i>Ondatra zibethicus</i>	Muskrat
<i>Oryzomys palustris</i>	Marsh rice rat
<i>Myocastor coypus</i>	Nutria
<i>Sylvilagus aquaticus</i>	Swamp rabbit

2.3 ARCHEOLOGICAL AND HISTORICAL RESOURCES

Archeological investigations have been fairly well documented within the proposed survey area due to federal projects associated with developments of the U.S. Army, Corps of Engineers or surveys by personnel associated with the Jean Lafitte National Historical Park and Preserve. Beginning with Giardina (1969), at least 16 reports, surveys, assessments or analyses have been conducted within or adjacent to the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve including Beavers, 1977, 1982, 1982a; Franks, 1988; Gagliano, 1978; Gendel, 1984; Giardina, 1969, 1984; Goodwin, 1985; Holmes, 1986; Neuman, 1975, 1975a; Goodwin and Associates, 1985; Speaker, 1986; Swanson, 1988; and Young, 1985.

The archeological sequence in Louisiana is not precisely defined; however, a general scheme has been established.

Paleo-Indian Era 10000 B.C.-6000 B.C.

The earliest people probably reached Louisiana after 10,000 BC as indicated by artifacts found in association with the remains of Pleistocene mammals at the Trappey Mastodon site, cordage of cane at the Avery Island site and a Clovis point at the John Pearce site. Fluted and unfluted lanceolate points of the Clovis, Folsom, Scottsbluff, Plainview and Meserve types are the only confirmed evidence of this period. Later in this era, Dalton and San Patrice type points replaced the Clovis prototypes with bifacial fluting replacing the single flake fluting. ,

During the early Paleo-Indian era, native American populations were wide ranging, following herds of Pleistocene megafauna and leaving few traces of their campsites. As this era began to wane, the traditional nomadic pattern began to shift as man exploited local floral and faunal resources. The ensuing population stabilization and localization resulted in the development of diverse regional cultural patterns.

Meso-Indian Era 6000 B.C.-2000 B.C.

During the early portion of this era, the settlement pattern continued to localize and native Americans began to exploit a greater diversity of natural resources. Additions of mortars, pestles, mealing stones and pipes provide evidence that the people were knowledgeable

of plants as food. Also, shell, copper and other raw materials were widely used and traded during this era, and human interments began.

Although the close of the Meso-Indian Era is often considered to mark the first appearance of horticulture, the transition is not clear, and the subsistence base of many groups did not shift at this time. Generally, the appearance of pottery and the shift from dart points to arrow points is considered evidence of the termination of this era. For example, the bow and arrow replaced the atlatl that presumably appeared in this era. However, the appearance of pottery and arrow points was not simultaneous and in many cases, dart points persisted well into the Neo-Indian Era. Stone projectile points diagnostic of this era include Morrow Mountain, Marshall, Frio, Tortugas, Ensor, Wells, Macon, Gary, Marcos, Morhiss, Trinity, Carrollton and Kirk.

Neo-Indian Era 2000 B.C.-1600 A.D.

The Neo-Indian Era may be divided into several foci depending upon the classification scheme. This report follows Neuman (1984) denoting seven distinct cultures that developed during this time frame. These cultures include the Poverty Point, Tchefuncte, Marksville, Troyville-Coles Creek, Caddo, Plaquemine and Mississippian.

The Poverty Point culture from 2000 B.C. to 800 B.C. developed along coastal areas on natural levees and associated stream terraces. Characteristic of their occupation were small sites circumscribing large regional centers. These regional centers possessed large earthen constructions and an extensive trade network of finished materials. These objects included lapidary work, fiber tempered pottery, stone tools, baked clay objects and steatite bowls. The Linsley site, uncovered during the construction of the Mississippi River Gulf outlet, dates from this cultural period from approximately 1740 B.C. Therefore, confirmed human occupation near the proposed survey area dates to this cultural period.

The Tchefuncte Culture that existed from approximately 500 B.C. to 400 A.D. is probably one of the earliest cultures known to produce ceramic pottery and which occupied locations within the Jean Lafitte National Historical Park and Preserve. Other small villages were located on natural levees, in backwater areas and dome formations near the survey area. The Big Oak Island, Little Woods and Little Oak Island sites are all associated with this culture and located near the

proposed survey area in the vicinity of Lake Pontchartrain. Due to the proximity of productive marshes, clams (Rangia cuneata) make up the principal component of the midden mounds. Remains of other species such as white-tailed deer, ducks, raccoons, beaver, muskrat, otter, bear, gray fox, catfish and alligator gar have also been found within these mounds. Other analogous locations such as the Copell site occupy approximately the same latitude in southern Louisiana. Although the Tchefuncte culture was later in the Neo-Indian era, the earthen mound building was not as impressive nor did this culture have an elaborate trade network as the previous Poverty Point culture. The Tchefuncte culture did, however, produce a greater quantity of ceramic pottery than the previous Poverty Point culture.

The Marksville Culture constructed conical mounds located primarily within the Red River Valley of Louisiana and southeastward to the Gulf Shores area of Alabama between 1 A.D. and 500 A.D. This culture possessed a large trade network due to the diverse artifacts found within their funerary mounds. These artifacts, included copper panpipes, mica, galena, earspools, bracelets, beads, mica figurines, ceramic figures and green stone celts. These artifacts suggest a regional manifestation of the vast Hopewellian complex from the Illinois River Valley; however, the Marksville culture's subsistence base that included chipped-stone points, knives, scrapers, ground-stone atlatl weights and plummetts are analogous to the preceding Tchefuncte culture. Coastal sites are associated with natural levees and cheniers sitting on shell middens where ceramic pottery is prevalent. Pottery designs with animal motifs were common. These sites extended from the Sabine River to the Chandeleur Islands and included the Jean Lafitte National Historical Park and Preserve area.

The Troyville/Coles Creek Culture between 400 A.D. and 1200 A.D. built flat topped, pyramidal shaped tumuli used as substructures for religious and ceremonial buildings rather than funeraries of the earlier Marksville Culture. Pottery of this culture is generally larger than that of the previous Marksville culture, decorated in checkered stamping which is confined generally to the upper half of the object and typically lacking animal motifs. In the inland portions of Louisiana, socio-religious structures surrounded open plazas, while along coastal areas, diverse shell middens were associated with these mounds as found within the Jean Lafitte National Historical Park and Preserve.

The larger midden mounds were used by previous and successive cultures that either placed cane (*Arundinaria*), clay or other associated building materials above the base layer to form culturally related structural features. Although there is a stratifying effect, it belies the pits, trenches and other excavations of successive cultures for funerary, pottery production or other occupational features. In both structure and form, these socio-religious architectural monuments emulate those of Meso-America but not as expansive.

The Meso-American influence may also have emanated in the use of cultigens such as squash and bottle gourds in the middle of this era circa 325 B.C., while corn first appeared in Louisiana artifacts about 400 A.D. and beans about 1000 A.D. Plant horticulture further assisted sedentism of the cultures by providing food for a larger population in a specific area and later grown in combination would provide better soil conditions for a greater length of time in a specific area. However, the abundant natural resources associated with the coastal environments throughout the year may have precluded the use of horticulture as a significant source of food.

The Caddo Culture was principally located in northwest Louisiana, Oklahoma and Texas; however, coexistence occurred briefly and near the western and northwestern extension of the Troyville-Coles Creek culture. Other principle developments attributed to the Caddo Culture are the bow and arrow, cultigens (e.g. corn, beans and squash) and cranial deformation. Northeast within the Mississippi Alluvial Valley, the Plaquemine Culture also coexisted with the Caddo Culture.

The Plaquemine Culture occupied a triangular region with a base covering the Louisiana coastal zone, including the Jean Lafitte National Park and Preserve, and forming an apex near Greenville, Mississippi. At this northern estimated terminus, the Plaquemine Culture also coexisted with the Mississippian Culture. Archaeological manifestations of the Plaquemine culture indicate a protohistoric development of the Troyville-Coles Creek Culture from 1000 A.D. to 1600 A.D. Pottery design, small stone projectile points, clay ear ornaments and ground stone celts link the Plaquemine and Troyville-Coles Creek cultures as well do mass burial funerary practices. The Plaquemine Culture constructed circular and rectangular, multi staged mounds that are the

classic development of temple mound construction in the lower Mississippi Alluvial Valley. These circular, stepped mounds typically possessed plazas between them with smaller round or rectangular domiciles indicating a class-structured society.

Characteristic Plaquemine ceramics include striated vessel exteriors from pre-fired rubbing of the clay possibly with vegetation, shell tempered clays, projecting handles on vessel rims, and the absence of stamped designs.

The Plaquemine and Mississippian Cultures, if they are separable, coalesced into some of the largest, ceremonial-residential centers existing in the prehistoric period. The Cahokia site along the Mississippi River in Illinois occupies a rectangular area of 6.5 square miles. The ceremonial complex of these mound builders is a notable characteristic of this culture. Mississippian vessels were diverse from short to tall, globular with straight, recurved or everted rims; plain and compound long-necked bottles; straight rimmed plates; deep and shallow bowls; gourd forms; footed vessels; and vessels with strap and loop handles. These ceramics were manufactured by shell tempering from pulverized particles incorporated into the unfired clay. Decorative motifs were also applied to the ceramics in addition to positive and negative painting. Effigy vessels often depicted fish, reptiles, amphibians, birds, mammals and humans. Mississippian prehistoric remains have been found within the Jean Lafitte National Park and Preserve.

Prior to the historic period, the ceremonial complex declined due in part to the warring factions of the purported chiefdoms that controlled this agrarian based culture. In Louisiana, the Taensas, Ouachas, Tchaouachas and Chitimachan groups were historic heirs of this Mississippian Culture. Recent evidence supports the theory that the Tchaouachas and Ouachas resided in the area until at least the 1850's (Swanson, et.al., 1991).

Historical Time

European explorations along the Louisiana coast and the Mississippi River initially included Spanish expeditions by Alonso Alvarez Pineda, Alvar Nunez Cabeza de Vaca, and Hernando De Soto. Later French exploration efforts were made by Marquette and Joliet. In 1682, de La Salle claimed the territory for France and named the land

for Louis XIV. In 1718, New Orleans was founded, and French plantations were the dominant agrarian base. In 1762 with the First Peace of Paris, Louisiana was ceded to Spain and Spanish rule ensued until the Treaty of San Ildefonso in 1800 where Louisiana again became a French colony. In 1803, the United States, during Thomas Jefferson's presidency, bought the Louisiana territory for 15 million dollars from Napoleon. In 1812, Louisiana became the 18th state. Since that time the Barataria basin has supplied New Orleans and Louisiana with seafood products of shrimp, crabs and fish. Since the 1930's, this area has been a large producer of natural gas and oil.

2.3.1 Known Prehistoric and Historic Sites

Over 80 prehistoric and historic known sites have been located on overall Jean Lafitte National Historical Park and Preserve lands. Coordination with the Louisiana Heritage section of the Louisiana Department of Wildlife and Fisheries, produced 20 known historical and archeological sites within or immediately adjacent to the total proposed seismic survey area. No sites exist within that northern portion of the Preserve that is included in the proposed survey area. The closest site is the Estelle Canal site which lies approximately one-fourth of a mile to the north of the Park (Figure 2.3.1). This site is located on a ridge extending westward from a subdivision of the town of Marrero. There is a cluster of archaeological sites within the Park but these are situated approximately two miles south of the southern boundary for the proposed survey area. Nearby others are scattered around Bayou Bardeaux and Lake Salvadore to the west and southwest. The location of all known archaeological sites within the proposed area of operations have been posted on Seitel's survey and other base maps.

The National Register of Historic Places lists 17 locations in Jefferson and St. Charles parishes (Table 2.3.1).

The Barataria Preserve of the Jean Lafitte National Historical Park and Preserve was listed on October 15, 1966. The Barataria Preserve was established in 1978 by Public Law 95-625 of 16 USC 230, Section 901, *et sequentia*. This preserve was established to "preserve for the education, inspiration, and benefit of present and future generations, significant examples of natural and historical resources of the Mississippi Delta region and to provide for their interpretation in such manner as to portray the development of cultural diversity in the region".

TABLE 2.3.1

SITE LIST OF THE NATIONAL REGISTER OF HISTORIC PLACES IN JEFFERSON AND ST. CHARLES PARISHES, LOUISIANA.	
Historic Site	Parish
Destrehan Plantation	St. Charles
Dorvin House	St. Charles
Homeplace Plantation House	St. Charles
Kenner and Kugler Cemeteries Archeological District	St. Charles
LaBranche Plantation Dependency	St. Charles
Ormond Plantation House	St. Charles
Barataria Preserve of Jean Lafitte Historical Park Historic District	Jefferson
Camp Parapet Powder Magazine	Jefferson
Crockett, David, Fire Hall and Pumper	Jefferson
Felix-Block Building	Jefferson
Fort Livingston	Jefferson
Gretna Historic District	Jefferson
Harahan Elementary School	Jefferson
Kenner Town Hall	Jefferson
Magnolia Lane Plantation House	Jefferson
Old Jefferson Parish Courthouse	Jefferson
St. Joseph Church-Convent of the Most Holy Sacrament Complex	Jefferson

2.4 AIR QUALITY

Air quality within the proposed survey will only be affected by the emissions of carbon monoxide from combustion engines associated with air boats, light aluminum tracked and other vehicles. The national ambient air quality standard is set at 35 parts per million for a one hour average by the Environmental Protection Agency.

A primary standard sets a limit to protect public health, including the health of the "sensitive" population sector such as asthmatics, children and the elderly as prescribed by the Clean Air Act amendments of 1990. From monitoring stations in New Orleans, Louisiana at the city park and Tulane Medical Center, there were no values that exceeded or even approached the standard of 35 parts per million from 1994 through 1996 (Louisiana Department of Air Quality, 1997) (See Table 2.4). The air quality during these three years relative

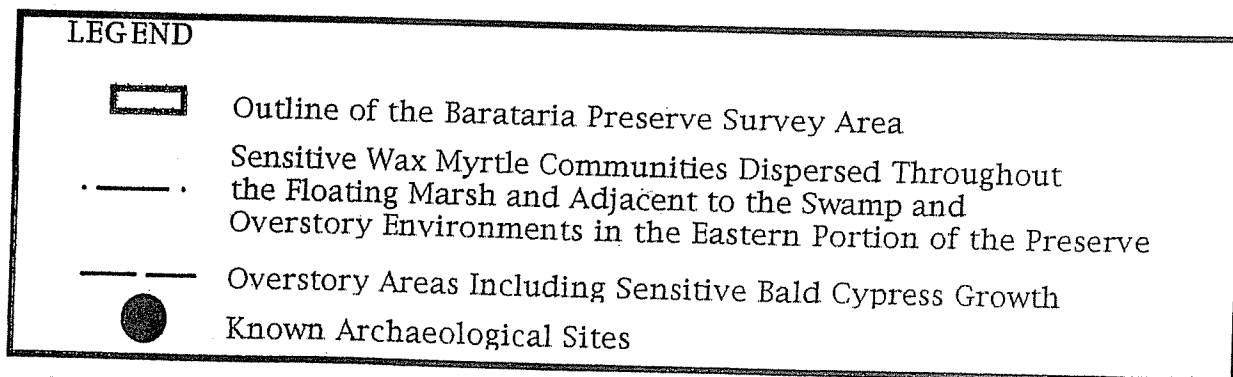


Figure 2.3.1 Environmentally and Culturally Sensitive Areas Within and Near the Barataria Preserve



to concentrations of carbon monoxide appears to be improving, especially at the Tulane Medical Center monitoring station.

TABLE 2.4

ANNUAL CARBON MONOXIDE LEVELS AT TWO MONITORING STATIONS IN NEW ORLEANS, LA., FROM 1994-1996			
Year/Station	High PPM (Date)	Number of Samples	Mean PPM
1996			
New Orleans (City Park)	5.7 (12/03)	8,415	0.6
New Orleans (Tulane Medical Center)	11.2 (12/03)	7,933	1.1
1995			
New Orleans (City Park)	5.0 (11/25)	8,275	0.5
New Orleans (Tulane Medical Center)	10 (01/26)	8,556	1.2
1994			
New Orleans (City Park)	6.0 (02/25)	8,184	0.8
New Orleans (Tulane Medical Center)	10.0 (02/26)	8,570	1.4

Ambient carbon monoxide does not appear deleterious to public health even at stations located in a large metropolitan area such as New Orleans. Ambient carbon monoxide concentrations near the proposed survey area should be less than source emissions from any major metropolitan area.

2.5 RECREATIONAL RESOURCES AND MAN-MADE FEATURES

The Barataria Preserve of the Jean Lafitte National Historical Park and Preserve provides recreational opportunities and activities for the general public which includes a visitor center, canoe trails, hiking trails along the spoil bank ridges of canals, boardwalks, and approximately 14 miles of waterways for motor boats. These facilities lie considerably south of the proposed survey area. Commercial swamp tours, wildlife observation, and hunting are also popular recreational pursuits here; however, hunting is mostly limited to white-tailed deer inhabiting wax myrtle thickets and higher forested areas. Thus, the planned operations by Seitel should be out of sight and audio range for most if not all of the visitors to the Preserve.

Several exploratory dry holes drilled over the years are scattered throughout the Preserve and adjacent lands. These were plugged and abandoned immediately after being drilled. As shown on topographic exhibit, Figure 1.4.1, a buried pipeline is present in the southwestern portion and overhead lines in the central portion of Preserve lands included in the survey outline. Three radio towers and their access road are located on or adjacent to the preserve near its east side. These are readily apparent on the included topographic and aerial exhibits. Prior to any drilling or detonation operations, the geophysical contractor will notify, via the internet, all companies having utility, pipeline or other facilities within the area of their intentions. These companies will pinpoint the location of their respective lines and/or above-ground structures. Offset distances for shot point locations will be mutually agreed to at this time. In discussion with National Park personnel, they pointed out the locations of several camp and/or home sites in the western portion of the Preserve lands to be surveyed. These will be given utmost consideration while conducting operations in the near vicinity.

Park personnel also made Seitel aware of an ongoing research effort in the southern portion of the Preserve survey area.

2.6 THREATENED AND ENDANGERED SPECIES, STATE SPECIES OF SPECIAL CONCERN AND SENSITIVE ENVIRONMENTAL AREAS

2.6.1 Threatened and Endangered Species

Table 2.6.1 lists a combination of federal and state threatened and endangered wildlife species which may or could occur periodically during the year in Jean Lafitte National Historical Park and Preserve. The table also lists four species of threatened and endangered plants in Louisiana. While the presence of a particular species may not be documented, the possibility of occurrence within the park was given due consideration. The list follows the U.S. Fish and Wildlife Service's (Division of Endangered Species) special reprint of 50 CFR 17.11 and 17.12 and is current as of December 31, 1997. Research of U.S. Fish and Wildlife Service's library revealed no addition to this endangered species list since the date of this publication.

Seitel's seismic permitting executives along with Jim Underwood, Plan of Operations consultant, met with Ms. Karen Soileau and other U.S. Fish and Wildlife Service personnel on 01/12/2001 in Baton

Rouge. The primary endangered or threatened species concern discussed involved bald eagle nesting within the survey area. Mr. Hulslander with Jean Lafitte National Historical Park and Preserve was at this meeting and in March of this year contacted USFWS for written documentation of approval or a letter of no objection.

TABLE 2.6.1

THREATENED AND ENDANGERED SPECIES (ANIMALS AND PLANTS)			
Common Name	Scientific Name	Federal Status	State Status
Louisiana black bear*	<i>Ursus americanus luteolus</i>	Threatened	Threatened
Jaguar	<i>Panthera onca</i>	Endangered	Not listed
Cylindrical lioplax	<i>Lioplax cyclostomaformis</i>	Candidate	Not listed
Sturgeon chub	<i>Macrhybopsis gelida</i>	Candidate	Not listed
Bald eagle*	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened
American peregrine falcon*	<i>Falco peregrinus anatum</i>	Endangered	Endangered
Peregrine falcon	<i>Falco peregrinus</i>	Endangered (S/A)	Not listed
Inflated heelsplitter	<i>Potamilus inflatus</i>	Threatened	Threatened
West Indian manatee	<i>Trichechus manatus</i>	Endangered	Endangered
Louisiana pearlshell	<i>Margaritifera hembeli</i>	Threatened	Threatened
Pink mucket pearlymussel	<i>Lampsilis abrupta</i>	Endangered	Endangered
Brown Pelican*	<i>Pelecanus occidentalis</i>	Endangered	Endangered
Piping plover	<i>Charadrius melodus</i>	Endangered	Endangered
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	Threatened	Threatened
Pallid sturgeon	<i>Scaphirynchus albus</i>	Endangered	Endangered
Least tern*	<i>Sterna antillarum</i>	Endangered	Endangered
Gopher tortoise	<i>Gopherus polyphemus</i>	Threatened	Threatened
Loggerhead sea turtle	<i>Caretta caretta</i>	Threatened	Threatened
Ringed map turtle	<i>Graptemys oculifera</i>	Threatened	Threatened
Black-capped vireo	<i>Vireo atricapillus</i>	Endangered	Endangered
Red-cockaded woodpecker	<i>Picoides borealis</i>	Endangered	Endangered
Earth-fruit	<i>Geocarpon minimum</i>	Threatened	Threatened
Louisiana quillwort	<i>Isoetes louisianensis</i>	Endangered	Endangered
Pondberry	<i>Lindera meliisifolia</i>	Endangered	Endangered
American chaffseed	<i>Schwalbea americana</i>	Endangered	Endangered
Notes:			
S/A = Threatened or endangered due to similarity of appearance			
* = Species has been identified within the boundary of Jean Lafitte NHPP			

Louisiana Black Bear

The Louisiana black bear is one of sixteen subspecies of the American black bear (Hall, 1981). The Louisiana black bear often overwinters in hollow cypress trees in or along sloughs, lakes, or riverbanks. These bears are extremely mobile, herbivorous omnivores that consume a variety of foods. The distribution of foods and habitat for rearing young largely determines the extent of their movements and consequently their home range.

Necessary elements of black bear habitat include hard and soft mast, escape cover, den sites, corridor habitats, and some freedom of disturbance from man. These necessary elements are found primarily in extensive areas of bottomland hardwood habitat. Currently only two known breeding populations of the Louisiana black bear exist. These breeding populations occur within the Tensas River Basin of Franklin, Madison, and Tensas Parishes, and the Atchafalaya River Basin of south central Louisiana. There are reported sightings of the bears outside of these two locations, but it is unknown whether these bears are reproducing or only wandering sub adults and males (US Fish and Wildlife Service, 1995).

Jaguar

Although reinstated as a federally endangered species in September, 1997, the Jaguar is not specifically listed as threatened or endangered in Louisiana. The Jaguar is included here because its historic range includes portions of Louisiana (Lowery, 1974); however, there are no known populations of jaguar in Louisiana. The historic accounts of Lowery (1974) were from two published newspaper articles in the *Donaldsonville Chief* in 1886. In Lowery's account, this species was only given a provisional status in Louisiana.

Cylindrical Lioplax

The cylindrical lioplax is a gill breathing snail in the family Viviparidae. It lives in mud, under large rocks, and in rapid currents of streams and river shoals. A single collection of this species has been reported from the Tensas River, Madison Parish, Louisiana; however, there are no subsequent records beyond the Alabama-Coosa River system. Current searches of the Tensas River in Louisiana by Fish and Wildlife Service biologists (1995) have found no evidence of the species or its typical habitat. This cylindrical lioplax is currently

known only from a fifteen mile stretch of the Cahaba River in Shelby and Bibb Counties, Alabama.

Sturgeon Chub

The sturgeon chub has recently been added as a candidate for possible addition to the federal threatened and endangered species list and Louisiana is identified as part of its historic range. This chub inhabits the open channels of large, silty rivers and occurs in swift current over a substrate of sand or fine gravel. Further documentation of this species is unknown.

Bald Eagle

Once designated as an endangered species in 43 states, the bald eagle's status has been reclassified to threatened throughout conterminous United States. The bald eagle's historic range includes the area of the Jean Lafitte National Historical Park and Preserve, where it is regularly seen. This eagle is primarily riparian in nature, often associated with coasts, rivers, and lakes, and nests near bodies of water, where it feeds. In the southeast, nesting occurs primarily in Florida, South Carolina, and coastal Louisiana. Nests are usually constructed in living, dominant pines or baldcypress, however standing snags are occasionally used. Seven nest sites are listed in the area within and near the southwest corner of the proposed survey area. The Preserve is within the area routinely foraged by one nesting pair. In coordination with and through the Louisiana Natural Heritage Program all known bald eagle nest locations have been spotted on Seitel's base maps.

American Peregrine Falcon

Considered neotropical migrants, these falcons nest from northern Alaska and Canada to Greenland. Wintering habitat includes Mexico, Central and South America, and the southern United States. This wintering range includes the area of Jean Lafitte National Historical Park and Preserve, where it is occasionally seen. A cliff or series of cliffs that dominates the surrounding landscape constitutes typical nesting habitat; however, river cut banks, trees, and manmade structures have been also utilized as nesting structure. The falcon's decline has been attributed to chlorinated pesticides (e.g. DDT).

Inflated Heelsplitter

The inflated heelsplitter is a freshwater clam known historically from the Amite and Tangipahoa Rivers in Louisiana, the Pearl River in Mississippi, and the Tombigee, Black Warrior, Alabama, and Coosa Rivers of Alabama. The presently known distribution is limited to the Amite River, Louisiana, and the Tombigee and Black Warriors Rivers, Alabama (Hartfield, 1989). The clam's preferred habitat is soft, stable substrate in slow to moderate currents.

West Indian Manatee

The West Indian manatee is a large gray or brown aquatic mammal. They inhabit both fresh and saline waters from 5 to 19 feet in depth, throughout their range. During the winter months, the United States' population is confined to the southern half of Florida's peninsular coastal waters and north to warm water outfalls of Georgia's southeast coast. During the summer months, they migrate north to coastal Virginia and westerly to Louisiana's Gulf Coast. Louisiana appears to be the western extent of the manatee's range, and the inclusion of the species as part of Louisiana's mammalian fauna is based on two individuals found dead and one single sighting (Lowery, 1974).

Louisiana Pearshell

The Louisiana pearshell is a freshwater mussel restricted to Louisiana streams. This mussel was previously thought to inhabit 11 streams in the Bayou Beouf drainage system in Rapides Parish, Louisiana; however, surveys in 1991 and 1992 found this species' range extended to eight streams within the Red River system of Grant Parish, Louisiana. U.S. Fish and Wildlife reclassified this species from endangered to threatened in 1993. The typical habitat for this species is flowing water at depths from 12 to 20 inches over sand and gravel substrates.

Pink Mucket Pearlymussel

The pink mucket pearlymussel is listed as an endangered species within the state of Louisiana probably due to its historic range. The pink mucket pearlymussel's primary habitat is within the lower Mississippi and Ohio Rivers and their larger tributaries over gravel or sand.

Brown Pelican

Although brown pelicans were extirpated from the Louisiana coast during the 1960s, the species has been successfully reintroduced. Nesting for the brown pelican is generally confined to the Carolinas, Florida, Louisiana, and the Caribbean. These pelicans nest in colonies on small coastal islands typically in mangroves; however, ground nesting has also been reported. Feeding occurs primarily in shallow estuarine waters, where brown pelican numbers have increased following the elimination of organochlorine pesticides. It is now a common post-breeding visitor to the Preserve.

Piping Plover

The piping plover is an endangered species in several northern states and threatened throughout the Gulf Coast states, including Louisiana. Piping Plovers nest along sandy beaches of the Atlantic Coast, gravelly shorelines of the Great Lakes and river sandbars throughout the Great Plains region. These birds are primarily confined to coastal habitats during the winter, preferring areas with expansive sand or mudflats in close proximity to a sandy beach. The primary threats to the piping plover are habitat modification, habitat destruction, and human disturbance to nesting adults and flightless chicks.

Gulf Sturgeon

Historically, this subspecies has occurred in most major rivers from the Mississippi River to the Suwannee River in Florida and marine waters of the central and eastern Gulf of Mexico. Gulf sturgeons are anadromous fish with a diet consisting of amphipods, isopods, crustaceans, and marine worms. Spawning occurs February through April in large coastal rivers.

Pallid Sturgeon

Listed as endangered in 1990, the pallid sturgeon's historic range included the middle and lower Mississippi River, the Missouri River, and the lower reaches of the Kansas, Platte and Yellowstone Rivers. Their preferred habitat is over bottom substrates of large, turbid, relatively warm, free-flowing rivers. Anthropogenic alteration of large river systems is reported to be the primary cause of decline.

Least Tern

The least tern's range includes the Jean Lafitte National Historical Park and Preserve where this species occurs as an uncommon visitor and migrant. Preferred nesting sites include salt flats, sandbars, and barren shores or other bare ground habitat, as well as gravel roof tops in the New Orleans area. Foods consist primarily of fish, and most pairs nest in association with wide shallow rivers. Population declines have been attributed to reservoir construction, river channelization projects, recreational use of sandbar areas and predators.

Gopher Tortoise

This species inhabits sandy coastal plain areas from extreme southern South Carolina to the southeastern corner of Louisiana. This tortoise's preferred habitat is transitional areas associated with a pine overstory. Habitat requirements also include an open understory with grass and forb groundcover and amply sunlit nesting areas.

Loggerhead Sea Turtle

Five species of threatened and endangered sea turtles are known to occur in the Gulf of Mexico; however, only one species, the loggerhead sea turtle, is considered to be threatened in Louisiana, as listed by the U.S. Fish and Wildlife Service in Region 4. The loggerhead inhabits inshore bays, lagoons, salt marshes, ship channels and mouths of large rivers. Though a preference for a variety of mollusks and crustaceans is apparent, loggerheads will feed on a variety of marine invertebrates and vegetation. Loggerheads have been reported to nest on the Chandeleur Islands of Louisiana; however, sea turtles do not nest in the Barataria basin (Conner and Day, 1987).

Ringed Map Turtle

This species occurs in the Pearl River's main channel from near its mouth upstream to Neshoba County, Mississippi, and in the Bogue Chitto River from its confluence with the Pearl River upstream to near Franklinton, Louisiana. The turtle's habitat is primarily riverine in nature, where current is moderate and basking logs are available. Nesting habitat consists of large, high sand and gravel bars adjacent to the river.

Black-Capped Vireo

Inclusion of the black-capped vireo in the list for Louisiana is probably an error. No records of occurrence within the Jean Lafitte

National Historical Park and Preserve have been found. This insectivorous species prefers range land habitat with scattered clumps of shrubs separated by open grassland.

Red-cockaded Woodpecker

This bird's range is closely linked to the distribution of southern pines which occur from east Texas and Oklahoma eastward to Florida. Preferred nesting habitat includes mature open stands of pines of the 80 to 100 year age class. Foraging habitat comprises pine and pine-hardwood stands, although dense hardwood stands are usually avoided. No known sightings of this woodpecker in the park have occurred.

Earth-Fruit

Currently, the only known populations of earth-fruit are in Missouri and Arkansas. No known specimens have been taken from Louisiana, but it is included as a threatened species within the state. Earth-fruit grows on moist, sandy soils and on bare mineral soils of the Lefe and Wing Series.

Louisiana Quillwort

The Louisiana quillwort is a small, grass-like, aquatic plant closely related to ferns. The only known occurrence is in Washington and St. Tammany Parishes, Louisiana. It occurs predominately on sand and gravel bars in small to medium sized streams.

Pondberry

Pondberry is a deciduous shrub that reproduces by stolons. Pondberry's historic range included one unidentified site in Louisiana. No known populations now occur within the state. Pondberry is associated with wetland habitats, ponds, depressions and bottomland hardwood habitat. The plants may grow in open, sunlit habitats although they are typically found in shaded areas. The most significant threat to the pondberry is habitat conversion to other uses.

American Chaffseed

American chaffseed is an erect perennial herb typically found in sandy, acidic, seasonally moist to dry soils. The only known historic record of American chaffseed in Louisiana is now considered to be erroneous.

2.6.2 State Species of Special Concern

In coordination with the Louisiana Natural Heritage Program, it has been determined that nine species of special concern may have ranges that include the proposed survey area or are known to occur within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve. These species of special concern may occupy habitats that are near the extremity of their range or comprise only 5 to 20 existing populations within the state. These species of special concern include one plant and eight vertebrate species.

The only plant species of special concern is the creeping spikerush (Eleocharis fallax) that is known to occur within the Barataria Preserve. The vertebrate species include one amphibian, five avian and two mammalian species. The two-toed amphiuma is included in the list as a result of known range; however, this species has not been collected within the Barataria Preserve.

Avian species of particular concern include Cooper's hawk (Accipiter cooperii), roseate spoonbill (Ajaia ajaja), reddish egret (Egretta rufescens), and glossy ibis (Plegadis falcinellus). Cooper's hawk and glossy ibis are present year round within the Barataria Preserve, and Cooper's hawk may nest in forested areas. The reddish egret is a rare winter visitor. The roseate spoonbill might wander to the Barataria Preserve, although this species has not been sighted.

The two mammalian species include long-tailed weasel (Mustela frenata) and eastern spotted skunk (Spilogale putorius); however, no known specimens have been collected. The long-tailed weasel is listed only due to its reported range within the area (Lowery, 1974a).

2.6.3 Environmentally Sensitive Areas

In discussion with personnel of the National Park Service, two general types of habitat were deemed to be most environmentally sensitive in this area. These were wax myrtle thickets interspersed within and along the edge of the floating marsh and baldcypress trees located in the eastern and northernmost portions of the Park. The largest contiguous assemblage of wax myrtle in the vicinity of the Park extends along the eastern edge of the marsh and adjacent to and west of higher forested lands to the east. This relatively wide strip of wax myrtles extends northward through the eastern part of the Preserve. This assemblage, as it exists in the northeasterly corner of the park, is

somewhat unusual. As per our meeting with the Jean Lafitte personnel on November 30, 2000, the thickets here are unusually large and thick, sit atop a very thick floating mat (as much as one meter thick) and harbor a rather unique understory vegetation locally. Extreme precautions will be taken here.

Wax myrtle thickets will be avoided to the maximum extent practically possible. The following criteria shall be adhered to: Drilling crews will not cross through the thickets during their part of the seismic survey; receiver line crews, if necessary, may lay their lines through the thickets but may cut no more than a 36 inch wide pathway; no cutting of wax myrtle limbs or native wetlands vegetation 2 inches or greater in diameter will be allowed; and all such cuttings will be made flush with main stems. No cutting or other negative impact to baldcypress trees will be allowed.

Specific locations for these sensitive environmental areas are depicted in Figure 2.3.1 and Figure 2.2.1.

ANALYSIS AND INTERPRETATION OF SURVEY IMPACT ON CURRENTLY EXISTING ENVIRONMENTAL CONDITIONS

3.1. GEOLOGY AND SOILS

There would be no impacts to the geology of the seismic survey area. The deep Holocene sediments previously deposited by the Mississippi River would not be impacted except that any excess cuttings from drilling operations could transpose some of the inherent layering of the sediments.

Soil compaction or rutting as a consequence of equipment movement was a primary concern addressed during early meetings with personnel of the National Park Service. Even slight changes in ground elevation can result in habitat changes in coastal freshwater. Furthermore, ruts could lead to an unnatural drying allowing further invasion of exotics such as the Chinese Tallow tree. Excessive rutting could result in loss of the floating marsh and changes in species composition of the Barataria Preserve. To avoid and minimize the potential for these negative impacts, lightweight aluminum vehicles will be utilized wherever possible. Furthermore, vehicular passes will

be kept to a minimum by using these vehicles and small tender airboats in combination.

The only purposeful removal of soil in the Preserve would be due to drilling operations. This represents a displacement of approximately 14.57 square feet of the soil surface and a volume of approximately 53.96 cubic yards of material. However, assuming 85 percent of the drill cuttings will be returned to those shot holes that are drilled in dry firm substrate locales, would reduce this estimated total volume somewhat. Receiver points within the Barataria will have only transient environmental affect. The seismometers will be pushed into the substrate and the hole will fill quickly within the freshwater marshes of the Barataria Preserve. Receiver points will have minimal environmental effect upon the soils here.

No Action Alternative: This alternative would result in no impact on soils of the Preserve but represents no acquisition of objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact to Park lands, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of existing data in subsequent locating and drilling here is unlikely, but, in the event it was, would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. The disturbance and impacts spatially and as to degree of severity on the soils of the Park or adjacent wetlands due to probable non-beneficial and unnecessary ingress, drilling and egress operations would be much greater than those caused by the proposed operations.

Less Dense Grid alternative: Though this alternative would lessen soil impacts due to less ingress and egress of the area and the drilling of fewer shot holes primarily, again it would result in the acquisition of lesser quality seismic information. In the event it led to drilling operations such data would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled with resultant major disturbance of soils here.

3.2 TERRESTRIAL AND AQUATIC ENVIRONMENTS

3.2.1 Vegetation

Vegetation in the seismic survey area will be affected primarily by airboat and/or lightweight aluminum vehicle passage along the source and receiver lines. The impact to vegetation will be primarily due to flattening as the airboat or lightweight aluminum vehicle moves along each source or receiver line. Since the lightweight vehicle appears to be the least disruptive their use will be maximized. This transient impact to vegetation will also be reduced by maintaining the number of passes to a minimum along source and receiver lines. In the swamp and forested areas along the east side of the Preserve there are a relatively limited number of proposed source points. Impact here will be further minimized, wherever possible, by the process of offsetting these points.

Access along source and receiver lines will include:

Avoidance of sensitive areas where so indicated by the National Park Service or environmental monitors;

The limitation on cutting of native vegetation to branches of less than two inches in diameter and these to be made flush with their main stem. This would primarily be necessary when deploying seismic receiver lines through sensitive wax myrtle thickets. Pathways cut through such thickets will not exceed 36 inches in width at any point;

The same less-than-2-inch diameter limit for cutting in the forested and swamp areas along the east side of the Preserve. Under no circumstances will cutting or any other adverse impact to baldcypress trees be allowed;

Prior assessment of access routes across waterways and levees. These will be limited, wherever possible, to natural flooded cuts. If access is required through shrub or tree lined locals, preference will be to pass where exotic vegetation such as Chinese Tallow trees predominate or to those sites recommended by the National Park Service designee or environmental monitors. When any indication of excessive rutting along access locales appears, plywood or other protective hard surfaced sheeting will be superimposed over the soil surface.

The freshwater marsh community should not experience any long term effects from the proposed seismic survey. The impacts of pushing over the marsh vegetation should be temporary and localized in terms of spatial extent. The vegetative cutting restrictions for pathway widths and limbs should allow for relative rapid re-growth.

No Action Alternative: This would not result in any impact on vegetation of the Preserve but represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact to Park vegetation, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of lesser-quality existing data in subsequent locating and drilling here is unlikely, but, in the event it was, would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. The disturbance and impacts spatially and in severity on vegetation of the Park or adjacent wetlands due to such probably non-beneficial and unnecessary drilling operations would be much greater than those caused by the proposed operations.

Less Dense Grid alternative: Though this alternative would lessen vegetation impacts, due to fewer traverse pathways and drilling locations primarily, again it would result in the acquisition of lesser quality seismic information. In the event that it did lead to drilling operations such data would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled with resultant major impact on large areas of vegetation here. This would also unnecessarily increase the potential for spillage and any resulting toxic effects on vegetation.

3.2.2 Hydrology and Water Quality

There will be no adverse, long or short term impact to hydrology within the seismic survey area. Movement of water during and after the seismic survey will not be affected. Due to the floating nature of the marsh, no impacts to overland flows are expected. Since there will be no physical damage to waterways nor the aqueous solution underneath the existing floating marsh, there would be no impact from saltwater intrusion or heightened freshwater outflows from the marsh or canals.

The quality of surface water in the seismic survey area will not be impaired by the activities. During drilling operations, a turbidity screen will be placed around the drill to minimize impact to surrounding environments. During detonation of the explosive charges, the increase in turbidity should be minimal, localized and short in duration. Shallow water areas in the marsh will be avoided whenever possible while traversing the source or receiver lines. However, minimal turbidity increases are expected in small open water areas that will be traversed by airboat or tracked vehicle. These impacts should be localized and short in duration.

The seismic survey will require moderate quantities of water for drilling purposes. This water will come from local surface water or the aqueous solution beneath the floating marsh or will be hauled in by small tender airboats. When obtaining water from beneath the floating mat of vegetation, a small hole sufficiently large to allow "puddling" of water sufficient to keep up with the suction pump will be required. These will be kept as small as possible but could be as much as 4 to 5 feet in lateral dimensions and 2 to 3 feet in depth and will be lifted out intact. This vegetative plug will be put back in place prior to moving the drilling rig to the next location.

No Action alternative: This alternative would result in no impacts to the hydrology or water quality here. But, it would also result in no acquisition of the objective necessary seismic information.

Use of Existing Geophysical Data alternative: This alternative would not result in any impacts on hydrology or water quality but would not allow for the acquisition of seismic data sufficient to realize Seitel's objective. Future use of such inferior data could result in unsuccessful and unnecessary drilling operations with much greater impacts than those imposed by the proposed seismic survey.

Less Dense Grid alternative: This alternative would result in less impact on hydrology and water quality from turbidity primarily, as a result of less traverse traffic in the area and fewer shot holes being drilled and detonated. The resultant quality of the data acquired would be insufficient for Seitel's purpose. Also, this data could result in unsuccessful and unnecessary wells being drilled with consequential major impacts from surface alterations and associated large increases in turbidity due primarily to ingress and egress of the area by drilling

barges and equipment. Unnecessary drilling operations would increase the potential for inadvertent spillage pollution of marsh waters during drilling operations.

3.2.3 Fish

The impact of the seismic survey upon existing fish populations will primarily be short term and localized. There will be no impacts to fish populations due to surveying or recording seismic data; however, during detonation of explosive charges some local loss of individuals may occur due to concussion. These losses will not significantly affect population size or stability. Individual losses will be replaced within succeeding generations of each population affected.

Impacts from localized increases in turbidity due to drilling or detonation will be minimal as populations will move into adjacent habitat for a short period of time, if at all. Drilling rigs will use a silt screen to reduce turbidity into adjacent locations and minimize its impact. Any fish kills encountered in proximity to the seismic activities will be documented using the park's fish kill documentation form and will be reported immediately to the National Park Service.

No Action Alternative: This would not result in any impact on fish in the Preserve but represents no acquisition of the objective and necessary seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact to fish within the Preserve, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of lesser-quality existing data in subsequent locating and drilling here is unlikely, but, in the event it was, would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. Disturbances of fish habitat caused by ingress, operations and egress of this area by drilling equipment would be much greater and longer term than those caused by the proposed operations. Water pollution due to spillage and subsequent adverse impact on aquatic life is unlikely, but always possible, during drilling operations. The more wells drilled the greater the potential for this exists.

Less Dense Grid alternative: Though this alternative would lessen impact on fish in the marsh due to fewer drilling and detonation

locations, it would result in the acquisition of lesser quality of resolution seismic information. In the event it was to lead to drilling operations such data would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled. This would result in significant disturbance of fish habitat here as well as increase the potential for spillage into the marsh waters.

3.2.4 Herpetofauna

Impacts to amphibians and reptiles will also be short term and localized. Turbidity increases are not expected to be detrimental to the existing populations. During detonation of explosive charges, some individuals are expected to succumb to mechanical narcosis; however, this loss would be offset to some degree by aiding of predation within the immediate area.

No Action Alternative: This would not result in any impact on herpetofauna in the Preserve but represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact to herpetofauna within the Preserve, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of lesser-quality existing data in subsequent locating and drilling here is unlikely, but, in the event it was, would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. Disturbances resulting in migration of herpetofauna caused by ingress, operations and egress of this area by drilling equipment would be much greater and longer term than those caused by the proposed operations. Air pollution due to exhaust emissions would increase in the vicinity of any drill rig. Spillage with its subsequent adverse impact on wildlife is unlikely, but always possible, during drilling operations. The more wells drilled the greater the potential for this exists. The ongoing noise associated with drilling operations would affect wildlife for quite some distance from the rig and cause migration out of the operations area.

Less Dense Grid alternative: Though this alternative would lessen disturbance of reptiles and amphibians in the park due to fewer traverse pathways and fewer drilling and detonation locations, it would result in the acquisition of lesser quality of resolution seismic information. In the event such data was to lead to drilling operations

it would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled. This in turn would result in additional disturbance of herpetofauna here due to operations and noise as well as increase the potential for spillage into the wildlife habitat and contribute to an increase in air emissions in the vicinity of the drill rig.

3.2.5 Birds

Due to their mobility, avian species are not expected to be impacted by the proposed seismic survey. Some individuals may be displaced during drilling and detonation operations. However, these displacements are expected to be short term in duration. Nesting species are likely to suffer some mortality; however, their population will not be significantly affected especially due to the re-nesting potential of many species such as the red-winged blackbird. Migratory waterfowl and other neotropical migrants would be minimally impacted as they are forced to migrate out of the immediate area for a relatively short period of time or to continue on their normal migration route.

No Action Alternative: This alternative would result in no impact on birds in the Preserve but represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact to birds within the Preserve, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of lesser-quality existing data in subsequent locating and drilling here is unlikely, but, in the event it was, would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. Disturbances of birds and their habitat caused by ingress, operations and egress activities in this area by drilling equipment would be much greater and longer term than those caused by the proposed operations. Water pollution due to spillage and subsequent adverse impact on avian species is unlikely, but always possible, during drilling operations. Air quality in the vicinity of operations would be decreased temporarily. The more wells drilled the greater the potential for this exists. The ongoing noise associated with drilling operations would cause displacement of avian species and the abandonment of some nest sites in the area surrounding drilling operations.

Less Dense Grid alternative: Although this alternative would lessen impact on birds in the Preserve due to fewer traverse pathways, shorter total time in the area, less drilling operations and fewer detonations, it would result in the acquisition of lesser quality seismic information. In the event such data was to lead to drilling operations it would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled. Such unnecessary drilling would result in significant disturbance to birds and their habitat here as well as increase the potential for spillage into the marsh waters.

3.2.6 Mammals

Due to their mobility, mammals within the seismic survey are expected to be displaced into adjacent habitats during drilling and other seismic survey activities. During detonation a few individuals may experience mechanical narcosis; however, the impacts to these mostly small mammals will also be of short duration. Thus, localized and short term impacts to mammalian individuals is expected; however, population stability and numbers are not expected to be impacted long term.

No Action Alternative: This alternative would not result in any impact on mammals in the Preserve but represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact to mammals within the Preserve, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of lesser-quality existing data in subsequent locating and drilling here is unlikely, but, in the event it was, would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. Disturbances of mammalian life and their habitat caused by ingress, operations and egress activities in this area by drilling equipment would be much greater and longer term than those caused by the proposed operations. Water pollution due to spillage, and subsequent adverse impact on mammals utilizing this water, is unlikely, but always possible, during drilling operations. The more wells drilled the greater the potential for this exists. The ongoing noise associated with drilling operations would primarily cause displacement and abandonment of nests and dens in the vicinity of drilling operations.

Less Dense Grid alternative: Although this alternative would lessen impact on mammals in the Preserve due to fewer traverse pathways, shorter total time in the area, less drilling operations and fewer detonations, it would result in the acquisition of lesser quality seismic information. In the event such data was to lead to drilling operations it would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled. Such unnecessary drilling would result in significant disturbance to mammals and their dens and nests here, decrease air quality in the vicinity of drilling operations, and increase the potential for spillage into the marsh waters used by these species.

3.3 ARCHEOLOGICAL AND HISTORICAL RESOURCES

All known archeological sites within the seismic survey area will be marked with unique color flagging for avoidance. If any new sites are found during drilling, surveying or laying out of source and receiver lines within the Park, the monitors or operator will notify the National Park Service designee for appropriate action. Since all known archeological locations will be avoided, there will be no impacts to these resources.

Impact to the historical site as represented by the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve will be minimized to the most practicable extent possible. All impacts will be of short duration and any mitigation, required for disturbances at ingress sites to soil and vegetation, will be initiated immediately after any notification of degradation or completion of operations.

No Action Alternative: This alternative would not result in any impact on archaeological or historical resources within the Preserve but represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact to archaeological or historical sites within the Preserve, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. Thus it is probable that no benefit would accrue to the private mineral owners under the Park and adjacent lands since it is unlikely that existing data could lead to the drilling of an exploratory well.

Less Dense Grid alternative: Since the locations of all known archaeological and the historical site represented by the Preserve are recognized, this alternative would not significantly lessen the likelihood for any impact to archaeological and historical resources in the Preserve.

3.4 AIR QUALITY

Impacts to air quality are expected to be minimal. There may be a very local increase in carbon monoxide from airboat, or lightweight aluminum tracked vehicles from their combustion engines. However, the impacts from these sources should be minimal and short in duration. Therefore, there will be no long term or significant increases in the carbon monoxide levels within the seismic survey area.

No Action Alternative: This alternative would not result in any impact on air quality within the Preserve but represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact on air quality within the Preserve, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of lesser-quality existing data in subsequent locating and drilling here is unlikely, but, in the event it was, would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. Such unnecessary drilling would contribute significant exhaust emissions into the air around and downwind of each drill rig during drilling operations.

Less Dense Grid alternative: Although this alternative would lessen impact on air quality from emissions from survey vehicles and boats it would result in the acquisition of lesser quality seismic information. In the event such data was to lead to drilling operations it would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled. Such unnecessary drilling would result in significant increases in exhaust emissions (pollutants) in the vicinity of such drill rigs for the duration of drilling operations.

3.5 RECREATION RESOURCES AND MAN-MADE FEATURES

Locating the staging areas, launching sites and personnel deployment areas off site from the Barataria Preserve will reduce the impacts to recreational resources. Since the northerly portion of the Preserve to be surveyed lies approximately two miles north of the park's visitor center, trails, and outlooks, etc., there should be no visual or audible distraction to visitors. Only the occasional hunter or water-borne tourist would be cognizant of Seitel's presence.

There have been several oil or gas exploratory dry holes drilled within or adjacent to the current Preserve over the years. Records show these to have been properly plugged and abandoned shortly after being drilled. No producing wells are present here. A buried pipeline crosses the southwestern portion of the preserve. Standard safety distances or those approved by the right-away owners, whichever the greater, will be maintained during field operations for all pipeline and utility features. Operations will not impact either these plugged well bores or any pipeline or utility lines present.

Depicted on the topographic and aerial exhibits is a cluster of three towers shown in the eastern portion of the Preserve. These will not be impacted by operations since the required safe distances will be strictly adhered to by field personnel.

In discussion with Jean Lafitte National Historical Park and Preserve personnel, the presence and location of a few camps and/or homes in the Preserve were pointed out. These are located in the western portion of the Park area. Particular care and courtesy will be shown for such persons living here and for their personal property. Shot points will be adjusted accordingly.

No Action Alternative: This alternative would not result in any impact on recreational resources or man-made features located within the Preserve but represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact on recreational or man-made features within the Preserve, such data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of such lesser-

quality existing data to define locations to be drilled is unlikely, but, in the event it was, this would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. Due to the distance of the proposed Park survey area from the Park's main recreational facilities such unnecessary drilling may or may not significantly impact the recreational resources of the Park. Man-made features are well documented and would not be affected by drilling activities.

Less Dense Grid alternative: This alternative would not significantly lessen the impact on recreational or man-made resources located in the Preserve except for whatever benefit might result from less time being required for seismic operations and thus for said operations to become a distraction for an occasional visitor to this remote part of the Park. The lesser quality of data acquired with a reduced grid would not satisfy Seitel's objective to minimize drilling risk by utilizing the highest quality data possible in determining drillsite locations. In the event such data was to lead to drilling operations it would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled. Any such unnecessary drilling of multiple wells over a long period of time would increase the potential that such activity could impact the recreational resources of the Park.

3.6 THREATENED AND ENDANGERED SPECIES, STATE SPECIES OF SPECIAL CONCERN AND SENSITIVE ENVIRONMENTAL AREAS

During the seismic survey, no endangered or threatened animal or plant is expected to come into direct contact with or be affected by the activity. Four avian species may occur within the seismic survey area. They are the peregrine falcon, brown pelican, piping plover and bald eagle.

The seismic survey will occur after the spring migration of the peregrine falcon. This species is usually found in association with large concentrations of waterfowl and shorebirds that comprise its diet. However, it is doubtful that large concentrations of such waterfowl or shorebirds will be encountered within the floating marsh area of the Barataria Preserve during the anticipated time of the survey.

There are two known populations of brown pelicans that have colonized Barataria Bay and North Island of the Chandeleur chain. Both populations are south of the proposed seismic survey area;

however, small groups may be found as transients in Lake Salvador or Lake Cataouatche. If any of these small groups are sighted in the Park, their existence will be immediately reported to the National Park Service designee to determine the course of action necessary to reduce disturbance impacts to this species.

The occurrence of the piping plover within the survey area is a possibility along or near the western edge of the Barataria Preserve. This area possesses mud flats and beaches that are used by this species. If these birds are sighted during the seismic survey, the environmental monitors will immediately notify the National Park Service designee to determine options to minimize disturbance to these birds. Bald eagles that have been sighted near the Barataria Preserve will have made their northern migration by the time the proposed seismic survey would be initiated in the Park. There are no known nesting bald eagles in the Preserve at this time.

Threatened or endangered sea turtles occur further south along the Gulf of Mexico; however, environmental monitors will be required to report any sightings of these species to the National Park Service designee to determine the appropriate course of action.

Other threatened or endangered species described in Section 2.6 do not have habitat requirements that fit those afforded by the land use classification of the Park described in Section 2.2.1. Therefore, no adverse impact is expected to these species.

Impacts to species of special concern will also be avoided to the maximum extent practicable in the Barataria Preserve. These state-listed species include cooper's hawk, reddish egret, glossy ibis, white-breasted nuthatch, long-tailed weasel, eastern spotted skunk and creeping spikerush. The noted presence of these species will be reported immediately to the National Park Service designee by the environmental monitors, and appropriate actions will be taken to ensure that these species are not harmed or disturbed.

Impacts to sensitive environmental areas will be avoided to the maximum extent practicable. No impacts will occur to baldcypress trees from cutting during the seismic survey. Drilling of shot holes will be offset to avoid impacts to wax myrtle thickets. Any traversing of wax myrtle thickets by the receiver line crews will be done in such a

way as to cause only minimum impact by flush cutting only branches that are less than two inches in diameter. Such pathways through these thickets will be limited to a maximum width of 36 inches. Environmental monitors will report immediately to the National Park Service any violations of this procedure.

No Action Alternative: This alternative would result in no impact on endangered or threatened species, state species of special concern or environmentally sensitive areas located within the Preserve. However this alternative represents no acquisition of necessary seismic information.

Use of Existing Geophysical Data alternative: Although this alternative would result in no impact on endangered or threatened species, state species of special concern or environmentally sensitive areas within the Preserve, existing data is not sufficient in quantity, quality and resolution to satisfy Seitel's objective. The utilization of such lesser-quality existing data to define locations to be drilled is unlikely, but, in the event it was, this lower quality data would enhance the chances that any initial test well would be a dry hole. Subsequently this could conceivably lead to the drilling of additional "search" wells which would increase the likelihood for contact with and impact on these species of special concern and on environmentally sensitive areas.

Less Dense Grid alternative: Since no endangered species or state species of special concern are expected to be contacted during the proposed operations, this alternative would not significantly lessen the impact on these resources located in the Preserve. Environmentally sensitive resources such as wax myrtle thickets could be lesser impacted simply due to fewer receiver lines being traversed. The reduced quality of data acquired with a reduced grid would not satisfy Seitel's objective to minimize drilling risk by utilizing the highest quality data possible in determining drillsite locations. In the event such data was to lead to drilling operations it would increase the likelihood for unsuccessful and possibly unnecessary wells being drilled. Any such unnecessary ingress and egress of drilling equipment over a sustained period of time would increase the potential for contact with endangered or threatened species, state species of special concern and environmentally sensitive areas.

3.7 CUMULATIVE IMPACTS OF PROPOSED SEISMIC SURVEY

Cumulative long term impact from the proposed seismic survey is essentially nil. There will be no irreversible or non-reclaimable damage to natural resources. All impacts to the environment are expected to be of short duration with the bulk of natural restoration completed within one growing season. From previous seismic surveys overseen by the Louisiana Department of Wildlife and Fisheries, only one small area was impacted greater than one growing season. This was where a tracked vehicle was immobilized and extraction attempts created rutting near the disabled vehicle.

The subject Plan of Operations details the ongoing remediation efforts to be strictly adhered to during operations as well as Seitel's plans for post operational reclamation of any adverse impacts caused by ingress and egress activities. These efforts should suffice to leave Park lands as close to conditions prevailing prior to the initiation of operations as practically possible. Recovery of the floating marsh should occur within one growing season. Aquatic and terrestrial wildlife resources should recover within one month after the seismic survey has been completed. There will be no construction of permanent structures here, thus land use will not change nor will there be any continuous commitment of land use to the proposed project.

No chronic stresses would be imposed on the environment within and near the Barataria Preserve by the proposed survey. Water quality, vegetation, macroinvertebrates, fish, amphibians, reptiles, birds and mammals are affected to a much greater extent from the ongoing influx of effluents from nearby residential, commercial and upstream industrial lands than from any possible short term impact from seismic operations.

No Action Alternative: This alternative would, of course, result in no cumulative impacts on soils, vegetation, hydrology, water quality, wildlife, archaeological and historical sites, air quality, recreational resources, man-made features, threatened and endangered species, (including state species of special concerns) or environmentally sensitive areas located within the Barataria Preserve. But, it also represents no acquisition of the necessary objective seismic information.

Use of Existing Geophysical Data alternative: This alternative would produce no cumulative adverse impacts on soils, vegetation, hydrology, water quality, wildlife, archaeological and historical sites, air quality, recreational resources, man-made features, threatened and endangered species, (including state species of special concerns) or environmentally sensitive areas located within the Barataria. But, pre-existing data is not sufficient in quantity, quality and resolution to satisfy Seitel's needs and objectives. The utilization of such lesser-quality existing data to define locations to be drilled is unlikely, but, in the event it was, this would more likely lead to the drilling of an initial dry hole and possibly unnecessary multiple holes. In such an event, all resources in the area would be far more severely impacted than those expected from the proposed operations.

Less Dense Grid alternative: This alternative would primarily reduce the cumulative impacts on soil, vegetation, and wildlife resources located in the Preserve and to a lesser degree on air quality, recreational resources, and potentially on endangered species and environmentally sensitive areas. This would be due to less operating time in the area, less trafficking, fewer lines of traverse, and fewer shot holes drilled and detonated. The reduced quality of data acquired with a less dense seismic grid would not satisfy Seitel's immediate objectives which are to (1) determine, to the highest degree possible, the existence or non existence of potential hydrocarbon traps and if such appear to exist to (2) minimize drilling risk by utilizing the highest quality data possible in determining optimum initial drillsite locations. In the event less data, as represented by this alternative, was to lead to drilling operations it would increase the potential for unsuccessful and possibly unnecessary wells being drilled with the consequential significant and unnecessary cumulative impacts on the environment here.

OTHER PRACTICES AND PROCEDURES DESIGNED TO FURTHER REDUCE ENVIRONMENTAL IMPACTS FROM THE PROPOSED OPERATIONS

4.1 OTHER PRACTICES AND PROCEDURES TO REDUCE IMPACTS

Seitel will, to the greatest extent practicable, conduct all operations in such a manner as to prevent damage, erosion, pollution or contamination of lands, waters, vegetation, wildlife and facilities in

the area. Upon completion of the survey, the area shall be restored as nearly as practically possible to its condition prior to the commencement of the seismic operations. Other practices and procedures designed to reduce impacts and ensure compliance with park regulations and objectives include the following:

Field personnel will be trained prior to initiating seismic activities relative to existing environmental conditions within the Barataria Preserve and its ecosystems. Emphasis will be placed on their responsibility and the specifics of how to avoid and/or reduce damage to environmental or cultural resources. All personnel will be required to attend this initial environmental training. Training will be repeated periodically throughout the survey due to anticipated personnel replacement and whenever deemed necessary as a refresher course.

Environmental observers or monitors will be hired to ensure compliance with Seitel's operational and reclamation commitments relative to the environment as laid out in this report. Separate and independent third party monitors, responsible to the NPS, will also be present during operations and will advise the operator as to operations and adequacy of reclamation on a daily basis. These personnel will have access to communications, air boats with operators and, if necessary, helicopters with accredited pilots. The monitors' operational logs and photography of daily activity will be supplied to the Superintendent on a weekly basis, with a report at the conclusion of the operations.

Archaeologists approved by the NPS will be consulted prior to line surveying to identify and avoid any cultural sites. They shall also be on standby for consultation during drilling operations.

Seismic activities within the Barataria Preserve are projected to occur between late August or early September through late September or early October, 2001. This should minimize disturbance to neotropical migrants, inherent wildlife and plant communities according to recent research within the Barataria basin. This time frame is also after the summer visitation period at the Barataria Preserve which will hopefully help to minimize disturbance to recreational use of the park.

Air boats and/or motorized boats will be used in shallow water habitats of Lake Cataouatche, Bayou Bardeaux, Bayou Segnette, and existing canals in order to access the area of operations. Lightweight aluminum tracked vehicles will be used wherever possible in the floating marsh and emergent wetlands. The type of aluminum vehicles to be used here are favored by the Louisiana Department of Wildlife and Fisheries. This is based on their apparent lesser impact upon the marsh habitat relative to the use of air boats, as determined from previous surveys within Louisiana.

Access and egress sites into the marsh will be carefully chosen. They will be protected from cutting into the soil and vegetation where necessary by the utilization of plywood metal or other hard surface material.

All tracked vehicles and air boat drills will make only one pass, if possible, to reach a drilling location. Tracked vehicles may remain overnight in the Barataria Preserve. Light weight tender air boats or vehicles will be used to remove and return personnel to the survey area each day.

Minimizing damage to waterway banks and shorelines will be accomplished by avoiding traveling laterally near waterways, by changing ingress areas if damage due to wake erosion becomes significant, and by using plywood or other appropriate materials across small waterways.

Damage to vegetation along shot and receiver lines will be minimized by limiting the number of vehicle and air boat passes along seismic lines and by utilizing arc-turning of tracked vehicles and air boats. Any significant damage to vegetative cover will be subject to reclamation work after cessation of seismic operations along these lines.

Equipment used to haul water to the drills must be consistent with the drilling vehicles used in a particular habitat. Determinations will be made with the input from onsite environmental monitors as to whether water should be delivered by airboat or obtained at the drilling location. If obtained at the location, a hole in the marsh mat would be cut and water extracted through a screened hose. After drilling the shot hole, the marsh vegetation plug would be replaced to

conform to previously existing contours. Wherever possible, water available at the drill location will be utilized.

Locations such as shot holes, water holes and access points damaged by seismic survey activities will be restored as closely as possible to pre existing conditions. Access areas where invasive exotics such as Chinese tallow tree are removed will be replanted with native species at the discretion of the National Park Service's designee.

All equipment will be cleaned prior to initiating the survey and regularly thereafter to reduce the potential of spreading exotic plants such as Chinese tallow tree and water hyacinth.

Sensitive environmental areas (e.g. wax myrtle stands) will be avoided to the maximum extent possible. Drill rigs will not enter those areas where a closed canopy of this species exists. Receiver line crews may traverse these areas when laying their lines but are restricted to the cutting practices discussed previously.

Sensitive cultural resource areas will be avoided by all seismic crews with a buffer of 120 feet from any known areas that have been delineated by the Louisiana Department of Culture, Recreation and Tourism. Any cultural feature or artifact discovered during the course of the seismic survey will be reported to the environmental monitor, seismic survey project manager and National Park Service designee. The environmental monitors and National Park Service's designee possess the "stop work" authority for any cultural feature or artifacts discovered during the course of the seismic survey.

All state, federal, and park regulations will be strictly adhered to with regards to wildlife. Harassing, injuring or destroying wildlife is prohibited. All nesting and den sites of inherent wildlife will be avoided by all personnel and equipment.

All park regulations shall be enforced and adhered to by seismic personnel unless explicitly exempted by the park superintendent. Personnel will also comply with all applicable ordinances, laws, decrees, statutes, rules and regulations as required by federal and state entities.

All activities will not encroach closer than 50 feet to any vegetative sampling plot, hydrographic, or any other research associated sites or equipment. All shot holes will be placed at safe distances from any recognized special feature and will conform to the setback distances recommended by the International Association of Geophysical Contractors unless otherwise specified by any permit or right-a-way/easement related agreements. These setback distances are presented in Table 4.1. At such time that Seitel meets with utility and pipeline companies in order to delineate the exact locations of all pipelines and utility structures, it will be determined whether the standard geophysical offset distances shown in Table 4.1 are acceptable to each company and if not adjusted accordingly.

All explosives will be stored in a secure magazine at an approved location in accordance with the Bureau of Alcohol, Tobacco, and Firearms regulations. They are also to be loaded and stored in accordance with State Fire Marshall regulations.

TABLE 4.1

SAFE OPERATING DISTANCE CHART COMMONLY USED AND ACCEPTED BY THE GEOPHYSICAL INDUSTRY	
*Size of Charge (lb) = 6-10	Setback Distance (ft)
Pipeline less than 6" diameter	140'
Pipeline 6" to 12" diameter	215'
Pipeline greater than 12" diameter	290'
Telephone lines	56'
Railroad track or main paved highway	215'
Electric power line (shot hole not to exceed 200' depth)	2 x hole depth
Water well, buildings, underground cistern, and all other objects not mentioned, including all living things.	430'
Cultural features	120'
Explosives Energy Source charge size shown in pounds*	

RECLAMATION PLAN

The following reclamation plan reiterates much of the ongoing prevention and reclamation procedures described throughout this report and specifically in the earlier operational section. It also discusses plans to reclaim any adverse impacts remaining at completion of operational activities and the monitoring procedures to determine and assure that reclamation is successful.

5.1 RECLAMATION AND SAFETY PRACTICES DURING OPERATIONS

5.1.1 Above Ground Structures, Crew Generated Debris, Safety Practices and Contaminating Substances

The only above ground structures associated with the proposed survey would be wire flagging, cane poles and other biodegradable flagging used to mark source and receiver locations, sensitive avoidance areas and ingress areas. These items would be removed as the source points are shot and as receivers are extracted. These, as well as any other crew and operationally generated debris, will be disposed of daily in sturdy trash bags and removed from the Preserve premises as soon as possible. This would include cans, bottles, waste paper, or food wrappers, wires, detonation caps, flagging materials and stakes, etc.

All potentially contaminating substances such as grease tubes, oil or gas will be disposed of in appropriate containers. Fuel containers will be elevated and over drip pans of such volume as to confine 1.5 times the volume of the containers. Personnel shall comply with all fire safety measures and orders issued by the park Superintendent. Fire safety and clean up equipment will be kept on site. All vehicles in the marsh will carry absorbent pads to immediately contain any spillage of oil or gasoline. All gasoline will be transported in approved containers. These precautions should prevent any contaminating substances from being released into the environment here. However, if such an event does occur and in accordance with 36 CFR Section 9.45, Seitel will report the spillage or release of contaminating or potentially contaminating substances to the Superintendent within 24 hours. Any subsequent reporting required by the Resource Conservation and Recovery Act and/or Occupational Safety and Health Administration will include information as to the type of product released, the time the spill was discovered, estimated spill volume, cause of spill, and area covered. This planned operational preparedness will ensure that if such an event does happen, wastes, and contaminants or potentially contaminating substances will be contained within the smallest area possible and will be confined so as to prevent further escape attributable to percolation, rain, high water or other causes. Subsequently all clean up materials, contaminating substances, contaminated soils and/or vegetation will be removed from the area as

quickly as practicable to prevent "contamination, pollution, damage or injury to the lands, water (surface and subsurface), facilities, cultural resources, wildlife and vegetation of or visitors of the unit." Any such wastes and contaminants shall be disposed of in accordance with all applicable state and federal waste regulations.

5.1.2 Drilling

Following drilling operations in those locales with firm non-collapsible substrate, drill cuttings will be used to backfill the hole after the explosive charge is set and the casing is removed. Any excess cuttings will be dispersed around the shot hole to not more than 0.25 inches above the previously existing contours. In standing or flowing water turbidity screens will be used during drilling and reclamation operations. Any bentonite used in the field shall be so stored as to prevent contamination of the environment. Where bentonite is used, drop cloths will be placed under the drill and casing to prevent bentonite from contact with the natural surface.

5.1.3 Plugging and Capping

Where drill cuttings are insufficient to fully backfill shot holes, a metal or plastic "spider" plug will be placed 24 inches from the surface. A plug of native soil and vegetation will then be placed as the top component of fill so as to mimic the previously existing soil and vegetative conditions.

5.2 POST OPERATIONAL PLAN OF RECLAMATION

Post operational evaluation of residual impacts and subsequent restoration efforts should begin immediately after, but no later than 30 days from, cessation of seismic activities. Any required post operational reclamation should primarily involve local sites along spoil banks and stream levees. These sites would be those used as entryways to get equipment and personnel from canals and natural drainage access routes into the marshlands. As previously described, such entryways are to be carefully predetermined in agreement with environmental monitoring personnel and to be protected to every extent possible from soil and vegetation damage. The following is based on the assumption that some of these locales will require some degree of reclamation work.

5.2.1 Re-establishment of Natural Vegetation

Any overgrown ingress areas whose use could likely require vegetation to be replanted such as on levees or along waterways will conform to the following operational guidelines. Only overstory vegetation will be cut. Shrubs and herbaceous species will not be cut or otherwise removed unless they consist of exotic species. The removal of overstory will be directed toward those exotic species such as Chinese tallow tree which commonly exist in pure stands along canals. Stumps from the cutting of such species will be painted with an approved herbicide to reduce the probability of stump sprouting and thus potentially out-competing any native vegetation to be replanted.

If remediation is necessary, then at the time of abandonment of such ingress sites, a layer of jute mesh will be applied across the breadth of the embankment. Native species of shrubs such as wax myrtle or yaupon will then be planted to stabilize the embankment. A native mixture of herbaceous species will also be planted to shade out the seedlings of any previously existing exotic species. Also at this time, acorns of native overstory species such as live oak, Texas oak, and/or water oak will be planted on 3-foot centers to provide future mast for the inherent wildlife inhabiting the area. Native herbaceous species to be planted within the jute mesh will be coordinated with personnel from the National Park Service. The benchmark of successful reclamation will be when 75% of the locale is re-covered by native vegetation.

Reclamation of other ingress areas along natural waterways, where there are no overstory species, will include stabilizing the soil by laying down jute mesh and/or biologs if necessary. Biologs consist of floating, neutrally buoyant or submersible, usually round masses of vegetative material which are totally or partially composed of coconut husk fibers that can be used as an attachment device in selective conditions. Re-seeding or planting requirements will be coordinated with park service personnel.

Areas of the floating marsh that appear to be significantly separated by the passing of tracked vehicles will be held with jute mesh and/or biologs until the vegetation can reattach. This procedure will be coordinated with personnel from the National Park Service. This effort will be deemed successful when 70% of the marsh

vegetation that was disturbed has reattached to the floating mat. This would be expected to occur by the end of one full growing season.

5.2.2 Restoring Contours

Any significant ruts or depressions at points of ingress and egress, or along waterways and levees will be filled and/or leveled in an approved manner that restores, as close as practically possible, natural contours so as to optimize the restoration of previously existing vegetation and conditions.

5.3 COST ESTIMATE OF THE RECLAMATION PLAN

Based on their planned diligence and care, Seitel believes that the amount of post operational reclamation necessary should be limited. Without a definitive knowledge of the reclamation that will be needed here, Seitel must estimate the cost for what they consider a worse case scenario. The estimated reclamation costs are divided into specific categories pertaining to equipment, personnel, materials and monitoring (Table 5.3). This worst case situation assumes that three areas of ingress will have to be reclaimed and that six biologists will be used to stabilize the soil and vegetation. Also that four other ingress areas will have to be stabilized with jute mesh. This should require three men approximately 4 days to complete the stabilization procedures.

Equipment use will require three days for jon boats and two days for airboats. Automobiles will be used to transport personnel and equipment to the Highway 90 Marina staging area. Other materials to be used include gloves, seed for the jute mesh, seedlings to replant among the jute mesh fibers, stakes and biodegradable rope to hold the mesh in place. Mulch may be used underneath the mesh to stabilize any canal or marsh banks.

The four areas that would be stabilized by jute mesh may also be sprayed with an approved application of glyphosate on a monthly basis or as needed during the growing season to reduce the competition from Chinese tallow trees. The spraying could consume approximately 7 days during the growing season with one man and a jon boat used for each of the estimated 7 days.

TABLE 5.3

ESTIMATED COST OF RECLAMATION			
Item	Cost/Unit	Estimated Utilization	Total Cost
Equipment			
Boat	\$150/day	11 days	\$1,650
Airboat	\$900/day	5 days	\$4,500
Helicopter	\$3,000/day	2 days	\$6,000
Automobile	\$.50/mile	1200 miles	\$600
Sprayer	\$135/unit	2 units	\$270
Chain Saw	\$40/day	15 days	\$600
		Subtotal:	\$13,620
Personnel			
Contract labor	\$100/man-day	40 man -days	\$4,000
Plant ecologist	\$400/day	10 days	\$4,000
		Subtotal:	\$8,000
Materials:			
Biologs	\$150/unit	6 units	\$900
Jute Mesh	\$250/100 feet	532 feet	\$1,330
Stakes	\$14/100	150 stakes	\$21
Rope/string	\$19/100 feet	200 feet	\$38
Mask	\$75/unit	4 masks	\$300
Filters for mask	\$25/50 units	100 units	\$50
Glyphosate	\$120/gallon	4 gallons	\$480
Gloves	\$15/unit	4 units	\$60
Seed	\$1/pound	100 pounds	\$100
Seedlings	\$250/1,000	1300 seedlings	\$325
Mulch	\$23/yd ³	3 yd ³	\$69
		Subtotal:	\$3,673
Monitoring:			
Aerial photography	\$1000/photo	4 photos	\$4,000
Geo-referencing	\$2000/locale	7 locale	\$14,000
Ground photography	\$20/roll	14 rolls	\$280
		Subtotal:	\$18,280
Total estimated reclamation cost:			\$43,573

Finally, monitoring the success of soil and vegetation reclamation in the Barataria Preserve will require considerable time and expense.

An aerial photography mission will be flown in the near future as a baseline (pre-operational inventory) for environmental conditions of the Preserve prior to the proposed operations. Another aerial photography mission (post operational/reclamation inventory) will be scheduled near the end of the 2002 growing season to confirm the success of reclamation in all areas impacted by operations. Particular emphasis will be on those locales where post operational reclamation work was conducted.

Ground based geo-referencing will be conducted periodically, as deemed needed, between the completion of reclamation work and the time of the later aerial photographic mission. This will be done utilizing airboats and/or helicopters in order to determine and confirm the ongoing success of reclamation. This will include photographic documentation of the re-growth of native vegetation in these impact areas and along pathways traversed by seismic operations. If the aerial photographic mission, to be flown after one growing season, indicates areas of doubtful reclamation success, these will be further evaluated in the field. Such evaluations may require additional reclamation work to be conducted. Successful re-vegetation is expected to be completed by the late fall of 2002 or summer of 2003.

COMPLIANCE AND COORDINATION

Seitel and/or their permit agent, Merlin Oil and Gas, Inc., has applied for and subsequently acquired the necessary compliance permits, letters of no objections, and/or agreements from all federal, state, parish, and city governmental agencies. These, in conjunction with the subject NPS permit for the Barataria Preserve and the acquired permits from Park mineral owners, would allow the proposed seismic survey to proceed on Park and adjacent lands. These agencies or departments include those listed below along with the type of agreement, issue or approval date and any pertinent comments for each.

6.1 GOVERNMENTAL AGENCIES

U.S. National Park Service-Jean Lafitte National Historical Park and Preserve: Initial contact with Jean Lafitte personnel was made by Lee Sonnier representing Merlin Oil and Gas of Lafayette, permitting agent; he and Jim Underwood, Plan of Operations

consultant, met with Preserve personnel, Bill Hulslander and David Muth, on 10/30/00; Jim Underwood and Ralph Veazey, with Eagle Geophysical, met with Bill Hulslander 11/30/00; Seitel Data Ltd. submitted their initial draft of the Plan of Operations 12/29/00; list of corrections and additions to be made to the Plan along with NPS comments was picked up by Jim Underwood 3/1/01; second draft delivered to NPS 4/06/01; final comments and corrections to be made were received and incorporated into the Plan May, 2001; waiting on advertising requirement; permit pending.

U.S. Army Corps of Engineers: Permit No. EM-20-000-4153 approved 01/23/01.

U.S. Fish and Wildlife Service: Associated with U.S. Corps of Engineers permit; Lee Sonnier, Mark Miller and other representatives of Merlin Oil and Gas, permit agency, along with Jim Underwood met with U.S. Fish and Wildlife Service representative, Ms. Karen Soileau, and other department personnel on 1/12/01 at their facility in Baton Rouge; NPS representative, Mr. Bill Hulslander, was present at this meeting; historical and endangered species resources were discussed; primary concern expressed and noted involved bald eagle nests in the survey area. Informal consultation under Section 7 of the Endangered Species Act was requested by the National Park Service in March 2001, with a finding by the U.S. Fish and Wildlife Service that the proposed seismic operation would not affect listed or proposed threatened or endangered species.

Coastal Zone Management: Permit No. P19991375 approved 01/26/01.

State mineral Board (State owned lands and water bottoms): No. 00-8 approved 10/24/00.

Department of Natural Resources: Memorandum of no jurisdiction dated 2/16/2001.

LA Dept. of Wildlife and Fisheries: Approved 01/11/01.

Office of Cultural Development - Division of Archaeology (LA Natural Heritage Program/LA. Historic Preservation): Letter of no objection dated 12/11/00.

LA State Parks (Bayou Segnette State Park): Permit approved 12/5/00.

East Jefferson Parish Levee District: Letter of no objection dated 02/01/01.

West Jefferson Parish Levee District: Letter of no objection dated 01/09/01.

Jefferson Parish Council: No. SP-00-03 approved 3/14/01 and submitted to U.S. Army Corps of Engineers.

St. Charles Parish - Dept. of Planning and Zoning: No. 2001-1 dated 1/26/01.

St. Charles Parish - Dept. of Public Works: (Roads) No. PW0087 approved 1/30/01.

St. Charles Parish School Board: Approved 2/07/01.

Department of Transportation (DOTD):

Jefferson Parish, Serial No. 02006691.1 approved 12/11/00 and Serial No. 02006690 approved 12/11/00.

St. Charles Parish, Serial No. 02006692.1 approved 12/11/00.

Town of Marrero, LA: No permit - town not incorporated.

Any and all of these agreements or permits relative to Seitel's right to access and to operate within the Barataria Preserve were provided to the Superintendent's representative on April 6, 2001.

6.2 AFFIDAVIT OF COMPLIANCE

The following document was signed by Seitel Data, Ltd. and two signed originals were mailed to Jean Lafitte National Historical Park and Preserve on April 20, 2001 and subsequently confirmed as received by them.

AFFIDAVIT OF COMPLIANCE BY SEITEL DATA, LTD.

The following affidavit is written in association with Seitel Data, Ltd.'s "Proposed Plan of Operations and Environmental Assessment For a Proposed Three Dimensional Seismic Survey Within and Near the Barataria Preserve of Jean Lafitte National Historical Park and Preserve", Jefferson Parish, Louisiana. This plan has been submitted to Jean Lafitte National Historical Park and Preserve in New Orleans, Louisiana and the National Park Service. More specifically, this concerns Seitel Data, Ltd.'s proposed 3D seismic survey over a large area which includes the northernmost 1500 (plus or minus) acres of the Barataria Preserve.

Under 36 CFR 9.36(a)(15), 36 CFR 9.41(g), and 35 CFR 9.37(f) Seitel is required to and herein does so submit the following affidavit of compliance:

AFFIDAVIT OF COMPLIANCE

I herein certify and attest that I am familiar with the information contained in Seitel Data, Ltd.'s Plan of Operation and Environmental Assessment report submitted to and as approved by the Jean Lafitte National Historical Park and Preserve and the National Park Service. I also certify and attest that, to the best of my knowledge and belief, such information is true, complete and accurate and that this plan has been prepared in accordance with regulations of the National Park Service and all applicable Federal, State, and County laws and regulations.

Seitel Data, Ltd., its contractors, and its sub-contractors will fully comply with the Plan of Operations as approved by the National Park Service, and will further comply with all standards and stipulations issued by the Regional Director in accordance with regulations contained in Title 36 of the Code of Federal Regulations, Part 9, Subpart B (36 CFR 9B). Seitel Data, Ltd. is fully accountable for its contractor's and sub-contractor's compliance.

The Superintendent of Jean Lafitte National Historical Park and Preserve, or his representative, shall have reasonable access to the site of operations as is necessary to properly monitor and insure compliance with the Plan of Operations.

Agreed to and signed this ____ day of _____, 2001

By: _____

Paul Richard, Manager of Acquisition for Seitel Data, Ltd.

6.3 NATIONAL PARK SERVICE STATEMENT

Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands) orders direct federal agencies to enhance floodplain and wetland values, to avoid development in floodplains and wetlands whenever there is a practicable alternative, and to avoid to the extent possible adverse impacts associated with the occupancy or modifications of floodplains and wetlands.

Due to the locations of the target formations, the proposed seismic activity must be located in a floodplain to obtain sufficient data. This area of interest includes an approximate 1500 acre portion of the Barataria Preserve. Although not all seismic surveys are wetland dependent, the target location of this survey includes the wetlands of the Preserve. Since there will be no permanent structures erected as a result of the proposed action, no increased flooding will occur during or after the proposed survey, nor will the survey contribute to any future flood damages.

The proposed seismic survey's plan of operation has, to the maximum extent possible, avoided wetland impacts, minimized those impacts that cannot be avoided and provided a mitigation plan for any wetland damage within the Barataria Preserve. All wetland impacts have been identified and specific measures and methods have been developed to mitigate adverse impacts to those wetlands.

The National Park Service has concluded that any adverse impacts to floodplains and wetlands will be of small spatial extent (less than 0.10 acre), of short duration, and all practicable measures have been taken to avoid, minimize and mitigate disturbances, therefore, a statement of findings will not be prepared.

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APPENDIX 1

NPS LIST OF PLANT SPECIES OF KNOWN OR PROBABLE OCCURRENCE WITHIN JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE, JEFFERSON PARISH, LOUISIANA

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Azolla caroliniana</i>	Carolina mosquitofern	None	No data
<i>Pennisetum glaucum</i>	No data	None	No data
<i>Cornus foemina</i>	No data	None	No data
<i>Acacia farnesiana</i>	Ellington curse, Klu bush, aroma, huisache, kandaroma, klu, popinac, sweet acacia, texas huisache	None	No data
<i>Acalypha rhomboidea</i>	Virginia threeseed mercury	None	No data
<i>Acer negundo</i>	ashleaf maple, box elder, boxelder, boxelder maple, california boxelder, manitoba maple, western boxelder	None	No data
<i>Acer rubrum</i>	red maple	None	No data
<i>Acer rubrum drummondii</i>	Drummond's maple, drummond maple	None	No data
<i>Acnella oppositifolia repens</i>	creeping spotflower, oppositeleaf spotflower	None	No data
<i>Aeschynomene indica</i>	Indian jointvetch, Kat sola, Indian jointvetch, jointvetch, kat sola	None	No data
<i>Agalinis purpurea</i>	purple false foxglove	None	No data
<i>Ageratina altissima altissima</i>	white snakeroot	None	No data
<i>Oxalis dillenii</i>	Dillen's oxalis	None	No data
<i>Oxalis debilis corymbosa</i>	pink woodsorrel	None	No data
<i>Ostrya virginiana</i>	eastern hophornbeam, hophornbeam	None	No data
<i>Opismenus hirtellus setarius</i>	No data	None	No data
<i>Opismenus hirtellus</i>	bristle basketgrass	None	No data
<i>Onoclea sensibilis</i>	sensitive fern	None	No data
<i>Oenothera speciosa</i>	Showy evening primrose, pinkladies, showy eveningprimrose	None	No data
<i>Oenothera biennis</i>	common evening primrose, common evening-primrose, common eveningprimrose, evening primrose (common), hoary eveningprimrose, king's-cureall	None	No data
<i>Nyssa sylvatica</i>	black gum, black tupelo, blackgum	None	No data
<i>Nyssa aquatica</i>	water tupelo	None	No data

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
Nymphaea odorata	American waterlily,American white waterlily,white waterlily	None	No data
Nuttallanthus canadensis	Canada toadflax,oldfield toadflax,oldfield-toadflax	None	No data
Nothoscordum bivalve	crowpoison	None	No data
Nemophila aphylla	smallflower baby blue eyes	None	No data
Najas guadalupensis	Guadalupe waternymph,common waternymph,southern waternymph	None	No data
Myriophyllum aquaticum	brazilian watermilfoil,parrot feather,parrot feather watermilfoil,parrot's-feather,parrotfeather	None	No data
Myrica cerifera	southern bayberry,wax myrtle	None	No data
Myosotis macrosperma	largeseed forget-me-not,southern forget me not	None	No data
Morus rubra	red mulberry	None	No data
Morus nigra	black mulberry	None	No data
Morus alba	mulberry,white mulberry	None	No data
Morella cerifera	wax myrtle,waxmyrtle	None	No data
Modiola caroliniana	Carolina bristlemallow,Carolina modiola	None	No data
Mitreola petiolata	lax hornpod	None	No data
Mimulus alatus	sharpwing monkeyflower	None	No data
Mimosa strigillosa	herbaceous mimosa,powderpuff	None	No data
Mikania scandens	climbing hempvine,climbing hempweed	None	No data
Micranthemum umbrosum	shade mudflower	None	No data
Menispermum canadense	Canadian moonseed,common moonseed	None	No data
Melothria pendula	Guadeloupe cucumber,drooping melonnettle	None	No data
Melilotus indicus	Indian sweet-clover,annual yellow sweetclover	None	No data
Melia azedarach	Chinaberry tree,Chinaberrytree,Indian lilac,chinaberry,lelah,paraiso,pride of India,white cedar	None	No data
Mecardonia procumbens	baby jump-up,baby jumpup	None	No data
Mecardonia acuminata	axilflower	None	No data
Mazus pumilus	Japanese mazus	None	No data
Matelea gonocarpos	angularfruit milkvine	None	No data
Malvastrum coromandelianum	threelobe false mallow	None	No data

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Magnolia grandiflora</i>	southern magnolia	None	No data
<i>Lythrum lineare</i>	wand lythrum	None	No data
<i>Lythrum alatum lanceolatum</i>	winged lythrum	None	No data
<i>Lygodium japonicum</i>	Japanese climbing fern	None	No data
<i>Lycopus virginicus</i>	Virginia bugleweed, Virginia water horehound	None	No data
<i>Lycopus rubellus</i>	taperleaf bugleweed, taperleaf water horehound	None	No data
<i>Ludwigia uruguayensis</i>	Uruguay waterprimrose, Uruguayan primrose-willow, Uruguayan primrosewillow, water primrose	None	No data
<i>Ludwigia repens</i>	creeping primrose-willow, creeping primrosewillow, creeping waterpurslane	None	No data
<i>Ludwigia peploides</i>	creeping waterprimrose, floating primrose, floating primrose-willow, floating primrosewillow	None	No data
<i>Ludwigia palustris</i>	marsh primrose-willow, marsh seedbox	None	No data
<i>Ludwigia octovalvis</i>	Mexican primrose-willow, Mexican primrosewillow	None	No data
<i>Ludwigia leptocarpa</i>	anglestem primrose-willow, anglestem waterprimrose	None	No data
<i>Ludwigia grandiflora</i>	No data	None	No data
<i>Ludwigia decurrens</i>	wingleaf primrose-willow, wingleaf waterprimrose	None	No data
<i>Lonicera japonica</i>	Chinese honeysuckle, Japanese honeysuckle	None	No data
<i>Lobelia cardinalis</i>	Cardinal flower, cardinalflower	None	No data
<i>Lithospermum tuberosum</i>	tuberous gromwell, tuberous stone seed	None	No data
<i>Liquidambar styraciflua</i>	sweetgum	None	No data
<i>Limnobia spongia</i>	American spongeplant, frogbite	None	No data
<i>Lilaeopsis carolinensis</i>	Carolina grasswort	None	No data
<i>Ligustrum vulgare</i>	European privet, wild privet	None	No data
<i>Ligustrum lucidum</i>	glossy privet, tree privet	None	No data
<i>Ligustrum japonicum</i>	Japanese privet	None	No data
<i>Leptochloa fascicularis</i>	bearded sprangletop, sprangletop	None	No data
<i>Lepidium virginicum</i>	Virginia pepperweed, Virginian peppergrass, poorman pepperweed, poorman's pepper, poorman's-pepperwort	None	No data
<i>Leonurus cardiaca</i>	common motherwort, motherwort	None	No data

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Lemna minor</i>	common duckweed, least duckweed, lesser duckweed	None	No data
<i>Leersia virginica</i>	white grass, whitegrass	None	No data
<i>Leersia lenticularis</i>	catchfly grass	None	No data
<i>Leersia hexandra</i>	southern cutgrass	None	No data
<i>Lantana camara</i>	lantana, largeleaf lantana	None	No data
<i>Lamium amplexicaule</i>	common henbit, giraffehead, henbit, henbit deadnettle	None	No data
<i>Lactuca floridana</i>	Florida lettuce, woodland lettuce	None	No data
<i>Lactuca canadensis</i>	Canada lettuce, Florida blue lettuce, wild lettuce	None	No data
<i>Krigia dandelion</i>	potato dwarf dandelion, tuber dandelion, tuber dwarf dandelion	None	No data
<i>Kosteletzkya virginica</i>	Virginia saltmarsh mallow, Virginia saltmarsh willow	None	No data
<i>Styrax americanus</i>	American snowbell, snowbell	None	No data
<i>Strophostyles helvula</i>	Trailing wildbean, trailing fuzzybean	None	No data
<i>Stenotaphrum secundatum</i>	St. Augustine grass, St. Augustinegrass	None	No data
<i>Stellaria media</i>	chickweed, common chickweed, nodding chickweed	None	No data
<i>Stachys tenuifolia</i>	slender betony, smooth hedge-nettle, smooth hedgenettle	None	No data
<i>Stachys crenata</i>	mouse's-ear, mouseear	None	No data
<i>Sporobolus indicus</i>	Rattail smutgrass, smut grass, smutgrass	None	No data
<i>Spirodela polyrrhiza</i>	common duckmeat, common duckweed, greater duckweed	None	No data
<i>Spiranthes odorata</i>	marsh ladies'-tresses, marsh ladiestressés	None	No data
<i>Sphenopholis pensylvanica</i>	swamp wedgescale	None	No data
<i>Sphenopholis obtusata</i>	prairie wedgegrass, prairie wedgescale	None	No data
<i>Spartina patens</i>	marshhay cordgrass, salt meadow cordgrass, saltmeadow cordgrass	None	No data
<i>Spartina cynosuroides</i>	big cordgrass	None	No data
<i>Spartina alterniflora</i>	Atlantic cordgrass, saltmarsh cordgrass, smooth cordgrass	None	No data
<i>Sorghum halepense</i>	Johnson grass, Johnsongrass, aleppo milletgrass, herbe de Cuba, sorgho d'Alep, sorgho de alepo, zacate Johnson	None	No data

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Sonchus asper</i>	perennial sowthistle, prickly sowthistle, spiny sowthistle, spiny-leaf sow-thistle	None	No data
<i>Solidago sempervirens</i>	seaside goldenrod	None	No data
<i>Solidago altissima</i>	Canada goldenrod	None	No data
<i>Solanum ptychanthum</i>	Eastern black nightshade, West Indian nightshade, black nightshade, eastern black nightshade, nightshade	None	No data
<i>Solanum carolinense</i>	Carolina horsenettle, apple of Sodom, bull nettle, devil's tomato, horsenettle, sand briar	None	No data
<i>Solanum americanum</i>	American black nightshade	None	No data
<i>Smilax tamnoides</i>	bristly greenbrier	None	No data
<i>Smilax rotundifolia</i>	bullbriar, common catbriar, common greenbrier, greenbrier, horsebriar, roundleaf greenbrier, roundleaf greenbrier	None	No data
<i>Smilax bona-nox</i>	saw greenbrier	None	No data
<i>Smallanthus uvedalius</i>	hairy leafcup	None	No data
<i>Sisyrinchium rosulatum</i>	annual blue-eyed grass, annual blueeyed grass	None	No data
<i>Sideroxylon lycioides</i>	buckthorn bully	None	No data
<i>Sida rhombifolia</i>	Cuban-jute, arrowleaf sida, cuban jute	None	No data
<i>Setaria parviflora</i>	knotroot bristlegrass, marsh bristle grass, marsh bristlegrass, yellow bristlegrass	None	No data
<i>Setaria magna</i>	giant bristlegrass	None	No data
<i>Sesbania punicea</i>	rattelbox, rattlebox	None	No data
<i>Sesbania herbacea</i>	bigpod sesbania, hemp sesbania, peatree	None	No data
<i>Sesbania drummondii</i>	poisonbean	None	No data
<i>Senecio glabellus</i>	butterweed, cressleaf, cressleaf groundsel	None	No data
<i>Scirpus olneyi</i>	No data	None	No data
<i>Scirpus lineatus</i>	drooping bulrush	None	No data
<i>Scirpus cyperinus</i>	bulrush, woolgrass	None	No data
<i>Scirpus californicus</i>	No data	None	No data
<i>Schoenoplectus californicus</i>	California bulrush	None	No data
<i>Schoenoplectus americanus</i>	American bulrush, Olney bulrush, Schoenoplectus, chairmaker's bulrush	None	No data
<i>Saururus cernuus</i>	lizard's tail, lizards tail	None	No data

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Sassafras albidum</i>	sassafras	None	No data
<i>Sapium sebiferum</i>	Chinese tallow tree, Florida aspen, chicken tree, popcorn tree, tallowtree, vegetable tallow, white wax berry	None	No data
<i>Sanicula canadensis</i>	Canada sanicle, Canadian blacksnakeroot	None	No data
<i>Samolus valerandi parviflorus</i>	seaside brookweed, smallflower water pimpernel, water brookweed	None	No data
<i>Sambucus nigra canadensis</i>	Mexican elderberry, blue elder, common elderberry, elder, elderberry	None	No data
<i>Sambucus canadensis</i>	american elder	None	No data
<i>Salvinia minima</i>	water fern, water spangles	None	No data
<i>Salvia lyrata</i>	lyreleaf sage	None	No data
<i>Salvia coccinea</i>	blood sage	None	No data
<i>Salix nigra</i>	black willow	None	No data
<i>Sagittaria platyphylla</i>	delta arrowhead	None	No data
<i>Sagittaria latifolia</i>	broadleaf arrowhead, common arrowhead, duck-potato	None	No data
<i>Sagittaria lancifolia media</i>	bulltongue arrowhead	None	No data
<i>Sagittaria lancifolia</i>	bulltongue, bulltongue arrowhead, scythe fruit arrowhead	None	No data
<i>Sacciolepis striata</i>	American cupscale	None	No data
<i>Saccharum giganteum</i>	sugarcane plume grass	None	No data
<i>Sabatia calycina</i>	coastal rose gentian, coastal rosegentian	None	No data
<i>Sabal minor</i>	dwarf palmetto	None	No data
<i>Rumex verticillatus</i>	swamp dock	None	No data
<i>Rumex pulcher</i>	fiddle dock	None	No data
<i>Rumex crispus</i>	Curley dock, curly dock, narrowleaf dock, sour dock, yellow dock	None	No data
<i>Ruellia nudiflora</i>	ruellia, violet wild petunia, wild petunia	None	No data
<i>Ruellia brittoniana</i>	Britton's wild petunia	None	No data
<i>Rubus trivialis</i>	southern dewberry	None	No data
<i>Rubus argutus</i>	prickly Florida blackberry, sawtooth blackberry	None	No data
<i>Rubus allegheniensis</i>	Allegheny blackberry	None	No data
<i>Rosa bracteata</i>	Macartney rose	None	No data
<i>Rorippa islandica</i>	northern marsh yellowcress	None	No data
<i>Robinia pseudoacacia</i>	black locust, false acacia, yellow locust	None	No data
<i>Rivina humilis</i>	bloodberry rougeplant, rougeplant	None	No data

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Rhynchospora corniculata	shortbristle horned beaksedge	None	No data
Rhynchospora colorata	starrush whitetop	None	No data
Zizaniopsis miliacea	giant cutgrass	None	No data
Youngia japonica	oriental false hawksbeard	None	No data
Xanthium strumarium	cocklebur, cocklebur, common cocklebur, rough cocklebur, rough cocklebur	None	No data
Woodwardia areolata	chainfern, netted chainfern	None	No data
Wolffiella lingulata	tongueshape bogmat	None	No data
Wolffiella gladiata	Florida mudmidget	None	No data
Wolffiella floridana	No data	None	No data
Wolffia columbiana	Columbian watermeal, columbia watermeal	None	No data
Wisteria sinensis	Chinese wisteria	None	No data
Waldsteinia fragarioides	Appalachian barren strawberry	None	No data
Vitis rotundifolia	muscadine, muscadine grape	None	No data
Vitis cinerea	graybark grape, sweet grape	None	No data
Viola sororia	common blue violet, hooded blue violet	None	No data
Viola septemloba	southern coastal violet	None	No data
Viola primulifolia	primrose violet, violet	None	No data
Vigna luteola	deer pea, hairy pod cowpea	None	No data
Vicia sativa nigra	common vetch, garden vetch, slimleaf vetch, vetch	None	No data
Vicia ludoviciana	Louisiana vetch, deerpea vetch, slim vetch	None	No data
Veronica persica	Persian speedwell, bird-eye speedwell, birdseye speedwell, birdseye speedwell, winter speedwell	None	No data
Veronica peregrina	neckweed, purslane speedwell	None	No data
Vernonia gigantea	giant ironweed, tall ironweed	None	No data
Verbesina virginica	Virginia crownbeard, iceweed, white crownbeard	None	No data
Verbena urticifolia	white verbena, white vervain	None	No data
Verbena rigida	tuberous vervain	None	No data
Verbena brasiliensis	Brazilian vervain	None	No data
Verbascum virgatum	wand mullein	None	No data
Valerianella stenocarpa	narrowcell cornsalad	None	No data
Utricularia inflata	swollen bladderwort	None	No data
Utricularia gibba	conespur bladderpod, humped bladderwort	None	No data
Urtica chamaedryoides	heartleaf nettle, slim stingingnettle	None	No data

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<i>Ulmus rubra</i>	slippery elm	None	No data
<i>Ulmus americana</i>	American elm,american elm	None	No data
<i>Typha latifolia</i>	broadleaf cattail,cattail,cattail (common),common cattail	None	No data
<i>Typha domingensis</i>	Southern cat-tail,southern cattail	None	No data
<i>Triodanis perfoliata</i>	Venus lookingglass,clasping Venus' looking-glass,clasping Venus' lookingglass,clasping bellwort,clasping venuslookingglass,clasping-leaf venus'-looking-glass,common Venus' lookingglass,roundleaved triodanis	None	No data
<i>Triodanis biflora</i>	No data	None	No data
<i>Trifolium resupinatum</i>	Persian clover,reversed clover	None	No data
<i>Trifolium repens</i>	Dutch clover,ladino clover,white clover	None	No data
<i>Trifolium pratense</i>	red clover	None	No data
<i>Trifolium incarnatum</i>	crimson clover	None	No data
<i>Triadica sebifera</i>	tallowtree	None	No data
<i>Triadenum walteri</i>	greater marsh St. Johnswort	None	No data
<i>Tradescantia ohiensis</i>	Ohio spiderwort,bluejacket	None	No data
<i>Toxicodendron rydbergii</i>	W. Poison ivy,poison ivy,western poison ivy,western poison-ivy	None	No data
<i>Toxicodendron radicans</i>	eastern poison ivy,poison ivy,poisonivy	None	No data
<i>Tillandsia usneoides</i>	Spanish moss	None	No data
<i>Thelypteris palustris</i>	eastern marsh fern,marsh fern,meadow fern	None	No data
<i>Thelypteris kunthii</i>	Kunth's maiden fern	None	No data
<i>Thalictrum dasycarpum</i>	purple meadow-rue,purple meadowrue	None	No data
<i>Taxodium distichum</i>	bald cypress,baldcypress	None	No data
<i>Taraxacum officinale</i>	blowball,common dandelion,dandelion,faceclock	None	No data
<i>Symphyotrichum tenuifolium</i>	perennial saltmarsh aster	None	No data
<i>Symphyotrichum praealtum</i>	willowleaf aster	None	No data
<i>Symphyotrichum lateriflorum</i>	calico aster	None	No data
<i>Symphyotrichum laeve</i>	smooth blue aster	None	No data
<i>Symphyotrichum divaricatum</i>	southern annual saltmarsh aster	None	No data
<i>Rhynchosia minima</i>	least snoutbean	None	No data

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<i>Rhus toxicodendron</i>	No data	None	No data
<i>Rhus radicans</i>	poison ivy	None	No data
<i>Ranunculus trilobus</i>	threelobe buttercup	None	No data
<i>Ranunculus sceleratus</i>	celeryleaf buttercup, cursed buttercup	None	No data
<i>Ranunculus pusillus</i>	low spearwort, weak buttercup	None	No data
<i>Ranunculus platensis</i>	prairie buttercup	None	No data
<i>Quercus virginiana</i>	live oak	None	No data
<i>Quercus texana</i>	Nuttall oak	None	No data
<i>Quercus phellos</i>	willow oak	None	No data
<i>Quercus nuttallii</i>	No data	None	No data
<i>Quercus nigra</i>	water oak	None	No data
<i>Quercus laurifolia</i>	laurel oak	None	No data
<i>Quercus alba</i>	white oak	None	No data
<i>Pyrrhopappus carolinianus</i>	Carolina desert chicory, Carolina desert-chicory, Carolina false dandelion, Carolina false-dandelion	None	No data
<i>Pueraria montana lobata</i>	Japanese arrowroot, acha, aka, kudzu, nepalem, w a yaka	None	No data
<i>Ptilimnium capillaceum</i>	herbwilliam, threadleaf mockbishopweed	None	No data
<i>Pteridium aquilinum</i>	bracken, bracken fern, brackenfern, northern bracken fern, western brackenfern	None	No data
<i>Prunus serotina</i>	black cherry, black chokecherry	None	No data
<i>Potamogeton pulcher</i>	heartleaf pondweed, spotted pondweed	None	No data
<i>Portulaca oleracea</i>	akulikuli-kula, common purslane, duckweed, garden purslane, little hogweed, little-hogweed, purslane, pursley, pusley, wild portulaca	None	No data
<i>Populus deltoides</i>	common cottonwood, cottonwood, eastern cottonwood, plains cottonwood	None	No data
<i>Pontederia cordata</i>	pickerelweed	None	No data
<i>Polypremum procumbens</i>	juniper leaf	None	No data
<i>Polypogon monspeliensis</i>	annual rabbit's-foot grass, annual rabbitsfoot grass, rabbit'sfootgrass, rabbitfoot beardgrass, rabbitfoot grass, rabbitfoot polypogon, rabbitfootgrass	None	No data

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<i>Polygonum virginianum</i>	Virginia smartweed, jumpseed	None	No data
<i>Polygonum setaceum</i>	bog smartweed	None	No data
<i>Polygonum ramosissimum</i>	bushy knotweed, tall knotweed, yellow knotweed, yellow-flower knotweed	None	No data
<i>Polygonum punctatum punctatum</i>	dotted smartweed	None	No data
<i>Polygonum punctatum</i>	dotted smartweed	None	No data
<i>Polygonum hydropiperoides</i>	swamp smartweed	None	No data
<i>Polygonum densiflorum</i>	denseflower knotweed	None	No data
<i>Poa annua</i>	annual blue grass, annual bluegrass, walkgrass	None	No data
<i>Pluchea odorata</i>	sweetscent	None	No data
<i>Pleopeltis polypodioides polypodioides</i>	resurrection fern	None	No data
<i>Platanus occidentalis</i>	American sycamore, sycamore	None	No data
<i>Plantago major</i>	broadleaf plantain, buckhorn plantain, common plantain, great plantain, rippleseed plantain	None	No data
<i>Planera aquatica</i>	planertree, water elm, water-elm	None	No data
<i>Pistia stratiotes</i>	apon-apon, laitue d'eau, lechuguita de qgua, pistie, tropical duckweed, water lettuce, water-lettuce	None	No data
<i>Pilea pumila</i>	Canada clearweed, Canadian clearweed	None	No data
<i>Phytolacca americana</i>	American pokeweed, common pokeweed, inkberry, pigeonberry, poke, pokeberry, pokeweed	None	No data
<i>Physalis angulata</i>	cut-leaf ground-cherry, cutleaf groundcherry, lanceleaf groundcherry	None	No data
<i>Phyllanthus urinaria</i>	chamber bitter	None	No data
<i>Phyla nodiflora</i>	frog fruit, sawtooth fogfruit, turkey tangle, turkey tangle fogfruit	None	No data
<i>Phyla lanceolata</i>	frog fruit, lanceleaf fogfruit, lanceleaf frog fruit, northern fogfruit	None	No data
<i>Phragmites australis</i>	common reed	None	No data
<i>Phoradendron tomentosum</i>	Christmas mistletoe, bigleaf mistletoe, downy mistletoe	None	No data
<i>Phanopyrum gymnocarpon</i>	Savannah panic grass, savannah panicum, savannah-panicgrass	None	No data
<i>Phalaris caroliniana</i>	Carolina canarygrass	None	No data

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<i>Phalaris angusta</i>	timothy canarygrass	None	No data
<i>Persea borbonia</i>	redbay	None	No data
<i>Passiflora lutea</i>	passionflower, yellow passionflower	None	No data
<i>Passiflora incarnata</i>	purple passionflower	None	No data
<i>Paspalum urvillei</i>	Vasey grass, Vasey's grass, vaseygrass	None	No data
<i>Paspalum notatum</i>	Bahia grass, bahiagrass	None	No data
<i>Paspalum lividum</i>	longtom	None	No data
<i>Paspalum distichum</i>	knotgrass, knotroot paspalum	None	No data
<i>Parthenocissus quinquefolia</i>	American ivy, Virginia creeper, fiveleaved ivy, woodbine	None	No data
<i>Parthenium hysterophorus</i>	Santa Maria feverfew, ragweed parthenium, whitetop weed	None	No data
<i>Panicum virgatum</i>	switchgrass	None	No data
<i>Panicum rigidulum</i>	redtop panicgrass, redtop panicum	None	No data
<i>Panicum hemitomon</i>	maidencane, mountain panic	None	No data
<i>Panicum dichotomiflorum</i>	fall panic, fall panicgrass, fall panicum, western witchgrass	None	No data
<i>Panicum anceps</i>	beaked panicgrass, beaked panicum	None	No data
<i>Koeleria paniculata</i>	goldenrain tree	None	No data
<i>Justicia ovata lanceolata</i>	loose justica, looseflower water-willow	None	No data
<i>Juniperus virginiana</i>	eastern red-cedar, eastern redcedar, red cedar juniper	None	No data
<i>Juncus tenuis</i>	field rush, path rush, poverty rush, slender rush, slender yard rush, wiregrass	None	No data
<i>Juncus effusus</i>	common rush, lamp rush	None	No data
<i>Jacquemontia tamnifolia</i>	clustervine, hairy clustervine	None	No data
<i>Iva frutescens</i>	Jesuit's bark, bigleaf sumpweed	None	No data
<i>Iva annua</i>	annual marsh-elder, annual marshelder, seacoast sumpweed	None	No data
<i>Iris pseudacorus</i>	paleyellow iris, yellow flag	None	No data
<i>Iris giganteaerulea</i>	giant blue iris	None	No data
<i>Iris fulva</i>	copper iris	None	No data
<i>Ipomoea sagittata</i>	saltmarsh morning-glory, saltmarsh morningglory	None	No data
<i>Ipomoea leucantha</i>	ipomoea, morningglory	None	No data

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<i>Ipomoea cordatotriloba</i> cordatotriloba	cotton morningglory, sharppod morningglory, tievine	None	No data
<i>Ipomoea coccinea</i>	Mexican morningglory, red morningglory, redstar, scarlet morningglory, scarlet morningglory, starglory, wooly tidesstromia	None	No data
<i>Ionactis linariifolius</i>	flaxleaf whitetop aster, savoryleaf aster	None	No data
<i>Ilex vomitoria</i>	yaupon	None	No data
<i>Ilex decidua</i>	possumhaw	None	No data
<i>Ilex cassine</i>	dahoon	None	No data
<i>Hypoxis</i>	hypoxis, star-grass	None	No data
<i>Hypericum walteri</i>	No data	None	No data
<i>Hypericum spathulatum</i>	No data	None	No data
<i>Hypericum prolificum</i>	shrubby St. Johnswort, shrubby st johnswort	None	No data
<i>Hypericum hypericoides</i> hypericoides	St Andrews cross, St. Andrew's cross	None	No data
<i>Hypericum densiflorum</i>	bushy St. Johnswort, dense st. johnswort	None	No data
<i>Hymenocallis</i> caroliniana	Carolina spiderlily	None	No data
<i>Hygrophila lacustris</i>	gulf swampweed	None	No data
<i>Hydrocotyle verticillata</i>	whorled marsh pennywort, whorled marshpennywort, whorled pennyroyal	None	No data
<i>Hydrocotyle umbellata</i>	manyflower marshpennywort, umbrella pennyroyal	None	No data
<i>Hydrocotyle</i> ranunculoides	floating marsh pennywort, floating marshpennywort, floating pennyroyal	None	No data
<i>Hordeum pusillum</i>	little barley, little wildbarley	None	No data
<i>Hibiscus moscheutos</i> lasiocarpos	crimson-eyed rosemallow, marshmallow	None	No data
<i>Hibiscus laevis</i>	halberdleaf rosemallow, scarlet rosemallow	None	No data
<i>Heliotropium</i> curassavicum	quail plant, salt heliotrope, seaside heliotrope	None	No data
<i>Helianthus annuus</i>	annual sunflower, common sunflower, sunflower, wild sunflower	None	No data
<i>Helenium flexuosum</i>	purplehead sneezeweed	None	No data

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Habenaria repens	waterspider bog orchid, waterspider false reinorchid	None	No data
Gleditsia triacanthos	Honey locust, common honeylocust, honey-locust, honeylocust, honeylocusts	None	No data
Geum canadense	white avens	None	No data
Geranium maculatum	spotted crane's-bill, spotted geranium	None	No data
Geranium carolinianum	Carolina crane's-bill, Carolina geranium	None	No data
Galium tinctorium	dye bedstraw, stiff marsh bedstraw	None	No data
Galium aparine	bedstraw, catchweed bedstraw, cleavers, cleaverwort, goose grass, scarthgrass, sticky-willy, stickywilly, white hedge	None	No data
Gaillardia pulchella	Indian blanket, Indianblanket, firewheel, rosering gaillardia	None	No data
Fuirena squarrosa	hairy umbrella-sedge, hairy umbrellasedge	None	No data
Fraxinus profunda	pumpkin ash	None	No data
Fraxinus pennsylvanica	green ash	None	No data
Fraxinus caroliniana	Carolina ash, carolina ash	None	No data
Festuca subverticillata	nodding fescue	None	No data
Eupatorium serotinum	late eupatorium, lateflowering thoroughwort	None	No data
Eupatorium rugosum	richweed, snakeroot, white snakeroot	None	No data
Eupatorium capillifolium	dogfennel	None	No data
Erigeron philadelphicus	Philadelphia daisy, Philadelphia fleabane	None	No data
Erianthus giganteus	No data	None	No data
Eragrostis minor	little love grass, little lovegrass	None	No data
Epidendrum conopseum	green fly orchid	None	No data
Elymus virginicus	Virginia wild rye, Virginia wildrye	None	No data
Eleusine indica	Indian goose grass, Indian goosegrass, crow'sfoot grass, goose grass, goosegrass, manienie ali'l, silver crabgrass, wiregrass	None	No data
Elephantopus carolinianus	Carolina elephantsfoot, leafy elephantfoot	None	No data
Eleocharis quadrangulata	squarestem spikerush, squarestem spikesedge	None	No data

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<i>Eleocharis palustris</i>	common spikerush, creeping spikerush, spikesedge	None	No data
<i>Eleocharis montevidensis</i>	sand spikerush	None	No data
<i>Eleocharis microcarpa</i>	smallfruit spikerush	None	No data
<i>Eleocharis macrostachya</i>	No data	None	No data
<i>Eleocharis flavescens</i>	yellow spikerush	None	No data
<i>Eleocharis fallax</i>	creeping spikerush	None	No data
<i>Eleocharis cellulosa</i>	Gulf Coast spikerush, Gulfcoast spikesedge	None	No data
<i>Eichhornia crassipes</i>	common water hyacinth, common water-hyacinth, floating water hyacinth, floating waterhyacinth, jacinthe d'eau, jacinto de agua, lirio acuatico, mbekambekairanga, water hyacinth	None	No data
<i>Eclipta prostrata</i>	eclipta, false daisy, yerba de tago, yerba de tajo	None	No data
<i>Eclipta alba</i>	No data	None	No data
<i>Echinodorus cordifolius</i>	burhead, creeping burhead, creeping burrhead	None	No data
<i>Echinochloa walteri</i>	coast cockspur, coast cockspur grass	None	No data
<i>Echinochloa crus-galli</i>	Japanese millet, barnyard grass, barnyardgrass, cockspur, large barnyard grass, watergrass	None	No data
<i>Duchesnea indica</i>	India mockstrawberry, Indian strawberry	None	No data
<i>Dracopis amplexicaulis</i>	clasping cone flower, clasping-cone flower	None	No data
<i>Doellingeria sericocarpoides</i>	Doellingeria sericocarpoides, southern whitetop	None	No data
<i>Diospyros virginiana</i>	Persimmon, common persimmon, eastern persimmon	None	No data
<i>Diodia virginiana</i>	Virginia buttonweed	None	No data
<i>Digitaria sanguinalis</i>	Crabgrass, hairy crab grass, hairy crabgrass, large crabgrass, purple crabgrass, redhair crabgrass	None	No data
<i>Digitaria ischaemum</i>	small crabgrass, smooth crab grass, smooth crabgrass	None	No data
<i>Dicliptera brachiata</i>	branched foldwing	None	No data
<i>Dichondra carolinensis</i>	Carolina ponysfoot, grass ponyfoot	None	No data

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Dichanthelium commutatum	variable panicgrass	None	No data
Desmodium paniculatum	panicled tickclover,panicledleaf ticktrefoil	None	No data
Desmodium laevigatum	smooth tickclover,smooth ticktrefoil	None	No data
Desmodium glabellum	Dillenius' ticktrefoil	None	No data
Desmodium canescens	hoary tickclover,hoary ticktrefoil	None	No data
Desmanthus illinoensis	illinois bundleflower,prairie bundleflower	None	No data
Cyperus virens	green flatsedge	None	No data
Cyperus thyrsoiflorus	Southern flat sedge,southern flatsedge	None	No data
Cyperus strigosus	stawcolored flatsedge,strawcolor flatsedge,strawcolor nutgrass,strawcolored flatsedge,strawcolored nutgrass	None	No data
Cyperus oxylepis	sharp scale flatsedge	None	No data
Cyperus odoratus	fragrant flatsedge,rusty flat sedge	None	No data
Cyperus ochraceus	pond flatsedge	None	No data
Cyperus iria	ricefield flatsedge	None	No data
Cyperus hermaphroditus	No data	None	No data
Cyperus haspan	haspan flatsedge	None	No data
Cyperus esculentus	chufa,chufa flatsedge,yellow nutgrass,yellow nutsedge	None	No data
Cyperus erythrorhizos	red-root flat sedge,redroot flatsedge,redroot nutgrass	None	No data
Cyperus elegans	royal flatsedge,sticky flatsedge	None	No data
Cuphea carthagenensis	Colombian waxweed	None	No data
Cucurbita texana	Texas gourd	None	No data
Crinum americanum	seven sisters	None	No data
Crataegus viridis	No data	None	No data
Cornus florida	flowering dogwood	None	No data
Cornus drummondii	roughleaf dogwood	None	No data
Cornus alternifolia	alternate-leaf dogwood,alternatleaf dogwood	None	No data
Conoclinium coelestinum	blue mistflower	None	No data
Commelina virginica	Virginia dayflower	None	No data
Commelina erecta	erect dayflower,whitemouth dayflower	None	No data
Commelina diffusa	climbing dayflower,spreading dayflower	None	No data
Colocasia esculenta	coco yam,wild taro	None	No data

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<i>Cocculus carolinus</i>	Carolina coralbead, Carolina snailseed, redberry moonseed	None	No data
<i>Clematis virginiana</i>	Virginia bower, devil's darning needles, devil's-darning-needles, virgin's bower	None	No data
<i>Clematis terniflora</i>	leatherleaf clematis, sweet autumn virginsbower, yam-leaved clematis	None	No data
<i>Clematis crispa</i>	curly virginsbower, swamp leather flower	None	No data
<i>Cladium mariscus jamaicense</i>	Jamaica swamp sawgrass, jamaica sawgrass	None	No data
<i>Citrus</i>	citrus	None	No data
<i>Cirsium horridulum</i>	yellow thistle	None	No data
<i>Cinnamomum camphora</i>	camphor laurel, camphor tree, camphortree	None	No data
<i>Cicuta maculata maculata</i>	common water hemlock, poison parsnip, spotted cowbane, spotted parsley, spotted water hemlock, spotted water-hemlock, water hemlock	None	No data
<i>Chloris gayana</i>	Rhodes grass, rhodesgrass	None	No data
<i>Chamaesyce prostrata</i>	prostrate sandmat, prostrate spurge	None	No data
<i>Chamaesyce nutans</i>	eyebane, nodding spurge, spotted sandmat, spotted spurge	None	No data
<i>Chamaesyce maculata</i>	spotted sandmat	None	No data
<i>Chamaesyce hirta</i>	pill-pod sandmat, pillpod sandmat	None	No data
<i>Chamaesyce cordifolia</i>	heartleaf sandmat	None	No data
<i>Chamaecrista fasciculata</i>	Showy partridgepea, partridge pea, sleepingplant	None	No data
<i>Chaerophyllum tainturieri</i>	chervil, hairy-fruit chervil, hairyfruit chervil	None	No data
<i>Ceratopteris pteridoides</i>	floating antlerfern	None	No data
<i>Ceratophyllum demersum</i>	common hornwort, coon's tail, coon's-tail, coontail, hornwort	None	No data
<i>Cerastium glomeratum</i>	sticky chickweed	None	No data
<i>Cephalanthus occidentalis</i>	buttonbush, common buttonbush	None	No data
<i>Centrosema virginianum</i>	butterflypea, spurred butterfly pea	None	No data
<i>Celtis laevigata</i>	sugar berry, sugar hackberry, sugarberry	None	No data
<i>Cassia fasciculata</i>	partridge pea, showy partridgepea, sleepingplant	None	No data
<i>Carya illinoensis</i>	pecan	None	No data
<i>Carya aquatica</i>	water hickory	None	No data

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Carpinus caroliniana</i>	American hornbeam,american hornbeam	None	No data
<i>Carex tribuloides</i>	blunt broom sedge	None	No data
<i>Carex hyalinolepis</i>	shoreline sedge	None	No data
<i>Carex flaccosperma</i>	thinfruit sedge	None	No data
<i>Carex crus-corvi</i>	ravenfoot sedge	None	No data
<i>Carex cherokeensis</i>	Cherokee sedge	None	No data
<i>Carex cephalophora</i>	oval-leaf sedge,ovalleaf sedge	None	No data
<i>Carex amphibola</i>	amphibious sedge,eastern narrowleaf sedge	None	No data
<i>Cardiospermum halicacabum</i>	balloonvine,love in a puff	None	No data
<i>Cardamine pensylvanica</i>	Pennsylvania bittercress,Quaker bittercress	None	No data
<i>Canna flaccida</i>	bandanna of the Everglades	None	No data
<i>Campsis radicans</i>	common trumpetcreeper,cow-itch,trumpet creeper	None	No data
<i>Calyptracarpus vialis</i>	straggler daisy	None	No data
<i>Callitriche heterophylla</i>	differentleaf waterstarwort,greater water starwort,larger waterstarwort,twoheaded waterstarwort,variedleaf waterstarwort	None	No data
<i>Callicarpa americana</i>	American beautyberry	None	No data
<i>Calibrachoa parviflora</i>	seaside petunia,seaside-petunia	None	No data
<i>Cabomba caroliniana</i>	Carolina fanwort,fanwort	None	No data
<i>Bumelia lycioides</i>	buckthorn bumelia	None	No data
<i>Brunnichia ovata</i>	American buckwheat vine,buckwheat vine,redvine	None	No data
<i>Boehmeria cylindrica</i>	small-spike false nettle,smallspike false nettle,smallspike falsenettle	None	No data
<i>Bignonia capreolata</i>	cross vine,crossvine	None	No data
<i>Bidens pilosa</i>	Spanish needle,Spanish needles,beggar's tick,cobbler's pegs,fisi'uli,hairy beggarticks,kofe tonga,matakaro	None	No data
<i>Bidens laevis</i>	burmarigold,smooth beggartick,smooth beggarticks	None	No data
<i>Bidens bipinnata</i>	Spanish needles,spanish-needles	None	No data
<i>Berchemia scandens</i>	Alabama supplejack	None	No data
<i>Bacopa monnieri</i>	coastal waterhyssop,herb of grace,herb-of-grace	None	No data
<i>Baccharis halimifolia</i>	eastern baccharis	None	No data
<i>Aster umbellatus</i>	No data	None	No data
<i>Aster subulatus</i>	annual saltmarsh aster	None	No data
<i>Aster praealtus</i>	willowleaf aster	None	No data

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Aster linariifolius</i>	No data	None	No data
<i>Aster lateriflorus</i>	calico aster	None	No data
<i>Aster laevis</i>	smooth aster	None	No data
<i>Asplenium platyneuron</i>	ebony spleenwort	None	No data
<i>Asclepias perennis</i>	aquatic milkweed	None	No data
<i>Arundinaria gigantea tecta</i>	switchcane	None	No data
<i>Arundinaria gigantea</i>	giant cane	None	No data
<i>Arthraxon hispidus</i>	hairy jointgrass, small carpgrass	None	No data
<i>Arisaema dracontium</i>	green dragon, greendragon	None	No data
<i>Argemone albiflora</i>	bluestem pricklypoppy	None	No data
<i>Aralia spinosa</i>	angelicatree, devil's walkingstick, devils walkingstick	None	No data
<i>Allium canadense</i>	Canada garlic, Wild onion, meadow garlic, wild onion	None	No data
<i>Alternanthera philoxeroides</i>	alligator weed, alligatorweed, pig weed	None	No data
<i>Amaranthus australis</i>	southern amaranth	None	No data
<i>Amaranthus tamariscinus</i>	No data	None	No data
<i>Ambrosia artemisiifolia</i>	Roman wormwood, annual ragweed, common ragweed, low ragweed, ragweed, short ragweed, small ragweed	None	No data
<i>Ambrosia psilostachya</i>	Cuman ragweed, perennial ragweed, western ragweed	None	No data
<i>Ambrosia trifida</i>	blood ragweed, giant ragweed, great ragweed, horseweed, perennial ragweed (great), tall ragweed	None	No data
<i>Ammannia coccinea</i>	purple ammannia, valley redstem	None	No data
<i>Ampelopsis arborea</i>	peppervine	None	No data
<i>Ampelopsis cordata</i>	heartleaf ampelopsis, heartleaf peppervine	None	No data
<i>Anagallis arvensis</i>	pimpernel, scarlet pimpernel	None	No data
<i>Andropogon glomeratus</i>	bushy bluestem		

APPENDIX 2

NPS LIST OF FISH SPECIES OF KNOWN OR PROBABLE OCCURRENCE WITHIN JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE, JEFFERSON PARISH, LOUISIANA

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Ameiurus melas</i>	black bullhead	<i>Ameiurus melas</i>	Black Bullhead
<i>Trinectes maculatus</i>	hogchoker	<i>Trinectes maculatus</i>	Hogchoker
<i>Strongylura marina</i>	Atlantic needlefish	<i>Strongylura marina</i>	Atlantic Needlefish
<i>Sciaenops ocellatus</i>	red drum	<i>Sciaenops ocellatus</i>	Red Drum
<i>Pylodictis olivaris</i>	flathead catfish	<i>Pylodictis olivaris</i>	Flathead Catfish
<i>Pomoxis nigromaculatus</i>	black crappie	<i>Pomoxis nigromaculatus</i>	Black Crappie
<i>Poecilia latipinna</i>	sailfin molly	<i>Poecilia latipinna</i>	Sailfin Molly
<i>Platybelone argalus</i>	keeltail needlefish	<i>Platybelone argalus</i>	Keeltail Needlefish
<i>Paralichthys lethostigma</i>	southern flounder	<i>Paralichthys lethostigma</i>	Southern Flounder
<i>Notemigonus crysoleucas</i>	golden shiner	<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Sebastes viviparus</i>	norway haddock, redfish	None	No Data
<i>Nematalosa nasus</i>	Bloch's gizzard shad, gizzard shad	None	No Data
<i>Menidia peninsulae</i>	tidewater silverside	None	No Data
<i>Liza tricuspidens</i>	striped mullet	None	No Data
<i>Lepisosteus productus</i>	shortnose gar, spotted gar	None	No Data
<i>Atractosteus spatula</i>	alligator gar	None	No Data
<i>Micropterus salmoides</i>	largemouth bass	<i>Micropterus salmoides</i>	Largemouth Bass
<i>Menidia beryllina</i>	inland silverside, tidewater silverside	<i>Menidia beryllina</i>	Inland Silverside
<i>Lucania parva</i>	rainwater killifish	<i>Lucania parva</i>	Rainwater Killifish
<i>Lepomis symmetricus</i>	bantam sunfish	<i>Lepomis symmetricus</i>	Bantam Sunfish
<i>Lepomis punctatus</i>	spotted sunfish	<i>Lepomis punctatus</i>	Spotted Sunfish
<i>Lepomis microlophus</i>	redeer sunfish	<i>Lepomis microlophus</i>	Redeer Sunfish
<i>Lepomis macrochirus</i>	bluegill	<i>Lepomis macrochirus</i>	Bluegill
<i>Lepomis humilis</i>	orangespotted sunfish	<i>Lepomis humilis</i>	Orangespotted Sunfish
<i>Lepomis cyanellus</i>	green sunfish	<i>Lepomis cyanellus</i>	Green Sunfish
<i>Lepisosteus spatula</i>	No data	<i>Lepisosteus spatula</i>	Alligator Gar
<i>Lepisosteus oculatus</i>	spotted gar	<i>Lepisosteus oculatus</i>	Spotted Gar
<i>Leiostomus xanthurus</i>	spot	<i>Leiostomus xanthurus</i>	Spot
<i>Ictalurus punctatus</i>	channel catfish, graceful catfish	<i>Ictalurus punctatus</i>	Channel Catfish

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Ictalurus furcatus</i>	blue catfish	<i>Ictalurus furcatus</i>	Blue Catfish
<i>Heterandria formosa</i>	dwarf livebearer, least killifish	<i>Heterandria formosa</i>	Least Killifish
<i>Elops saurus</i>	ladyfish	<i>Elops saurus</i>	Ladyfish
<i>Mugil cephalus</i>	striped mullet	<i>Mugil cephalus</i>	Striped Mullet
<i>Elassoma zonatum</i>	banded pygmy sunfish	<i>Elassoma zonatum</i>	Banded Pygmy Sunfish
<i>Dorosoma cepedianum</i>	American gizzard shad, eastern gizzard shad, gizzard shad, hickory shad, mud shad, skipjack	<i>Dorosoma cepedianum</i>	Gizzard Shad
<i>Dormitator maculatus</i>	fat sleeper	<i>Dormitator maculatus</i>	Fat Sleeper
<i>Dasyatis sabina</i>	Atlantic stingray	<i>Dasyatis sabina</i>	Atlantic Stingray
<i>Cyprinus carpio</i>	European carp, common carp	<i>Cyprinus carpio</i>	Common Carp
<i>Cyprinodon variegatus</i>	sheepshead minnow, sheepshead pupfish	<i>Cyprinodon variegatus</i>	Sheepshead Minnow
<i>Cynoscion nebulosus</i>	spotted seatrout	<i>Cynoscion nebulosus</i>	Spotted Seatrout
<i>Centrarchus macropterus</i>	flier, peacock sunfish, round sunfish	<i>Centrarchus macropterus</i>	Flier
<i>Gambusia affinis</i>	mosquitofish, western mosquitofish	<i>Gambusia affinis</i>	Western Mosquitofish
<i>Fundulus pulvereus</i>	Bayou killifish	<i>Fundulus pulvereus</i>	Bayou Killifish
<i>Fundulus grandis</i>	Gulf killifish	<i>Fundulus grandis</i>	Gulf Killifish
<i>Fundulus confluentus</i>	marsh killifish	<i>Fundulus confluentus</i>	Marsh Killifish
<i>Fundulus chrysotus</i>	golden topminnow	<i>Fundulus chrysotus</i>	Golden Topminnow
<i>Brevoortia patronus</i>	Gulf menhaden, largescale menhaden	<i>Brevoortia patronus</i>	Gulf Menhaden
<i>Aphredoderus sayanus</i>	pirate perch	<i>Aphredoderus sayanus</i>	Pirate Perch
<i>Anguilla rostrata</i>	American eel	<i>Anguilla rostrata</i>	American Eel
<i>Anchoa mitchilli</i>	bay anchovy	<i>Anchoa mitchilli</i>	Bay Anchovy
<i>Amia calva</i>	bowfin	<i>Amia calva</i>	Bowfin
<i>Ameiurus natalis</i>	yellow bullhead	<i>Ameiurus natalis</i>	Yellow Bullhead

APPENDIX 3

NPS LIST OF AMPHIBIAN SPECIES OF KNOWN OR PROBABLE OCCURRENCE WITHIN JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE, JEFFERSON PARISH, LOUISIANA

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Acris crepitans</i>	Northern cricket frog	<i>Acris crepitans</i>	Northern Cricket Frog
<i>Ambystoma texanum</i>	Small-mouthed salamander	<i>Ambystoma texanum</i>	Small-mouth Salamander
<i>Amphiuma tridactylum</i>	Three-toed amphiuma	<i>Amphiuma tridactylum</i>	Three-Toed Amphiuma
<i>Desmognathus auriculatus</i>	Southern dusky salamander	<i>Desmognathus auriculatus</i>	Southern Dusky Salamander
<i>Bufo woodhousii</i>	Woodhouse's toad	<i>Bufo woodhousii</i>	Woodhouse's Toad
<i>Bufo valliceps</i>	Gulf Coast toad	<i>Bufo valliceps</i>	Gulf Coast Toad
<i>Eurycea quadridigitata</i>	Dwarf salamander	<i>Eurycea quadridigitata</i>	Dwarf Salamander
<i>Hyla avivoca</i>	Bird-voiced treefrog	<i>Hyla avivoca</i>	Bird-Voiced Treefrog
<i>Hyla cinerea</i>	Green treefrog, green tree frog	<i>Hyla cinerea</i>	Green Treefrog
<i>Notophthalmus viridescens</i>	Eastern newt	<i>Notophthalmus viridescens</i>	Eastern Newt
<i>Notophthalmus meridionalis</i>	Black-spotted newt	<i>Notophthalmus meridionalis</i>	Black-Spotted Newt
<i>Rana clamitans clamitans</i>	bronze frog	None	No Data
<i>Notophthalmus viridescens louisianensis</i>	central newt	None	No Data
<i>Desmognathus fuscus conanti</i>	spotted dusky salamander	None	No Data
<i>Bufo woodhousii woodhousii</i>	woodhouse's toad	None	No Data
<i>Bufo valliceps valliceps</i>	gulf coast toad	None	No Data
<i>Hyla versicolor</i>	Gray treefrog	<i>Hyla versicolor</i>	Gray Treefrog
<i>Hyla squirella</i>	Squirrel treefrog	<i>Hyla squirella</i>	Squirrel Treefrog
<i>Siren intermedia</i>	Lesser siren, dwarf siren	<i>Siren intermedia</i>	Lesser Siren
<i>Rana utricularia sphenocephala</i>	florida leopard frog, southern leopard frog	<i>Rana utricularia sphenocephala</i>	No Data
<i>Rana sphenocephala</i>	Southern leopard frog	<i>Rana sphenocephala</i>	Southern Leopard Frog
<i>Rana grylio</i>	Pig frog	<i>Rana grylio</i>	Pig Frog
<i>Rana clamitans</i>	Green frog	<i>Rana clamitans</i>	Green Frog
<i>Rana catesbeiana</i>	Bullfrog	<i>Rana catesbeiana</i>	Bullfrog

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Pseudacris triseriata</i>	Striped chorus frog, western chorus frog	<i>Pseudacris triseriata</i>	Striped Chorus Frog, Western Chorus Frog
<i>Pseudacris crucifer</i>	northern spring peeper	<i>Pseudacris crucifer</i>	No Data
<i>Pseudacris crucifer</i>	Spring peeper	<i>Pseudacris crucifer</i>	Spring Peeper
<i>Hyla chrysoscelis</i>	Cope's gray treefrog, cope's gray frog	<i>Hyla chrysoscelis</i>	Cope's Gray Treefrog
<i>Gastrophryne carolinensis</i>	Eastern narrow-mouthed toad	<i>Gastrophryne carolinensis</i>	Eastern Narrowmouth Toad,

APPENDIX 4

NPS LIST OF REPTILE SPECIES OF KNOWN OR PROBABLE OCCURRENCE WITHIN JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE, JEFFERSON PARISH, LOUISIANA

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
Agkistrodon contortrix	copperhead	Agkistrodon contortrix	Copperhead
Apalone spinifera	spiny softshell turtle	Apalone spinifera	Spiny Softshell
Anolis carolinensis	green anole	Anolis carolinensis	Green Anole
Chrysemys picta	painted turtle	Chrysemys picta	Painted Turtle
Crotalus horridus	timber rattlesnake	Crotalus horridus	Timber Rattlesnake
Lampropeltis triangulum	milk snake	Lampropeltis triangulum	Milk Snake
Lampropeltis getula holbrooki	speckled kingsnake	Lampropeltis getula holbrooki	Speckled Kingsnake
Lampropeltis getula	common kingsnake	Lampropeltis getula	Common Kingsnake
Kinosternon subrubrum	common mud turtle	Kinosternon subrubrum	Eastern Mud Turtle
Heterodon platyrhinos	No data	Heterodon platyrhinos	Eastern Hognose Snake
Hemidactylus turcicus	Mediterranean gekko, Mediterranean house gekko	Hemidactylus turcicus	Mediterranean Gecko
Graptemys pseudogeographica	false map turtle	Graptemys pseudogeographica	False Map Turtle
Farancia abacura reinwardtii	western mud snake	Farancia abacura reinwardtii	Western Mud Snake
Farancia abacura	mud snake	Farancia abacura	Mud Snake
Eumeces laticeps	broad-headed skink	Eumeces laticeps	Broadhead Skink
Eumeces fasciatus	five-lined skink	Eumeces fasciatus	Five-Lined Skink
Elaphe obsoleta lindheimeri	Texas rat snake	Elaphe obsoleta linsheimeri	Texas Rat Snake
Elaphe obsoleta	rat snake	Elaphe obsoleta	Rat Snake
Diadophis punctatus stictogenys	Mississippi ringneck snake	Diadophis punctatus stictogenys	Mississippi Ringneck Snake
Deirochelys reticularia miaria	western chicken turtle	Deirochelys reticularia miaria	No Data
Crotalus horridus atricaudatus	No data	Crotalus horridus atricaudatus	Canebrake Rattlesnake
Nerodia rhombifera	No data	Nerodia rhombifer	Diamondback Water Snake

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Nerodia fasciata confluens</i>	broad-banded water snake	<i>Nerodia fasciata confluens</i>	Broad-Banded Water Snake
<i>Nerodia fasciata</i>	southern water snake	<i>Nerodia fasciata</i>	Southern Water Snake
<i>Nerodia erythrogaster flavigaster</i>	yellow-bellied water snake	<i>Nerodia erythrogaster flavigaster</i>	No Data
<i>Nerodia erythrogaster</i>	plain-bellied water snake	<i>Nerodia erythrogaster</i>	Plainbelly Water Snake
<i>Nerodia cyclopion</i>	Mississippi green water snake, green water snake	<i>Nerodia cyclopion</i>	Green Water Snake
<i>Nerodia clarkii</i>	salt marsh water snake	<i>Nerodia clarkii</i>	Salt Marsh Snake
<i>Macroclmys temminckii</i>	alligator snapping turtle	<i>Macroclmys temminckii</i>	Alligator Snapping Turtle
<i>Coluber constrictor latrunculus</i>	black-masked racer	<i>Coluber constrictor latrunculus</i>	Blackmask Racer
<i>Scincella lateralis</i>	ground skink	<i>Scincella lateralis</i>	Ground Skink
<i>Regina rigida</i>	glossy crayfish snakes	<i>Regina rigida</i>	Glossy Crayfish Snake
<i>Regina grahamii</i>	Graham's crayfish snake	<i>Regina grahamii</i>	Graham's Crayfish Snake
<i>Pseudemys floridana</i>	common cooter	<i>Pseudemys floridana</i>	Cooter
<i>Pseudemys concinna</i>	river cooter	<i>Pseudemys concinna</i>	River Cooter
<i>Opheodrys aestivus</i>	rough green snake	<i>Opheodrys aestivus</i>	Rough Green Snake
<i>Trachemys scripta elegans</i>	red-eared slider	None	No Data
<i>Storeria dekayi linnetes</i>	marsh brown snake	None	No Data
<i>Regina rigida rigida</i>	glossy crawfish snake	None	No Data
<i>Pseudemys concinna mobilensis</i>	No data	<i>Pseudemys concinna mobilensis</i>	No Data
<i>Trachemys scripta</i>	common slider	<i>Trachemys scripta</i>	Slider
<i>Thamnophis sirtalis</i>	common garter snake	<i>Thamnophis sirtalis</i>	Common Garter Snake
<i>Thamnophis proximus orarius</i>	Gulf Coast ribbon snake	<i>Thamnophis proximus orarius</i>	Gulf Coast Ribbon Snake
<i>Thamnophis proximus</i>	western ribbon snake	<i>Thamnophis proximus</i>	Western Ribbon Snake
<i>Terrapene carolina major</i>	Gulf Coast box turtle	<i>Terrapene carolina major</i>	Gulf Coast Box Turtle

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
Storeria occipitomaculata occipitomaculata	northern redbelly snake	Storeria occipitomaculata occipitomaculata	Northern Redbelly Snake
Storeria dekayi	Dekay's brown snake	Storeria dekayi	Brown Snake
Sternotherus odoratus	common musk turtle	Sternotherus odoratus	Common Musk Turtle
Sternotherus carinatus	razor-backed musk turtle	Sternotherus carinatus	Razorback Musk Turtle
Sistrurus miliarius streckeri	western pigmy rattlesnake	Sistrurus miliarius steckeri	No Data
Sistrurus miliarius	pigmy rattlesnake	Sistrurus miliarius	Pigmy Rattlesnake
Ophisaurus ventralis	eastern glass lizard	None	No Data
Malaclemys terrapin pileata	Mississippi diamondback terrapin	None	No Data
Lampropeltis triangulum amaura	Louisiana milk snake	None	No Data
Kinosternon subrubrum hippocrepis	Mississippi mud turtle	None	No Data
Graptemys pseudogeographica pseudogeographica	false map turtle	None	No Data
Graptemys kohnii	Mississippi map turtle	None	No Data
Chrysemys picta dorsalis	southern painted turtle	Chrysemys picta dorsalis	No Data
Chelydra serpentina	common snapping turtle, snapping turtle	Chelydra serpentina	Snapping Turtle
Agkistrodon contortrix contortrix	southern copperhead	Agkistrodon contortrix contortrix	Southern Copperhead
Agkistrodon piscivorus	cottonmouth	Agkistrodon piscivorus	Cottonmouth
Alligator mississippiensis	American alligator, Florida alligator, Louisiana alligator, Mississippi alligator, alligator, gator	Alligator mississippiensis	American Alligator
Agkistrodon piscivorus leucostoma	western cottonmouth	Agkistrodon piscivorus leucostoma	Western Cottonmouth

APPENDIX 5

NPS BIRD CHECKLIST OF SPECIES OF KNOWN OR PROBABLE OCCURRENCE WITHIN THE BARATARIA PRESERVE AND ADJACENT LAKES (3/13/01), JEFFERSON PARISH, LOUISIANA

Species	Scientific name	habitat	sp	su	fa	wi
Cerulean Warbler	<i>Dendroica cerulea</i>	forest	u		u	
Black-and-white Warbler	<i>Mniotilta varia</i>	forest	c		c	r
Am. Redstart	<i>Setophaga ruticilla</i>	forest	c		c	r
Prothonotary Warbler	<i>Protonotaria citrea</i>	swamp +	c	c	c	
Worm-eating Warbler	<i>Helmitheros vermivorus</i>	forest	u		c	
Swainson's Warbler	<i>Limnithlypis swainsonii</i>	forest +	u	u		
Ovenbird	<i>Seiurus aurocapillus</i>	forest	c		c	r
Northern Waterthrush	<i>Seiurus noveboracensis</i>	forest	c		c	r
Louisiana Waterthrush	<i>Seiurus motacilla</i>	forest	u		u	
Kentucky Warbler	<i>Oporornis formosus</i>	forest	u		u	
Common Yellowthroat	<i>Geothlypis trichas</i>	marsh +	a	c	a	c
Hooded Warbler	<i>Wilsonia citrina</i>	forest +	c	c	c	
Wilson's Warbler	<i>Wilsonia pusilla</i>	scrub			u	u
Canada Warbler	<i>Wilsonia canadensis</i>	forest	u		fc	
Yellow-breasted Chat	<i>Icteria virens</i>	scrub +	u	r	u	
Summer Tanager	<i>Piranga rubra</i>	forest +	c	r	c	
Scarlet Tanager	<i>Piranga olivacea</i>	forest	fc		fc	
N. Cardinal	<i>Richmondena cardinalis</i>	forest +	a	a	a	a
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	forest	c		c	r
Blue Grosbeak	<i>Guiraca caerulea</i>	scrub	fc		fc	
Indigo Bunting	<i>Passerina cyanea</i>	scrub +	a	r	a	
Painted Bunting	<i>Passerina ciris</i>	wetlands +	fc	fc	fc	r
Chipping Sparrow	<i>Spizella passerina</i>	scrub			u	u
Savannah Sparrow	<i>Passerculus sandwichensis</i>	marsh			u	u
Le Conte's Sparrow	<i>Passerherbulus caudacutus</i>	scrub			u	u
Song Sparrow	<i>Melospiza melodia</i>	scrub			u	u
Swamp Sparrow	<i>Melospiza georgiana</i>	scrub	c		c	a
White-throated Sparrow	<i>Zonotrichia albicollis</i>	scrub	u		u	c
Dark-eyed "Slate-colored" Junco	<i>Junco hyemalis</i>	forest			u	u
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	marsh + throughout	a	a	a	a
Rusty Blackbird	<i>Euphagus carolinus</i>	swamp				r
Common Grackle	<i>Cassidix quiscula</i>	forest +	c	c	c	a
Boat-tailed Grackle	<i>Cassidix mexicanus</i>	marsh +	a	a	a	a
Brown-headed Cowbird	<i>Molothrus ater</i>	forest +	c	c	u	u
Orchard Oriole	<i>Icterus spurius</i>	forest +	u	u	u	
Baltimore Oriole	<i>Icterus galbula</i>	forest	u		u	
Am. Goldfinch	<i>Spinus tristis</i>	forest	c		c	c

Species	Scientific name	habitat	sp	su	fa	wi
House Sparrow (I)	Passer domesticus	scrub			u	u
Common Loon	Gavia immer	lake	u		u	u
Pied-billed Grebe	Podilymbus podiceps	lake, marsh	u		u	u
Horned Grebe	Podiceps auritus	lake	u		u	u
Am. White Pelican	Pelecanus erythrorhynchos	lake, marsh	u		u	u
Brown Pelican	Pelecanus occidentalis	open water	fc		fc	fc
Dbl.-crested Cormorant	Phalacrocorax auritus	lake, marsh	c		c	c
Anhinga	Anhinga anhinga	wetlands	u		u	r
Am. Bittern	Botanus ientignosus	marsh	u		u	u
Least Bittern	Ixobrychus exilis	marsh +	fc	fc		
Great Blue Heron	Ardea herodias	wetlands +	c	c	c	c
Great Egret	Casmerodius albus	wetlands +	c	c	c	c
Snowy Egret	Leucophoyx thula	wetlands +	c	c	c	c
Little Blue Heron	Florida caerlea	wetlands +	c	c	c	c
Tricolored Heron	Egretta tricolor	wetlands	c	c	c	c
Cattle Egret	Bubulcus ibis	wetlands	c		c	c
Green-backed Heron	Butorides striatus	wetlands +	c	c	c	r
Bl.-crowned Night-Heron	Nycticorax nycticorax	marsh +	u	u	u	u
Yel.-crowned Night-Heron	Nyctanassa violacea	swamp +	c	c	c	r
White Ibis	Eudocimus albus	wetlands +	c	c	c	c
Glossy Ibis	Plegadis falcinellus	marsh	c	c	c	c
White-faced Ibis	Plegadis chihi	marsh	c	c	c	c
Black Vulture	Coragyps atratus	overhead	c	c	c	c
Turkey Vulture	Cathartes aura	overhead	c	c	c	c
Snow Goose	Chen caerulescens	overhead	u		u	r
Wood Duck	Aix sponsa	swamp +	c	c	c	c
Green-winged Teal	Anas crecca	marsh	u		c	c
Mottled Duck	Anas fulvigula	marsh	fc	fc	fc	fc
Mallard	Anas platyrhynchos	marsh	u		c	c
Blue-winged Teal	Anas discors	marsh	c		c	c
N. Shoveler	Spatula clypeata	marsh	u		u	u
Gadwall	Anas strepera	marsh	u		u	u
Am. Wigeon	Anas americana	marsh	u		u	u
Lesser Scaup	Aythya affinis	lake	c		c	c/a
Com. Goldeneye	Bucephala clangula	lake	u		u	u
Bufflehead	Bucephala albeola	lake	u		u	u
Red-breasted Merganser	Mergus serrator	lake	u		u	u
Ruddy Duck	Ovyura jamaicensis	lake	u		u	u
Osprey	Pandion haliaetus	lake, marsh	u		u	u
Swallow-tailed Kite	Elanoides forficatus	forest	u			
Mississippi Kite	Ictinia mississippiensis	forest +	u	u		
Bald Eagle	Haliaeetus leucocephalus	open water	u		u	u
N. Harrier	Circus cyaneus	marsh	c		c	c
Sharp-shinned Hawk	Accipiter striatus	overhead	u		u	u

Species	Scientific name	habitat	sp	su	fa	wi
Cooper's Hawk	Accipiter cooperii	forest +	u	r	u	u
Red-shouldered Hawk	Buteo lineatus	forest +	c	c	c	c
Broad-winged Hawk	Buteo platypterus	forest +	u	r	u	
Red-tailed Hawk	Buteo vamaicensis	marsh			c	c
Am. Kestrel	Falco sparverius	marsh	c		c	c
Merlin	Falco columbarius	marsh	r		r	r
Peregrine Falcon	Falco peregrinus	marsh	r		r	r
King Rail	Rallus elegans	marsh +	c	c	c	c
Virginia Rail	Rallus limicola	marsh	u		u	u
Sora	Porzana carolina	marsh	c		c	c
Purple Gallinule	Porphyryla martinica	marsh +	fc	fc		
Com. Moorhen	Gallinula chloropus	marsh +	c	c	c	c
Am. Coot	Fulica americana	marsh	u		u	u/c
Semipalmated Plover	Charadrius semipalmatus	marsh	u			
Killdeer	Charadrius vociferus	marsh +	c	c	c	c
Black-necked Stilt	Himantopus mexicanus	marsh +	u	u	u	r
Greater Yellowlegs	Totanus melanoleucus	marsh	u		u	u
Lesser Yellowlegs	Totanus flavipes	marsh	c		c	u
Solitary Sandpiper	Tringa solitaria	marsh	c		u	
Spotted Sandpiper	Actitis macularia	marsh	c		c	
Semipalmated Sandpiper	Ereunetes Pusillus	marsh	c		u	
Western Sandpiper	Ereunetes mauri	marsh	c		u	u
Least Sandpiper	Erolia minutilla	marsh	c		u	u
White-rumped Sandpiper	Erolia fuscicollis	marsh	u			
Dunlin	Erolia alpina	marsh			u	c
Common Snipe	Capella gallinago	marsh	c		c	c
Am. Woodcock	Philohela minor	forest	c		c	c
Laughing Gull	Larus atricilla	lake	c	c	c	c
Bonaparte's Gull	Larus philadelphia	lake				c
Ring-billed Gull	Larus delawarensis	lake	c		c	c
Herring Gull	Larus Argentatus	lake	u		u	c
Caspian Tern	Hydroprogne caspia	lake		u		
Royal Tern	Thalasseus maximus	lake	u	u	u	u
Sandwich Tern	Thalasseus sandvicensis	lake	u	u	u	
Common Tern	Sterna hirundo					
Forster's Tern	Sterna forsteri	lake	c	c	c	c
Least Tern	Sterna albifrons					
Black Tern	Chlidonias niger	lake	u		u	
Black Skimmer	Rynchops nigra					
Rock Dove (I)	Columba livia					
Mourning Dove	Zenaidura macroura	scrub	u	u	u	u
Black-billed Cuckoo	Coccyzus erythrophthalmus					
Yellow-billed Cuckoo	Coccyzus americanus	forest +	c	c	c	
Barn Owl	Tyto alba					

Species	Scientific name	habitat	sp	su	fa	wi
E. Screech-Owl	Otus asio	forest +	c	c	c	c
Great Horned Owl	Bubo virginianus	swamp +	c	c	c	c
Barred Owl	Strix varia	forest +	a	a	a	a
Common Nighthawk	Chordeiles minor	overhead	u		u	
Chuck-will's-widow	Caprimulgus carolinensis	forest	r		u	r
Chimney swift	Chaetura pelagica	swamp +	c	c	c	
Ruby-throated Hummingbird	Archilochus colubris	forest +	c	c	c	
Belted Kingfisher	Megaceryle alcyon	marsh	c		c	c
Red-bellied Woodpecker	Centurus carolinus	forest +	c	c	c	c
Yellow-bellied Sapsucker	Sphyrapicus varius	forest +	c		c	c
Downy Woodpecker	Dendrocopos pubescens	forest +	cc	c	c	c
Hairy Woodpecker	Dendrocopos villosus	forest +	fc	fc	fc	fc
N. "Yellow-shafted" Flicker	Colaptes auratus	forest	c		c	c
Pileated Woodpecker	Dryocopus pileatus	forest +	fc	fc	fc	fc
Eastern Wood-Pewee	Contopus virens	forest	c		c	
Yel.-bellied Flycatcher	Empidonax flaviventris	forest			u	
Acadian Flycatcher	Empidonax virescens	forest +	fc	fc	c	
Alder Flycatcher	Empidonax alnorum	scrub			u	
Least Flycatcher	Empidonax minimus	scrub			u	
Eastern Phoebe	Sayornis phoebe	forest	c		c	c
Great Crested Flycatcher	Myiarchus crinitus	forest +	fc	fc	fc	
Eastern Kingbird	Tyrannus tyrannus	marsh +	c	u	c	
Loggerhead Shrike	Lanius ludovicianus	marsh +	u	u	u	u
Purple Martin	Progne subis	marsh +	c	c		
Tree Swallow	Indoproctne bicolor	marsh	c/a		c/a	c/a
Northern Rough-winged Swallow	Stelgidopteryx ruficollis	marsh	u		u	r
Bank Swallow	Riparia riparia	marsh	u		u	
Cliff Swallow	Petrochelidon pyrrhonota	marsh	u		u	
Barn Swallow	Hirundo rustica	marsh	c		c	
Blue Jay	Cyanocitta cristata	forest +	c	c	c	c
Am. Crow	Corvus brachyrhynchos	forest +	c	c	c	c
Carolina Chickadee	Parus carolinensis	forest +	a	a	a	a
Tufted Titmouse	Parus bicolor	forest +	c	c	c	c
Brown Creeper	Certhia familiaris	forest			e/r	e/r
Carolina Wren	Thryothorus ludovicianus	forest +	c	c	c	c
House Wren	Troglodytes aedon	scrub	u		u	u
Winter Wren	Troglodytes troglodytes	swamp	u		u	u
Sedge Wren	Cistothorus platensis	marsh	fc		fc	fc
Marsh Wren	Cistothorus palustris	marsh	c		c	c
Golden-crowned Kinglet	Regulus satrapa	forest	e/c		e/c	e/c
Ruby-crowned Kinglet	Regulus calendula	forest	c		c	c
Blue-gray Gnatcatcher	Polioptila caerulea	forest +	c	c	c	u
Eastern Bluebird	Sialia Sialis	swamp	u	u	u	u

Species	Scientific name	habitat	sp	su	fa	wi
Veery	Hylocichla fuscescens	forest	u		u	
Gray-cheeked Thrush	Cylocichla minima	forest	u		u	
Swainson's Thrush	Hylocichla ustulata	forest	c		c	
Hermit Thrush	Hylocichla guttata	forest	fc		fc	fc
Wood Thrush	Hylocichla mustelina	forest	fc		fc	
Am. Robin	Turdus migratorius	forest	c		c	c/a
Gray Catbird	Dumetella carolinensis	forest	c		c	u
N. Mockingbird	Mimus polyglottos	forest +			c	c
Brown Thrasher	Toxostoma rufum	forest +	u	r	fc	u
Cedar Waxwing	Bombycilla cedrorum	forest	e/c		e/c	e/c
Euro. Starling (I)	Sturnus vulgaris	forest +	u	u	u	c
White-eyed Vireo	Vireo griseus	forest +	c	c	c	u
Yellow-throated Vireo	Vireo flavifrons	forest +	fc	r	fc	
Warbling Vireo	Vireo gilvus	forest	r		u	
Philadelphia Vireo	Vireo philadelphicus	forest	u		fc	
Red-eyed Vireo	Vireo olivaceus	forest +	c	c	c	
American Pipit	Anthus rubescens	marsh	u		u	fc/c
Blue-winged Warbler	Vermivora pinus	forest	fc		c	
Golden-winged Warbler	Vermivora chrysoptera	forest	u		u	
Tennessee Warbler	Vermivora peregrina	forest	c		c	
Orange-crowned Warbler	Vermivora celata	forest	fc		fc	c
Northern Parula	Parula americana	forest +	a	a	a	r
Yellow Warbler	Dendroica petechia	scrub	u		a	
Chestnut-sided Warbler	Dendroica pensylvanica	forest	u		c	
Magnolia Warbler	Dendroica magnolia	forest	fc		c	
Yellow-rumped Warbler	Dendroica coronata	forest	c		c	a
Black-throated Green Warbler	Dendroica virens	forest	c		c	r
Blackburnian Warbler	Dendroica fusca	forest	u		u	
Yellow-throated Warbler	Dendroica dominica	swamp +	c	c	fc	r
Pine Warbler	Dendroica pinus	forest	u		u	u
Prairie Warbler	Dendroica bicolor				r	r
Palm Warbler	Dendroica palmarum	scrub	u		u	fc
Bay-breasted Warbler	Dendroica castanea	forest	u		u	
Purple Finch	Carpodacus purpureus	forest			e-u	e-u
Blue-headed Vireo	Vireo solitarius	forest	fc		fc	fc

Occurrence

a = abundant: always seen u = uncommon: usually not seen
 c = common: usually seen r = rare: not seen every year
 fc = fairly common: expected e = erratic: numbers fluctuate
 + = breeds

Seasons:

sp = Mar-May fa = Aug-Nov
 su = Jun-Jul wi = Dec-Jan

APPENDIX 6

NPS LIST OF MAMMAL SPECIES OF KNOWN OR PROBABLE OCCURRENCE WITHIN JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE, JEFFERSON PARISH, LOUISIANA

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Canis latrans</i>	coyote	<i>Canis latrans</i>	Coyote
<i>Mus musculus</i>	house mouse	<i>Mus musculus</i>	House Mouse
<i>Lynx rufus</i>	bobcat	<i>Lynx rufus</i>	Bobcat
<i>Lutra canadensis</i>	river otter	<i>Lutra canadensis</i>	A River Otter
<i>Lasiurus seminolus</i>	Seminole bat	<i>Lasiurus seminolus</i>	Seminole Bat
<i>Lasiurus intermedius</i>	northern yellow bat	<i>Lasiurus intermedius</i>	Northern Yellow Bat
<i>Lasiurus borealis</i>	red bat	<i>Lasiurus borealis</i>	Eastern Red Bat
<i>Glaucomys volans</i>	southern flying squirrel	<i>Glaucomys volans</i>	Southern Flying Squirrel
<i>Didelphis virginiana</i>	Virginia opossum, virginia opossum	<i>Didelphis virginiana</i>	Virginia Opossum
<i>Dasypus novemcinctus</i>	nine-banded armadillo	<i>Dasypus novemcinctus</i>	Nine-Banded Armadillo
<i>Peromyscus leucopus</i>	white-footed mouse	None	No Data
<i>Peromyscus gossypinus gossypinus</i>	cotton mouse	None	No Data
<i>Oryzomys palustris palustris</i>	marsh rice rat	None	No Data
<i>Odocoileus virginianus virginianus</i>	white-tailed deer	None	No Data
<i>Neotoma floridana</i>	eastern woodrat	<i>Neotoma floridana</i>	Eastern Woodrat
<i>Myotis austroriparius</i>	southeastern myotis	<i>Myotis austroriparius</i>	Southeastern Myotis
<i>Myotis auriculus</i>	southwestern myotis	<i>Myotis auriculus</i>	Southwestern Myotis
<i>Myocastor coypus</i>	nutria	<i>Myocastor coypus</i>	Nutria
<i>Mustela vison</i>	mink	<i>Mustela vison</i>	Mink
<i>Reithrodontomys fulvescens</i>	fulvous harvest mouse	<i>Reithrodontomys fulvescens</i>	Fulvous Harvest Mouse
<i>Rattus rattus</i>	black rat	<i>Rattus rattus</i>	Black Rat
<i>Rattus norvegicus</i>	Norway rat	<i>Rattus norvegicus</i>	Norway Rat
<i>Procyon lotor</i>	raccoon	<i>Procyon lotor</i>	Common Raccoon
<i>Pipistrellus subflavus</i>	eastern pipistrelle	<i>Pipistrellus subflavus</i>	Eastern Pipistrelle

ITIS Scientific Name	ITIS Common Name	Preferred Scientific Name	Preferred Common Name
<i>Peromyscus gossypinus</i>	cotton mouse	<i>Peromyscus gossypinus</i>	Cotton Mouse
<i>Oryzomys palustris</i>	marsh rice rat	<i>Oryzomys palustris</i>	Marsh Rice Rat
<i>Ondatra zibethicus</i>	muskrat	<i>Ondatra zibethicus</i>	Muskrat
<i>Odocoileus virginianus</i>	white-tailed deer	<i>Odocoileus virginianus</i>	White-Tailed Deer
<i>Nycticeius humeralis</i>	evening bat	<i>Nycticeius humeralis</i>	Evening Bat
<i>Corynorhinus rafinesquii</i>	No data	<i>Corynorhinus rafinesquii</i>	Rafinesque's Big-Eared Bat
<i>Castor canadensis</i>	beaver	<i>Castor canadensis</i>	American Beaver
<i>Vulpes vulpes</i>	red fox	<i>Vulpes vulpes</i>	Red Fox
<i>Urocyon cinereoargenteus</i>	gray fox	<i>Urocyon cinereoargenteus</i>	Common Gray Fox
<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	Brazilian Free-Tailed Bat
<i>Sylvilagus floridanus</i>	eastern cottontail	<i>Sylvilagus floridanus</i>	Eastern Cottontail
<i>Sylvilagus aquaticus</i>	swamp rabbit	<i>Sylvilagus aquaticus</i>	Swamp Rabbit
<i>Sus scrofa</i>	pig,pig (feral)	<i>Sus scrofa</i>	Feral Hog
<i>Sigmodon hispidus</i>	hispid cotton rat	<i>Sigmodon hispidus</i>	Hispid Cotton Rat
<i>Sciurus niger</i>	fox squirrel	<i>Sciurus niger</i>	Eastern Fox Squirrel
<i>Sciurus carolinensis</i>	gray squirrel	<i>Sciurus carolinensis</i>	Eastern Gray Squirrel