PART III: SURFACE WATER ASSESSMENT

Chapter 1: Surface Water Monitoring Program

The surface water monitoring program of the OEC and OEA of LDEQ is designed to measure progress towards achieving water quality goals at state and national levels, to gather baseline data used in establishing and reviewing the state water quality standards, and to provide a data base for use in determining the assimilative capacity of the waters of the state. Information is also used to establish permit limits for wastewater discharges.

The surface water monitoring program consists of a fixed station long-term network, intensive surveys, special studies, and wastewater discharge compliance sampling. All aspects of LDEQ's surface water monitoring program are documented as part of the departments *Surface Water Monitoring and Assessment Program: Revision 3*, which is currently under review (LDEQ, 2006). Each of these components of the state monitoring program is addressed below.

Fixed Station Long-Term Surface Water Quality Network and Comprehensive Monitoring Strategy

Louisiana's Department of Environmental Quality and its predecessor agencies have maintained a surface water quality monitoring program since the 1950s. In the past the program consisted of collecting water samples from designated points on waters across the state on a monthly, bimonthly, or quarterly basis. Current protocol specifies monthly sampling for most parameters. Metals and VOC sampling and analysis are conducted quarterly (LDEQ, 2006). Samples are analyzed for 29 different conventional parameters and for fecal coliform bacteria. In addition to the conventional parameters, volatile organic compounds (VOCs) are sampled at some sites. A priority pollutant scan is run quarterly on samples from Mississippi River sites. All conventional parameters monitored for water quality purposes are listed in Table 3.1.1., with organic parameters listed in Table 3.1.2. The purposes of this program are to provide baseline or background data on a water body and to monitor long-term trends in water quality. Over the years, monitoring stations have been discontinued or added as needs or conditions changed.

The U.S. EPA has recommended that states take a watershed approach with their water quality programs. In light of these issues, the LDEQ has focused its water quality monitoring efforts on water bodies where there is a lack of water quality data within target watersheds or basins.

LDEQ revised its monitoring program in May of 1998 to operate on a five-year cycle with monthly sample collections occurring in two or three basins each year and rotating from year to year (calendar year). In this manner, the entire state had been covered at the end of 2002. Although the five-year cycle completed the goal of collecting water quality data from every subsegment in the state, it did not correspond with the even year §305(b) reporting cycle and placed a disproportionate amount of responsibility on the regional field staff during the one-year surveys. Additionally, LDEQ prefers to use two cycles of monitoring data for a more accurate assessment. When two cycles of data are used, the five-year rotating cycle causes large time gaps in the datasets used for some water bodies in each assessment cycle. In an effort to equalize the number of basins assessed every two years, balance the field staff work load, and minimize data gaps, LDEQ implemented a four-year rotating sampling plan in January, 2004. The new plan will be evident in the 2006 Integrated Report, although the assessment information contained in this 2006 report is based on the five-year sampling regime. Water quality monitoring at selected long-term trend sites on larger rivers, bayous, and Lake Pontchartrain will be continued statewide. The former five-year and current four-year monitoring schedules are represented in Tables 3.1.3 and 3.1.4.

Samples collected from the stations are analyzed in the LDEQ laboratory (conventionals and organics), Louisiana Department of Health and Hospitals laboratory (fecal coliform), or a contract lab (fecal coliform and metals) using procedures outlined in the state and U.S. EPA approved Quality Assurance Project Plan (LDEQ, 2003). A listing of ambient water quality monitoring stations is provided in Appendix F.

Table 3.1.1.

Conventional parameters monitored under Louisiana's ambient water quality monitoring network. Not all parameters are monitored at all sites. As of November 2006 (LDEQ, 2006).

Conventional analysis	
alkalinity	hardness
ammonia nitrogen	total Kjeldahl nitrogen
arsenic*	cadmium*
turbidity	gage height (stage)
chromium*	copper*
fecal coliform bacteria	zinc*
dissolved oxygen	salinity
dissolved oxygen – percent saturation	oil sheen
field conductivity	lead*
nickel*	nitrate and nitrite nitrogen
pH	temperature
total phosphorus	total organic carbon
specific conductance	true color**
sulfates	chlorides
total dissolved solids	total suspended solids
*Metals sampling and analysis is done quarterly	
**Drinking water sources only	

Table 3.1.2.

Organic compound parameters monitored under Louisiana's ambient water quality monitoring network. Not all parameters are monitored at all sites. As of November 2006 (LDEQ, 2006).

Volatile Organic Compounds		
chloromethane	chloroethane	bromoform
bromomethane	2-chloroethylvinyl-ether	dichlorodifluoromethane
benzene	chloroform	trichlorofluoromethane
carbon tetrachloride	1,1-dichloroethylene	dichlorobromomethane
chlorobenzene	1,2-trans-dichloroethylene	chlorodibromomethane
1,1-dichloroethane	1,2-dichloropropane	tetrachloroethylene
1,2-dichloroethane	1,3-dichloropropene	toluene
1,1,1-trichloroethane	ethylbenzene	trichloroethylene
1,1,2-trichloroethane	methylene chloride	vinyl chloride
1,1,2,2-tetrachloroethane	MTBE	bis(chloromethyl) ether
Base-Neutral Extractable Organic Compounds		
acenaphthene	4-chlorphenyl phenyl ether	diethyl phthalate
benzidine	4-bromophenyl phenyl ether	dimethyl phthalate
1,2,4-trichlorobenzene	bis(2-chloroisopropyl) ether	benzo(a)anthracene
hexachlorobenzene	bis(2-chloroethoxy) methane	benzo(a)pyrene
hexachloroethane	hexachlorobutadiene	benzo(b)fluoranthene
bis(2-chloroethyl) ether	hexachlorocyclopentadiene	benzo(k)fluoranthene
2-chloronaphthalene	isophorone	chrysene
1,2-dichlorobenzene	naphthalene	acenaphthylene
1,3-dichlorobenzene	nitrobenzene	anthracene
1,4-dichlorobenzene	N-nitrosodimethylamine	benzo(ghi)perylene
3,3-dichlorobenzidine	N-nitrosodiphenylamine	fluorene
2,4-dinitrotoluene	N-nitrosodi-n-propylamine	phenanthrene
2,6-dinitrotoluene	butylbenzyl phthalate	dibenzo(a,h)anthracene
fluoranthene	di-n-butyl phthalate	ideno(1,2,3-cd) pyrene
polychlorinated biphenyls	di-n-octyl phthalate	pyrene
bis(2-ethylhexyl) phthalate	banned pesticides	
Acid Extractable Organic Compounds		
2,4,5-trichlorophenol	4-nitrophenol	4-chloro-3-methyl phenol
2,4-dinitrophenol	2-chlorophenol	4,6-dinitro-o-cresol
2-nitrophenol	2,4-dichlorophenol	2,4-dimethylphenol
phenol		

Table 3.1.3.

Five-year sampling schedule for Louisiana's ambient water quality monitoring network implemented May 1998 and discontinued January 2004.

Basin	First Rotation	Second Rotation
Mermentau River	1998	2003
Vermilion-Teche	1998	2003
Calcasieu River	1999	N/A
Ouachita River	1999	N/A
Barataria	2000	N/A
Terrebonne	2000	N/A
Mississippi River	2001	N/A
Lake Pontchartrain	2001	N/A
Pearl River	2001	N/A
Red River	2002	N/A
Sabine River	2002	N/A
Atchafalaya River	2002	N/A

Table 3.1.4.

First four-year sampling schedule for Louisiana's ambient water quality monitoring network implemented January 2004.

Watershed Basins	Year Completed	Number of Subsegments
Calcasieu, Ouachita, Terrebonne, Barataria, Mississippi, Atchafalaya	2005	216
Pontchartrain, Pearl, Red, Sabine, Mermentau, Vermillion-Teche	2007	257
Calcasieu, Ouachita, Terrebonne, Barataria, Mississippi, Atchafalaya	2009	216
Pontchartrain, Pearl, Red, Sabine, Mermentau, Vermillion-Teche	2011	257

Water Quality Data Storage

Following water quality sample collection and laboratory analysis, the resulting data is recorded in an Oracle database known as the Louisiana Environmental Assessment Utility (L'EAU). Data entry is performed by personnel with the WQAD, Standards, Assessment and Nonpoint Section (SAN) along with personnel from the OEC, Surveillance Division. Personnel with the regional offices, Surveillance Division, conduct all ambient sample collection. Data from the LDEQ laboratory is currently transferred electronically to an Oracle database developed by the OEA. Fecal coliform data is currently hand-entered into the Oracle database, but it is hoped this can be converted to electronic data transfer in the near future. Data is retrieved using Access or Discoverer queries; SAS, Access, or Excel programs are used for data analysis. All data is checked and verified twice during entry to assure accuracy.

Toxic Substances Monitoring Program

Surveillance Division (SD) activities include collection of environmental samples for analyses of toxic substances. Samples analyzed to date encompass various environmental matrices including ambient water, industrial and municipal effluents, fish, shellfish, and sediments. Due to limited state funding, emphasis is placed on areas of known contamination and the basins in the current rotation. Other areas with potential toxic substance concerns are also included as part of special studies.

LDEQ also maintains an ambient water monitoring network of three sites on the Mississippi River. This network tests samples of Mississippi River water for the presence of volatile organic compounds, polychlorinated biphenyls (PCBs), acid/base neutrals (ABNs), chlorinated organics, and phenols at all three sites on a quarterly basis. From January 2003 to July 2006, 378 sites across the state were sampled for the above classes of compounds, including the three Mississippi River sites.

Fish Tissue Monitoring Activities

With the exception of a statewide mercury study, the Surveillance Division does not maintain a regular fish tissue monitoring program. However, fish are frequently sampled in response to significant complaints, as a result of enforcement actions, or in response to other problems as they occur. Results of tissue analyses are forwarded to the LDEQ and LDHH for statistical and risk assessment analysis.

The LDEQ is currently conducting an ongoing statewide study to locate water bodies where some fish species have been contaminated with mercury. Up-to-date water quality advisory information can be found on the LDEQ Website at http://www.deq.louisiana.gov/portal/Default.aspx?tabid=1631 or by calling 1-888-293-7020. Please refer to Part II, Chapter 4 for more information on Louisiana mercury contaminant study.

In addition to the sampling efforts described above, the LDEQ keeps abreast of fish contamination research done in Louisiana and other states. The current mercury study is a prime example of this. In this instance, research done in Wisconsin and Florida was used to assist in setting priorities for which water bodies are to be sampled and in what order. This enabled LDEQ to target those water bodies that are both popular fishing areas and most at risk to contain mercury-contaminated fish.

Intensive Water Quality Surveys

The WQAD of the OEA conducts intensive stream surveys to provide physical, chemical, and some biological data necessary to define water quality problems, calibrate and verify mathematical models for development of TMDLs and wasteload allocations (WLAs), and provide additional data for assessments and permitting. Data acquired through these surveys is also used to assess and revise water quality standards. These surveys provide a part of the basic water quality data required for the development and revision of the state water quality management plan. The LDEQ has set up a program of reference stream sampling to provide data to assist in the assessment and revision of water quality standards and to provide background data for TMDLs and WLAs on impacted streams. The LDEQ continued conducting intensive surveys for Terrebonne Basin water bodies in the summer of 2004 and completed them in the summer of 2005. LDEQ began intensive surveys for the Red River Basin in 2004 and completed them in the summer of 2006. LDEQ began and completed surveys in the Sabine River Basin in the summer of 2005.

Total Maximum Daily Load Status

The Water Quality Assessment Division has focused on TMDL development for water bodies listed on the §303(d) list for low dissolved oxygen, nutrients, and metals and will continue to do so until all water bodies requiring a TMDL have been addressed. By July 2004, LDEQ completed the oxygen demand and nutrients TMDLs for the Barataria Basin water bodies listed on the §303(d) and reported in the 2002 *Water Quality Inventory*. TMDLs for some of the listed water bodies in the Terrebonne Basin and Red River Basin have also been completed, and TMDL development is continuing for these basins. Based upon an agreement between LDEQ and U.S. EPA, some TMDLs are developed by U.S. EPA and/or U.S. EPA contractors. These TMDLs are submitted to LDEQ for review. TMDL progress is shown in Table 3.1.5.

Table 3.1.5.

Louisiana Department of Environmental Quality Total Maximum Daily Load progress from July 30, 2004 to July 12, 2006.

Subsegment Number	Substance	Status	Status Date
020101	Oxygen Demand	Final	7/30/2004
020102	Oxygen Demand	Final	7/30/2004
020103	Oxygen Demand	Final	7/30/2004
020301	Oxygen Demand	Final	7/30/2004
020501	Oxygen Demand	Final	7/30/2004
020701	Oxygen Demand	Final	7/30/2004
100606	Oxygen Demand	Draft	7/12/2006
101303	Oxygen Demand	Final	4/18/2006
101605	Oxygen Demand	Final	4/18/2006
120111	Oxygen Demand and Nutrients	Final	1/25/2006
120201	Oxygen Demand and Nutrients	Final	7/10/2006
120501	Oxygen Demand and Nutrients	Final	4/7/2006
120503	Oxygen Demand	Final	1/25/2006
120605	Oxygen Demand and Nutrients	Draft	7/5/2006

Special Studies

The OEA and OEC plan or conduct special studies in reported or known problem areas or concerning particular issues. Some of these studies have included fish tissue contamination with mercury, nonpoint source pollution studies, a study of the closure of oyster harvesting areas, acid rain, and studies of toxics-contaminated water bodies. Other than the studies for mercury in fish tissue, nonpoint source projects, and intensive water quality surveys for the TMDL program, all of which are discussed elsewhere in this report, there have been no significant special studies conducted in the past year. Post-hurricane monitoring following hurricanes Katrina and Rita, which is an exceptional category of special studies, is discussed below.

Summary of LDEQ Monitoring Efforts Following Hurricanes Katrina and Rita

On 29 August 2005 Hurricane Katrina came ashore coastal Louisiana due south of New Orleans at Buras, Louisiana, severely impacting Plaquemine, St. Bernard, Orleans, Jefferson, and St. Tammany parishes. LDEQ, in conjunction with the U.S. Geological Survey (USGS) and other state and federal agencies, conducted extensive sampling of multiple media (water, air, sediments) in order to determine the extent and nature of impacts caused by Hurricane Katrina. Only those LDEQ sampling efforts directed at surface water bodies primarily outside the flooded areas of New Orleans are discussed in this summary.

Hurricane Rita struck the coast on 24 September 2006 near the border between Texas and Louisiana, approximately 45 miles southwest of Lake Charles, Louisiana. Hurricane Rita caused extensive damage in Cameron, Vermilion, and Calcasieu parishes, as well as lesser damage to coastal areas farther east and inland regions to the north of the immediate impact area. Once again, LDEQ initiated water quality sampling in the affected region.

Sampling efforts and results are discussed separately for each of the two hurricanes. More detailed summary reports for both hurricanes can be found on the LDEQ web site at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=2402.

Hurricane Katrina Sampling and Results

Immediately following Hurricane Katrina, personnel with the WQAD participated in boat rescues in the New Orleans area. These personnel, in conjunction with the Louisiana Sheriff's Association, rescued approximately 480 people from the area. While LDEQ's WQAD did participate in rescue efforts, other state and federal agencies had primary responsibility for rescue operations. As rescue efforts were gradually completed and access improved, sampling in and around Lake Pontchartrain was initiated on 6 September 2005 at 12 locations. The short delay was necessitated by the need for rescue efforts to take priority, accessibility issues, and the need to gather resources for sampling. By 11 September 2005 a formal sampling plan had been developed, with sampling at 24 sites conducted twice per week. Sampling expanded again on 11 October 2005 to 62 sites (63 sites including a separate plume monitoring event) as access to impacted areas improved. All sampling conducted by the WQAD of LDEQ was focused on surface water bodies in the regions affected by Hurricane Katrina. LDEQ's Surveillance Division sampled both water bodies outside of New Orleans and floodwaters in the greater New Orleans area. Surface water body sampling was done in order to determine the impact of the hurricane itself as well as possible impacts to Lake Pontchartrain caused by the pumping of floodwater from New Orleans. Other divisions within LDEQ and other agencies focused their monitoring efforts on the areas of New Orleans flooded by levee breaches or impacted by oil spills. Results of these additional studies are not discussed here.

Most water quality sampling following Hurricane Katrina was conducted at existing ambient water quality monitoring sites throughout the impacted area. This was done in order to permit comparisons with historical data and criteria for each sampled water body. Sampling at ambient monitoring sites also allowed LDEQ to determine when these water bodies had returned to pre-storm conditions following the hurricane. In addition to ambient sample sites, five additional sites were established ½ mile off the south shore of Lake Pontchartrain. These sites were located offshore from major drainage canals in New Orleans in order to assess the impact of pumping floodwaters from the city. As monitoring sites were determined to be unimpacted or no longer impacted they were dropped from the monitoring plan. New sites were added periodically as resources and access to impacted areas improved.

Most sample sites were discontinued by December 2006; however, three sites located on streams draining into the north side of Lake Pontchartrain continued to be sampled through March 2006. These sites are again being sampled in October/November of 2006 to determine if these water bodies have returned to pre-Katrina conditions. In January 2006, LDEQ restarted its four-year rotating ambient monitoring program, which had been suspended in the hurricane impacted areas. Under this routine program, samples are collected monthly at various locations throughout the state. Samples collected in the impacted area will be evaluated to determine if these water bodies remain impacted or have reverted to normal conditions. Figure 3.1.1 shows the location of all post-Hurricane Katrina sampling points.

A wide range of water quality parameters were tested for during the course of LDEQ's monitoring response. The following categories of parameters were looked at, although not all parameters were tested for at all sites or throughout the monitoring period. Changes in parameters occurred based on previous results and developing needs. From these categories approximately 190 different analytes were tested for at one time or another during the course of the study.

- Field parameters (DO, pH, conductivity, etc.)
- Conventionals (Turbidity, TSS, etc.)
- Nutrients
- Dissolved Metals and Mercury
- TOC, BOD5, COD
- Volatile Organics
- Acid Base Neutrals

- PCBs and Pesticides
- Cyanide
- Fecal Coliform Bacteria

Early in the New Orleans recovery effort it was determined by the state and U.S. Corps of Engineers that it would be necessary to pump the floodwaters covering much of New Orleans into Lake Pontchartrain. This was done by means of existing drainage canals and pump stations as well as by massive pumps imported from around the U.S. and world. To monitor the impact of pumped floodwaters on Lake Pontchartrain, water chemistry analyses, biotoxicity testing, and fish tissue analyses were conducted by LDEQ, USGS, U.S. EPA, and the National Oceanic and Atmospheric Administration (NOAA). These analyses indicated the pumped floodwater had little to no impact on the lake. It was also noted by LDEQ and others that the volume of floodwaters pumped from New Orleans amounted to less than 5% of the volume of Lake Pontchartrain. Based on this fact and the testing conducted, it was determined that Lake Pontchartrain remained essentially unchanged following the hurricane and was largely unaffected by the pumping of floodwaters from New Orleans.

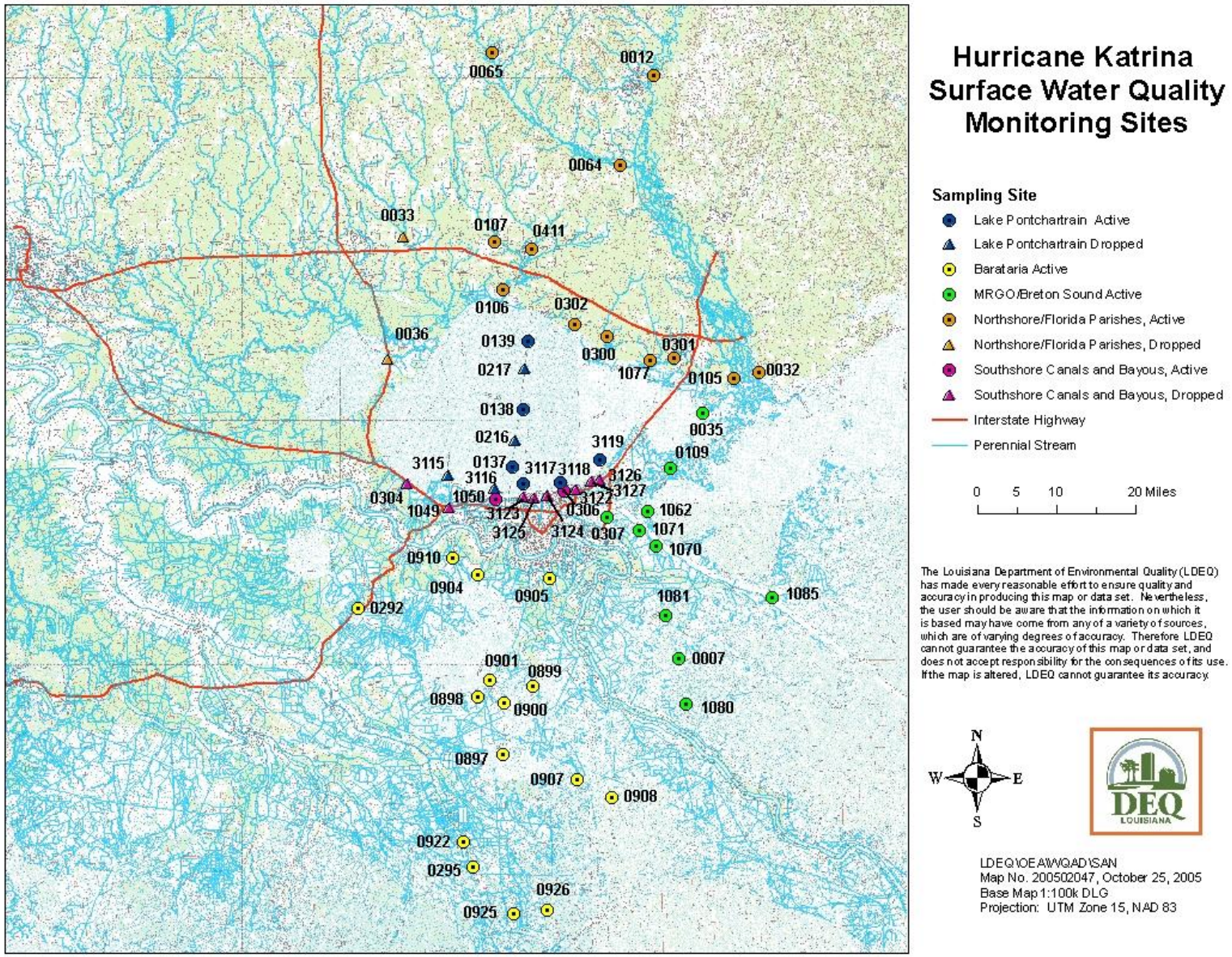
Of the 40,963 analytical results (497 sampling events) for organic compounds, only 107 (0.26%) were above detection levels. Only two compounds, hexachlorobenzene and bromodichloromethane, each exceeded non-drinking water human health criteria one time on 19 September 2005 and 3 October 2005, respectively. All other detections for organic compounds were below Louisiana water quality criteria. There were no further organic compound detections after 9 November 2005. Only three of 1,984 dissolved metals results exceeded criteria.

Results of LDEQ's testing largely agreed with what is commonly expected following hurricane impacts. In particular, streams north of Lake Pontchartrain suffered significant reductions in dissolved oxygen as a result of the massive amounts of woody, vegetative and structural debris deposited in them by wind and storm surges. This was particularly true at sample points within a few miles of Lake Pontchartrain. Farther inland there was less impact to headwater streams. Dissolved oxygen levels have returned to pre-storm conditions in portions of the north shore area; however, continued testing is being conducted to determine when water quality conditions have returned to pre-Katrina levels. In addition to the dissolved oxygen problems, numerous small and large sewage treatment facilities were either damaged or destroyed during the hurricane. This resulted in releases of partially treated or untreated sewage. Due to the difficulties of rebuilding in these damaged areas, as well as the influx of New Orleans residents moving to the north shore, adequate sewage treatment remains a significant concern for the area.

Marshes to the south and east of New Orleans, while heavily impacted by wind and storm surge, suffered lesser long-term water quality impacts to dissolved oxygen and other parameters. This was because the area is primarily marsh as opposed to forest land, resulting in less debris being dropped into the water. However, the region did suffer from extensive marsh loss as vegetation and bottom sediments were torn up and washed away or redeposited elsewhere. This has resulted in increased saltwater intrusion, further exacerbating the destruction of fresh and brackish marsh plants. Loss of vegetation due to saltwater intrusion may lead to increased coastal wetland loss. In some cases, areas formerly consisting of solid marsh have now become open water. Extensive oil spills from tanks and refineries in St. Bernard and Plaquemine parishes to the south of New Orleans in some cases resulted in additional marsh loss and contamination. Environmental impacts from these oil spills continue to be evaluated by LDEQ and other agencies.

Due to the counter-clockwise winds of Hurricane Katrina, areas to the southwest, west, and northwest of New Orleans received less damage during the hurricane. Limited post-hurricane monitoring in these areas revealed relatively minor, short term water quality impacts due to debris and storm surge.

Figure 3.1.1.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Hurricane Katrina
Surface Water Quality
Monitoring Sites
Sampling Site
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Lake Pontchartrain Dropped
Barataria Active
MRGO/Breton Sound Active
Northshore/Florida Parishes, Active
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Southshore Canals and Bayous, Active
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Projection: UTM Zone 15, NAD 83

Hurricane Rita Sampling and Results

Hurricane Rita caused widespread destruction, coming ashore near the Texas, Louisiana border. In Louisiana severe impacts extended from the Texas border to Rockefeller Wildlife Refuge and inland as far north as Lake Charles and Interstate 10. Lesser impacts were felt farther north as hurricane and tropical storm force winds continued up into north Louisiana. In New Orleans, approximately 230 miles east of the storm's center, storm driven surge and waves overtopped already weakened levees. These levees had been damaged during hurricane Katrina and were in the process of being repaired by the U.S. Corps of Engineers. Overtopping of the levees caused renewed flooding in portions of the city. The southwest Louisiana coastal communities of Cameron, Creole, Grand Cheniere, and Holly Beach were completely destroyed. Debris from these communities, along with uprooted trees and vegetation, were piled by storm surge as much as ten to twenty miles inland in the interior marshes. Debris piles extended along the southern edge of spoil banks along the Intracoastal Waterway and other navigation channels. Over-washed coastal cheniere ridges, formed by ancient coastal beaches, trapped this saltwater storm surge within freshwater marshes, pastures and rice ponds, killing vegetation. Soils in this area may be contaminated with salt for years to come depending on rainfall in the area. Lake Charles, Louisiana, some 30 miles from the coast, had extensive flooding of low-lying areas of the city caused by a storm surge and heavy rains. Unlike New Orleans, however, the floodwaters were not trapped in the city for a long period of time.

As with Hurricane Katrina, LDEQ began an intensive water quality monitoring program based on its existing ambient water quality monitoring sites in the region. Monitoring began on 17 October 2006 with samples collected once every two weeks for a minimum of four weeks or two samples. The need for further sampling was based on results found during the first two rounds of sampling. A suite of parameters similar to that used for Hurricane Katrina was used for the sampling effort. Fifty-one sites from the Texas border to Terrebonne Bayou and extending north to just beyond Interstate 10 were evaluated to determine the extent of damage caused by the hurricane. Figure 3.1.2 shows the location of all post-Hurricane Rita sampling points.

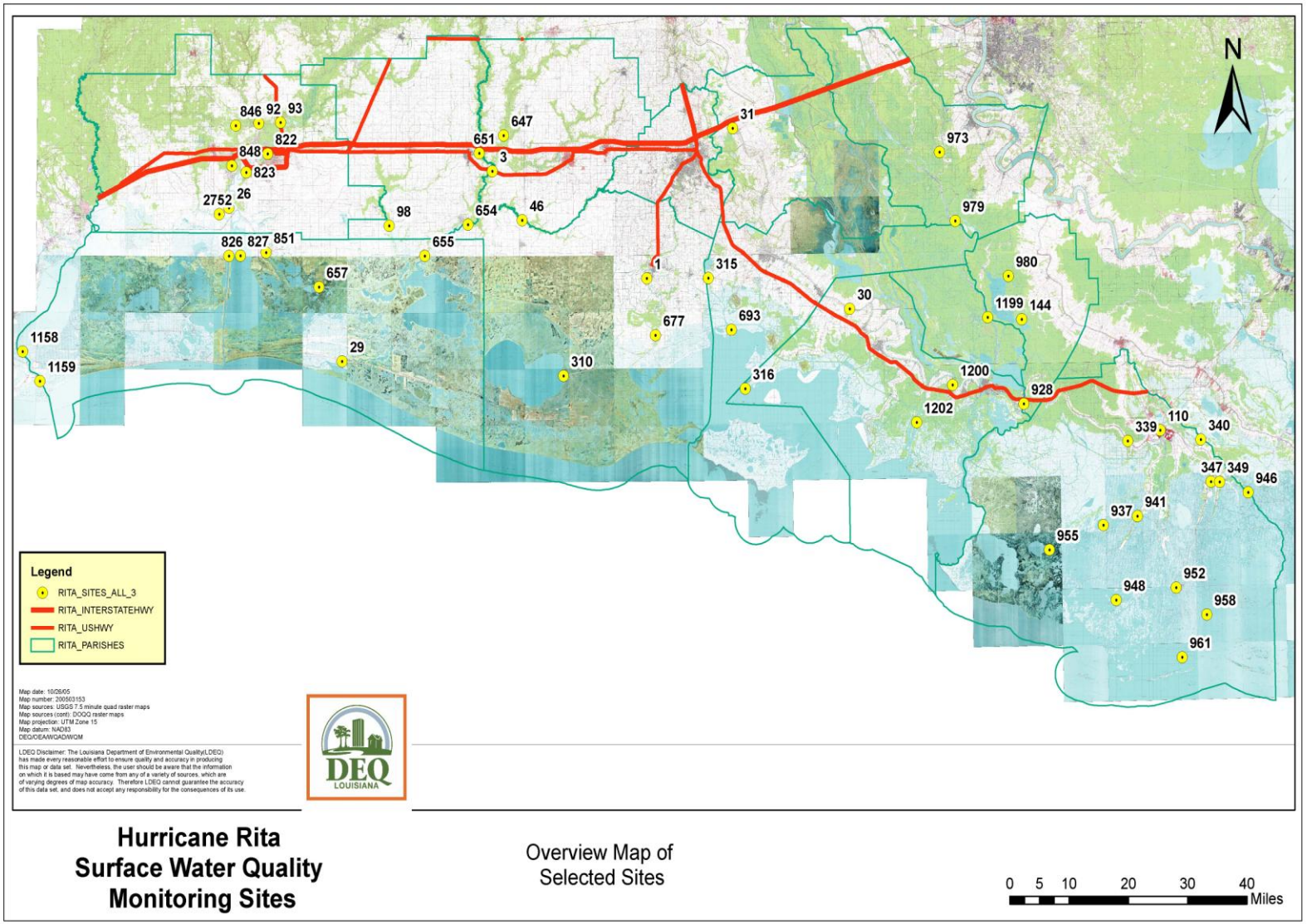
Fifty four, or 0.32%, of the results from 16,800 organic compound analyses (121 sampling events) were found to be above detection levels. The compound 1,2-dichloroethane (EDC) exceeded Louisiana's human health non-drinking water standard once at both Bayou Verdine and the Intracoastal Waterway near Boone's Corner. Malathion exceeded U.S. EPA freshwater chronic standards for one sample at Sabine Pass. All other detections for organic compounds were below Louisiana water quality criteria. Only one of 816 dissolved metals results exceeded criteria.

As expected, there were some cases of depressed dissolved oxygen due to organic debris having been thrown into area water bodies, particularly in the Mermentau River Basin south of Interstate 10. Some streams in the Vermilion-Teche Basin, farther east from the center of the storm, also experienced reduced dissolved oxygen concentrations, though reductions were not as severe as that found in the Mermentau Basin. Chloride concentrations were significantly higher throughout the impacted area due to the high storm surge. Chloride concentrations in the Vermilion-Teche Basin were also elevated but not as significantly as in the Mermentau region. This reduced impact compared to the Mermentau River Basin results from Vermilion-Teche Basin's location farther east from the center of the storm's path and from its protection from a direct hit by Marsh Island, Vermilion Bay and West Cote Blanche Bay.

Farther to the east, both the Atchafalaya and Terrebonne Basins showed minimal if any impact due to Hurricane Rita. Dissolved oxygen levels were generally at or near pre-storm conditions. Chloride concentrations were elevated in some locations, possibly due to storm surge. However, in addition to the hurricanes there was an ongoing drought in much of Louisiana. Droughts frequently lead to increased chloride concentrations in coastal streams due to reduced freshwater flows with resulting increases in tidal influence along coastal waters.

In general, impacts due to Hurricane Rita, while severe in terms of structural, agricultural, and economic losses, were not unusual or unexpected in terms of water quality. Post-hurricane monitoring in the area was quickly discontinued or replaced by Louisiana's ambient monitoring program described above. As with the ambient samples collected in the Hurricane Katrina impact area, ambient samples taken from sites in the Hurricane Rita impact area will be carefully scrutinized to determine if the site has returned to pre-hurricane conditions.

Figure 3.1.2.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Map sources (cont): DOQQ raster maps
Map projection: UTM Zone 15
Map datum: NAD83
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LDEQ Disclaimer: The Louisiana Department of Environmental Quality(LDEQ)
has made every reasonable effort to ensure quality and accuracy in producing
this map or data set. Nevertheless, the user should be aware that the information
on which it is based may have come from any of a variety of sources, which are
of varying degrees of map accuracy. Therefore LDEQ cannot guarantee the accuracy
of this data set, and does not accept any responsibility for the consequences of its use.
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Hurricane Rita
Surface Water Quality
Monitoring Sites
Overview Map of
Selected Sites
0 5 10 20 30 40
Miles

Early Warning Organic Compound Detection System

The Early Warning Organic Compound Detection System (EWOCDS), a collaboration between LDEQ, LSU, and various municipal and industrial facilities along the Mississippi, was established in 1986. Since its inception, the program has been considered a success and the number of detections of compounds in the Mississippi River has dropped dramatically over the past 15 years. The purpose of the program is to warn downstream water suppliers of high levels of problematic organic compounds. EWOCDS sample sites were originally located at eight locations between Baton Rouge and St. Bernard Parish, including three drinking water intakes and five industrial water intakes. Currently, there are eight locations hosted by seven entities (New Orleans Sewerage and Water Board analyzes at two locations) along the lower Mississippi River where ambient river water samples are collected and analyzed for the EWOCDS.

Table 3.1.6 lists the 27 compounds analyzed by this program. In 2005, 4,123 samples were collected and analyzed for the 26 compounds. Of the samples analyzed, 95.8% had no compounds detected, and 4.2% had one or more compounds detected. For more information about the EWOCDS program, contact the Office of Environmental Compliance, Surveillance Division at (225) 219-3615 or send mail to deqsurveillance@la.gov.

Table 3.1.6.

Compounds tested for as part of Louisiana's Early Warning Organic Compounds Detection System.

EWOCDS Acronym	Compound	CAS Number	Drinking Water MCL (ppb)
BDCM	Bromodichloromethane	75-27-4	**
Toluene	Toluene	108-88-3	1000
B-TRI	1,1,2-Trichloroethane	79-00-5	5
PERC	Tetrachloroethene	127-18-4	5
DBCM	Dibromochloromethane	124-48-1	**
CL-Ben	Chlorobenzene	108-90-7	100
Xylene(s)	Dimethylbenzene(s) (m-,o-, and p-Xylenes)	1330-20-7	10,000
PDC	1,2-Dichloropropane	78-87-5	5
BR-3	Bromoform	75-25-2	**
TCE	Trichloroethene	79-01-6	5
M-2	Dichloromethane	75-09-2	5
TV-2	trans-1-2-Dichloroethene	156-60-5	100
CV-2	cis-1-2-Dichloroethene	156-59-2	70
M-3	Chloroform	67-66-3	**
A-TRI	1,1,1-Trichloroethane	71-55-6	200
N.A.	1,3-Dichlorobenzene (m-Dichlorobenzene)	N.A.	N.A.
1,4Ben	1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	75
V-2	1-1-Dichloroethene	75-35-4	5
Benzene	Benzene	71-43-2	5
Styrene	Styrene	100-42-5	100
1,2,4-Ben	1,2,4-Trichlorobenzene	120-82-1	70
EDC	1,2-Dichloroethane	107-06-2	5
ET-Ben	Ethylbenzene	100-41-4	700
M-4	Carbon Tetrachloride	56-23-5	5
VC	Vinyl Chloride	75-01-4	2
1,2Ben	1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	600

- Maximum Contaminant Level – MCL
- Parts per billion – ppb
- Early Warning Organic Compound Detection System - EWOCDS
- This list represents the compounds analyzed by EWOCDS since 1 January 2000.
- Maximum contaminant level values listed above are obtained from the U.S. EPA's Safe Drinking Water Act Update March 2004. For more information see Drinking Water Regulations on U.S. EPA's web site: http://www.epa.gov/safewater/mcl.html

**These compounds are trihalomethanes and are regulated in drinking water at a maximum combined total of 80 ppb.

Chapter 2: Assessment Method and Summary Data/Integrated Report Rationale

Introduction

This summary of Louisiana's water quality assessment methods and Integrated Report (IR) development procedures is taken from the IR Rationale submitted to U.S. EPA in support of Louisiana's 2006 IR. The IR was developed in order to meet reporting requirements of the Federal Water Pollution Control Act (33 U.S.C. §1313 and 40 CFR Chapter 1 §130.7), commonly known as the Clean Water Act (CWA). Specifically, assessment results for this IR satisfy requirements of §303(d) and §305(b) of the CWA. Reports under §303(d) and §305(b) must be prepared every even-numbered year. Following current U.S. EPA guidance, these two reports are now combined into one Integrated Report. This rationale includes descriptions of changes made to Louisiana's IR since the 2004 cycle, along with the reasoning behind those changes. Changes to the IR for 2006 are based on new ambient water quality data collected from 1 January 1998 to 23 September 2005. Not using data collected after 23 September 2005 removes possible water quality effects caused by Hurricanes Katrina and Rita. During the 2005 ambient monitoring rotation there was little ambient sampling in the area affected by Hurricane Katrina; therefore, the period from 29 August 2005 when Hurricane Katrina came ashore and 23 September 2005 when Hurricane Rita came ashore did not include any sampling from the area affected by Katrina. In addition, due to rapidly shifting priorities following Hurricane Katrina, little or no ambient monitoring was conducted statewide. Additional assessment changes are based on data collected at Louisiana's 21 long-term trend sites for water quality monitoring.

Section 303(d) of the CWA requires the identification, listing, and ranking for development of Total Maximum Daily Loads (TMDLs) for waters that do not meet applicable water quality standards after implementation of technology-based controls. Section 305(b) of the CWA requires, among other items, a description of all navigable waters in each State and the extent to which these waters provide for the protection and propagation of fish and wildlife and allow for recreational activities in and on the water (33 U.S.C. §1315(b) et seq.). All assessments were prepared using existing and readily available water quality data and information in order to comply with rules and regulations under §303(d) of the Act (33 U.S.C. §1313 and 40 CFR Chapter 1 §130.7). Additional data and information are being solicited during the 30-day public comment period and will be considered when preparing the final 2006 IR for submittal to the U.S. Environmental Protection Agency (EPA). In most cases, water quality assessments and possible §303(d) listing are based on specific water body subsegments as defined in Louisiana's Environmental Regulatory Code (ERC) 33:IX.1123, Table 3 (ERC, 2006).

The 2006 IR contains new assessments for the Atchafalaya, Barataria, Calcasieu, Mississippi, Ouachita, and Terrebonne Basins of Louisiana, as well as water bodies for which long-term trend site data are available. Louisiana's water quality monitoring and assessment program follows the four-year rotating sampling approach shown in Table 3.2.1. Water quality assessments for a given basin are done every other IR cycle after all subsegments in the basin have been monitored for a given rotation. Subsegments containing long-term trend sites continue to be assessed every IR cycle.

LDEQ's four-year rotation monitoring program has a number of benefits over the previous monitoring programs:

1. Water quality data from the same number of water bodies will be collected over a shorter period of time, thus improving LDEQ's ability to identify and target newly developing problems in a timely manner.
2. Samples will be collected statewide, instead of in two or three basins per year, enabling LDEQ to monitor water quality issues on a broader regional scale.
3. Regional staff responsible for collection of samples will remain skilled and up-to-date on the latest sampling procedures.
4. Regional staff will be able to balance their workload more evenly, instead of having two or three years in which they do little or no ambient water quality sampling and one year of intense field sampling at the expense of all other work.

5. Water body assessments can now be conducted on groups of six alternating basins during each IR cycle. Beginning with the 2006 IR cycle, this results in six basins being assessed in 2006, followed by the remaining six basins in 2008. The first six basins are then reassessed in 2010, and so on.

Table 3.2.1.

Monitoring and assessment schedule for Louisiana's four-year rotating basin plan.

Basin	Monitoring Years	Assessment Year
Atchafalaya	2004, 2005	2006
Barataria	2004, 2005	2006
Calcasieu	2004, 2005	2006
Mermentau	2004, 2005, 2006, 2007	2008
Mississippi	2004, 2005	2006
Ouachita	2004, 2005	2006
Pearl	2006, 2007	2008
Pontchartrain	2006, 2007	2008
Red	2004, 2005, 2006, 2007	2008
Sabine	2006, 2007	2008
Terrebonne	2004, 2005	2006
Vermilion/Teche	2004, 2005, 2006, 2007	2008

2006 Water Quality Assessment Procedures

General Assessment Procedures

Assessment procedures used for Louisiana's 2006 IR have been developed over a number of years for use in previous §305(b) reports. Procedures follow U.S. EPA guidance documents for §305(b) assessments, U.S. EPA's Consolidated Assessment and Listing Methodology (CALM) guidance, as well as Louisiana's surface water quality standards, and ERC 33:IX.1101-1123. Assessment procedures remain largely the same as were used for the 2004 IR. Deviations from previous procedures will be noted in the following description of assessment processes.

For the 2006 IR assessment, field staff collected monthly field analysis and laboratory samples. Laboratory samples were sent to LDEQ's water laboratory in Baton Rouge (conventional parameters), one of several Louisiana Department of Health and Hospitals (LDHH) laboratories (fecal coliforms), or contract lab (metals and fecal coliforms). In order for water quality or other related data to be utilized for §305(b) Reporting and §303(d) listing, sample collection, handling, and laboratory analysis must be in accordance with LDEQ's Quality Assurance Project Plan developed by LDEQ and approved by U.S. EPA Region 6. Data from the LDEQ laboratory were entered into LIMS (Laboratory Information Management System) by laboratory staff. After receiving electronic data deliverables from the laboratory, data were electronically entered into the Oracle-based L'EAU database, maintained on a central LDEQ server by the Information Services Division (ISD) and the WQAD. Data from LDHH and the contract laboratory were also entered into L'EAU by SAN staff. All ambient water quality data used for this assessment can be obtained by following directions found on the LDEQ web site at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=2421. In addition to water quality data collected by LDEQ, additional data and information were also solicited from the public and considered during preparation of the final Integrated Report.

At the beginning of this assessment cycle, L'EAU and SAS programs were reviewed and updated as necessary to reflect changes in time frame, subsegments assessed, criteria, and assessment methods. A series of L'EAU data queries were run and the resulting data transferred to a series of SAS statistical programs. SAS programs are utilized to compare ambient numerical data to criteria for each water body subsegment and designated use. Louisiana Water Quality Standards define eight designated uses for surface waters: primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP), drinking water supply (DWS), oyster propagation (OYS), agriculture (AGR),

outstanding natural resource (ONR), and limited aquatic life and wildlife use (LAL). Designated uses and criteria for each water body subsegment are listed in Louisiana ERC 33:IX.1123. Designated uses have a specific suite of ambient water quality parameters used to assess their support. Links between designated uses and water quality parameters can be found in Table 3.2.2. Data and information collected from within or immediately downstream of a water body subsegment were used to evaluate each subsegment's designated uses, using the decision process shown in Table 3.2.2. Where more than one parameter and criterion define a designated use, support for each use was defined by the designated use's poorest performing parameter (most severely impaired). Likewise, where data from more than one sample station were available, the most severely impaired station was used to make the assessment.

To illustrate this point, most water bodies have the designated use of fish and wildlife propagation (FWP). Fish and wildlife propagation is assessed, as noted in Table 3.2.2, using criteria for the ambient sampling parameters dissolved oxygen, pH, temperature, chloride, sulfate, and TDS, as well as several metals and organic compounds. In the case of subsegment LA030305_00, Contraband Bayou, only the FWP criterion for dissolved oxygen was not met, based on requirements of Table 3.2.2. Therefore, only dissolved oxygen was reported as an impairment to FWP in the 2006 IR. Had turbidity or some other parameter also shown impairment, that impairment would have been listed as well. In some cases two or more monitoring stations are present on the same water body subsegment. For example, subsegment LA030305_00, Contraband Bayou, has two ambient monitoring sites (0631 and 0824). Site 0824 was shown to be fully supporting the fecal coliform (bacteria) criterion for primary contact recreation (PCR), but site 0631 was shown to be not supporting the PCR fecal coliform criterion based on requirements of Table 3.2.2. Therefore, the entire subsegment was reported in the 2006 IR as impaired for PCR due to high fecal coliform densities.

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2006 Integrated Report*.

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	**Partially[2]**	**Not Supporting**
Primary Contact Recreation (PCR) (Designated swimming months of May-October, only.)	Fecal coliform[1]	0-25% do not meet criteria	-	>25% do not meet criteria
	Temperature	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Metals[5] and Toxics	< 2 exceedences of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters		2 or more exceedences of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters
Secondary Contact Recreation (SCR) (All months)	Fecal coliform[1]	0-25% do not meet criteria	-	>25 % do not meet criteria
	Metals[5] and Toxics	< 2 exceedences of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	2 or more exceedences of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2006 Integrated Report*.

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially[2]	Not Supporting
Fish and Wildlife Propagation (FWP)	Dissolved oxygen[3]	0-10% do not meet minimum of 3.0 ppm and median > criteria of 5.0 ppm	-	>10% do not meet minimum of 3.0 ppm or median < criteria of 5.0 ppm
	Dissolved oxygen[4]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
	Temperature, pH, chloride, sulfate, TDS, turbidity	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Metals[5] and Toxics	< 2 exceedences of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	2 or more exceedences of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters
Drinking Water Source (DWS)	Color, Fecal coliform	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Metals and Toxics	< 2 exceedences of drinking water criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters		2 or more exceedences of drinking water criteria in the most recent consecutive 3-year period, or 1-year period for newly tested waters
Outstanding Natural Resource (ONR)	Turbidity	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
Agriculture (AGR)	None	-	-	-
Oyster Production (OYS)	Fecal coliform[1]	Median fecal coliform $\leq$ 14 MPN/100 mL; and $\leq$ 10% of samples $\leq$ 43 MPN/100 mL	-	Median fecal coliform > 14 MPN/100 mL; and > 10% of samples > 43 MPN/100 mL
Limited Aquatic Life and Wildlife (LAL)	Dissolved oxygen[4]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria

Footnotes to Table 3.2.2.:

1. For most water bodies, criteria are as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL; DWS, 2,000 colonies/100 mL; SFP, 43 colonies/100 mL (see ERC 33:IX.1123).
2. While the assessment category of "Partially Supporting" is included in the SAS statistical assessment programming, any use support failures were recorded in ADB as "Not Supporting." This procedure

was first adopted for the 2002 §305(b) cycle because "partially supported" uses receive the same TMDL treatment as "not supported" uses.

3. Water bodies with a D.O. criterion of 5.0 mg/L. This assessment method differs from U.S. EPA guidance.
4. Estuarine waters with a D.O. criterion of 4.0 mg/L and water bodies for which a special study has been conducted to establish site-specific criteria for D.O.
5. Marine metals criteria were used for all water bodies with an average salinity greater than or equal to 16.0 ppt. Freshwater metals criteria were used for all other water bodies.

Numerical data collected between 1 January 1998 and 23 September 2005 were compiled for each assessment. This represents a slight change from the normal five-year sampling period used in the past. Due to LDEQ's change to a four-year rotating monitoring program, LDEQ made the decision to extend the sampling period to allow for two full years of data, where available, for each basin assessed during a given assessment cycle. For many sampling sites, however, (e.g., new sites added under the rotating monitoring plan), only 6 to 12 months of data were available at reporting time. As water bodies are sampled for the second time in the rotation, it will become possible to use data from two monitoring rotations for each basin's assessment update. For most parameters and criteria, at least five samples were required for the assessment to be considered valid. Ambient data used for analysis depended on designated use(s) for each water body and the availability of numerical water quality criteria.

Following statistical determination of a water body's designated use support and what chemical parameters in that water body might be impaired, a determination was then made of which Integrated Report Category (IRC) the suspected water body impairment combination (WIC) should be placed in. A WIC is simply one impairment affecting one water body subsegment. For example, low dissolved oxygen, an impairment on subsegment LA030305_00, Contraband Bayou, is one WIC. In this case the WIC is an impairment to the designated use of FWP. In addition to this impairment, Contraband Bayou is also affected by the WIC of fecal coliform impairing the designated use of PCR. U.S. EPA guidance permits the placement of suspected WICs into one of seven IR categories. Integrated Report Categories, to which these WICs may be assigned, are described in Table 3.2.3.

A careful review of the IRC descriptions for 2006 led LDEQ to change WICs previously designated IRC 3 to IRC 2. For 2006 IRC 2 was used for water bodies in which some assessment information was available but not enough to be certain regarding a given suspected WIC. The resulting change from IRC 3 to IRC 2 is a change in nomenclature only and has no impact on water quality management aspects of a given water body.

Table 3.2.3.

Environmental Protection Agency Integrated Report categories used to categorize water body/pollutant combinations for Louisiana's 2006 Integrated Report.

IR Category (IRC)	IR Category Description
IRC 1	Specific Water body Impairment Combination (WIC) cited on a *previous* §303(d) list is now attaining all uses and standards.
IRC 2	Water body is meeting *some* uses and standards but there is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 3	There is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 4a	WIC exists but a TMDL has been completed for the *specific WIC* cited.
IRC 4b	WIC exists but control measures other than a TMDL are expected to result in attainment of designated uses *associated with the specific WIC* cited.
IRC 4c	WIC exists but a pollutant does not cause the *specific WIC* cited.
IRC 5	WIC exists for one or more uses, and a TMDL is required for the *specific W*IC cited. IRC 5 represents Louisiana's §303(d) list.

Determination of Suspected Sources of Impairment

In addition to use of numerical data, LDEQ regional staff members were asked for input regarding significant suspected sources of impairment, or whether impairment due solely to natural sources was occurring. It was anticipated that numerical data alone might suggest impairment for some Louisiana water bodies when in fact there was no impairment or the impairment was due exclusively to natural causes. In all cases, regional staff familiar with the area would be able to suggest one or more suspected sources for a water body's impairment. Using the best professional judgment of regional staff provides valuable input regarding the quality of individual water bodies.

Data Management of Assessment Results

All resulting assessment information, including water body name, size, type, designated uses, use support, suspected causes, and suspected sources of impairment were entered into a database developed for the U.S. EPA by RTI. (Formerly known as Research Triangle Institute, RTI is an U.S. EPA contractor for computer technology.) States are being encouraged by U.S. EPA to use this Assessment Database (ADB) in order to provide more consistent reporting at a national level. LDEQ has been using ADB since 2002. For 2006, IR Categories for each WIC were included in the "User Flag" field of the "Cause" data entry screen. Additional information regarding each water body including TMDL due date, TMDL status, monitoring information, and federal Hydrologic Unit Code (HUC) can also be input to ADB. Due to time limitations during this reporting cycle, this information has not yet been consistently recorded in ADB for all water bodies; however, all required information for the IR and water quality assessment process has been included. LDEQ hopes to add the remainder of this ancillary information to the ADB system following completion of the 2006 IR in order to facilitate easier tracking.

2006 §303(d) List Development and Other IR Categorizations

The 2006 §303(d) list represents a compilation of four different sources of information.

1. The 2004 Integrated Report.
2. New data assessments for the Atchafalaya, Barataria, Calcasieu, Mississippi, Ouachita, and Terrebonne Basins, along with long-term trend water bodies, were accounted for.
3. All recent TMDL activities occurring during or after development of the 2004 §303(d) list were taken into account.
4. All water bodies under new or existing fish consumption or swimming advisories were noted.

In rectifying these various sources and assigning IR Categories to the suspected sources of impairment, U.S. EPA's current guidance on IR development was used to determine what water bodies were formally included on Louisiana's 2006 list (IRC 5). Using U.S. EPA's IR guidance, all suspected WICs identified in the 2006 IR were assigned to one of seven categories (Table 3.2.3).

It is important to note that removal of a water body from the §303(d) list (IRC 5), for any reason, does not remove water quality protections from that water body. *All* water bodies in Louisiana, listed or not listed, are subject to the same protections under the Clean Water Act and Louisiana's Environmental Quality Act. Permitted facilities are still subject to conditions of their permits. Unpermitted point source dischargers are still required to obtain a permit or face enforcement actions. Violators of permit conditions are still subject to enforcement action. And, contributors to nonpoint sources of pollution are still encouraged to follow best management practices as developed by LDEQ's Nonpoint Source Program and its many collaborators. For water bodies removed from the §303(d) list because TMDLs have been developed, dischargers are still required to meet permit limits based on that TMDL.

EPA's IR guidance was used to categorize specific suspected WICs in order to narrow the focus on what impairments require development of a TMDL for each assessed water body subsegment. If necessary, suspected WICs placed in IRC 2 and 4b will be addressed with additional monitoring to determine if use impairment is occurring, or if the suspected impairment can be addressed by corrective actions other than

development of a TMDL. In the case of known impairments, usually fish consumption or swimming advisories, to small water bodies lying within a larger regulatory subsegment, the smaller water body was also named in the 2006 IR. Impairments of this nature are water body-specific issues not directly related to the overall subsegment. These smaller water bodies not named as a regulatory subsegment were not assessed for any uses other than the specific advisory in question.

Use of IRC 1-4c by Louisiana is not meant to imply that a *water body subsegment* placed in these categories for specific WICs is explicitly *excluded* from IRC 5 (the list). To the contrary, a water body with one or more specific WICs assigned to an IRC of 1-4c will be included in IRC 5 as well, provided one or more WICs for that water body have been placed in IRC 5. Therefore, according to U.S. EPA IR guidance, water bodies with one or more WICs assigned to IRC 5 are *explicitly on the §303(d) list*. **However, these water bodies are only on the §303(d) list for WICs assigned by Louisiana specifically to IRC 5**. IR Categories 1-4c were used by Louisiana in its Integrated Report as a means to classify and account for WICs found on U.S. EPA's Consent Decree §303(d) list. These categories were also used to account for newly identified impairments, not assigned to IRC 5, that are caused by natural sources or for which control activities other than TMDLs are in place.

Overview of Significant Differences between Louisiana's 2004 and 2006 Integrated Reports

A summary of the numerical differences between the 2004 and 2006 Integrated Reports can be found in Table 3.2.4. Integrated Report Category 1 increased from 982 to 1069, indicating in increase in WICs that were formerly impaired but are now fully supporting their designated uses. A total of 107 water body subsegments, up from 100 in 2002, are now fully supporting all designated uses. As noted earlier, WICs formerly in IRC 3 were switched to IRC 2. This is a technical change only and does not affect management of these WICs in any way. The number of WICs in IRC 2 (formerly 3) decreased from 194 to 82 as a result of additional data becoming available resulting in changes to their support status. IRC 4a declined slightly from 473 to 461 because water bodies with existing TMDLs (IRC 4a) are now fully supporting the criteria for which the TMDLs were developed. However, TMDLs for these water bodies remain in force even though the criteria are now supported. Water body impairments assigned to IRC 4b remained the same at 53. A total of 107 WICs were assigned to IRC 4c for the 2006 IR. Field surveys and review by regional staff indicated that the sources of these failures to meet criteria were not caused by a pollutant. In each of these cases, the failure to meet criteria is believed to be caused by natural conditions with no anthropogenic input. As recommended by U.S. EPA, additional monitoring will be conducted to confirm that there continues to be no pollutant-caused impairment. In addition, LDEQ will conduct Use Attainability Analyses (UAAs) on these water bodies in order to determine if more appropriate criteria can be established. Finally, IRC 5, the §303(d) list, continued to decline from 419 WICs to 373. This was due either to additional TMDLs being completed or in some cases due to the water bodies now being fully supported.

Table 3.2.4.

Summary of differences between Louisiana's 2004 and 2006 Integrated Report category totals.

		IRC 1[1]	IRC 2	IRC 3[2]	IRC 4a[2]	IRC 4b[2]	IRC 4c	IRC 5[2] (§303(d) List)
Total number of water body/ impairment combinations in each IR Category	Final 2002 Integrated Report	849	0	155	95	60	0	443
	Final 2004 Integrated Report	982	0	194	473	53	0	419
	Final 2006 Integrated Report	1069[4]	82[3]	14[3]	457	50	107	351

1. All IRC 1, formerly suspected impairments, are in the IRC 1 Addendum, not in the IR itself. U.S. EPA's Assessment Database system (ADB) from which the IR is derived cannot track water body impairment combinations that have been delisted from earlier IR cycles.
2. Most suspected impairments listed in these categories are present in the IR. However, some listings from previous IR cycles had to be placed in the IR Addendum due to limitations of U.S. EPA's ADB system, since these impairments are not included in ADB.
3. WICs formerly assigned to IRC 3 have been switched to IRC 2 to more closely follow U.S. EPA guidance. This is a nomenclature change only and has no effect on water quality management activities for these water bodies.
4. A total of 107 water body subsegments are fully supporting all uses as noted in the full IR ADB database, also placing these in IRC 1 according to U.S. EPA guidance. However, in order to maintain consistency with previous counts in this table these 107 IRC 1 subsegments are not included in the count of 1069.

Chapter 3: River and Stream Water Quality Assessment

Summary of River and Stream Water Quality Assessments

The figures reported in Table 3.3.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The miles of impaired water bodies identified as being affected by various suspected causes of impairment are shown in Table 3.3.2. The miles affected by various suspected sources of impairment are shown in Table 3.3.3. Tables 3.3.2 and 3.3.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in ERC 33:IX.1123, Table 3, can be found in Appendices A, B, and C.

Table 3.3.1.

Summary of designated use support for Louisiana rivers and streams, *2006 Integrated Report* assessment. (Reported in miles (water body count).)

Designated Use	Size Fully Supporting	Size Not Supporting	Insufficient Data	Not Assessed	Total Size for Designated Use
Primary Contact Recreation	6,660 (227)	2,531 (98)	68 (4)	63 (10)	9,321 (339)
Secondary Contact Recreation	8,912 (313)	412 (22)	85 (5)	81 (12)	9,489 (352)
Fish and Wildlife Propagation	2,946 (98)	6,327 (238)	77 (3)	57 (8)	9,407 (347)
Drinking Water Source	851 (16)	460 (8)	0	0	1,311 (24)
Outstanding Natural Resource	1,000 (33)	532 (22)	8 (2)	47 (4)	1,587 (61)
Oyster Propagation	154 (9)	316 (20)	77 (3)	0	547 (32)
Agriculture	2,007 (55)	0	0	34 (5)	2,041 (60)
Limited Aquatic Life/Wildlife	19 (2)	63 (3)	0	0	82 (5)

Suspected Causes of Non-Support of Designated Uses

Table 3.3.2.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected causes of impairment, *2006 Integrated Report*. (Reported in miles and water body count.)

Suspected Causes of Impairment	Size	Count
1,1,1,2-Tetrachloroethane	12	1
1,2-Dichloroethane	8	1
Ammonia (Total)	220	8
Atrazine	103	4
Benzo(a)pyrene (PAHs)	13	2
Bromoform	12	1
Carbofuran	930	23
Chloride	469	27
Chlorine	6	1
Color	460	8
Copper	50	1
DDT	749	6
Dioxin (including 2,3,7,8-TCDD)	70	2
Fecal Coliform	2,840	116
Fipronil	215	5
Hexachlorobenzene	12	1
Hexachlorobutadiene	12	1
Lead	207	7
Mercury	2,386	75
Methoxychlor	8	1
Methyl Parathion	43	1
Nitrate/Nitrite (Nitrite + Nitrate as N)	1,589	63
Non-Native Aquatic Plants	498	27
Oil and Grease	4	1
Oxygen, Dissolved	3,263	145
pH, High	7	1
pH, Low	361	19
Phenols	8	1
Phosphorus (Total)	1,525	61
Polychlorinated biphenyls	41	3
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	29	2
Sedimentation/Siltation	1,274	38
Sulfates	677	29
Total Dissolved Solids	1,184	48
Total Suspended Solids (TSS)	1,950	56
Toxaphene	420	2
Turbidity	2,270	65

Suspected Sources of Non-Support of Designated Uses

Table 3.3.3.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2006 Integrated Report*. (Reported in miles and water body count.)

Suspected Sources of Impairment	Size	Count
Agriculture	58	2
Atmospheric Deposition - Toxics	2,317	73
CERCLA NPL (Superfund) Sites	13	2
Changes in Tidal Circulation/Flushing	112	3
Contaminated Sediments	13	2
Dairies (Outside Milking Parlor Areas)	66	2
Discharges from Municipal Separate Storm Sewer Systems (MS4)	154	8
Drainage/Filling/Loss of Wetlands	129	4
Drought-related Impacts	352	21
Flow Alterations from Water Diversions	211	8
Forced Drainage Pumping	71	6
Impacts from Hydrostructure Flow Regulation/modification	131	3
Industrial Point Source Discharge	210	10
Introduction of Non-native Organisms (Accidental or Intentional)	498	27
Irrigated Crop Production	2,079	54
Livestock (Grazing or Feeding Operations)	89	4
Managed Pasture Grazing	261	11
Marina/Boating Sanitary On-vessel Discharges	79	6
Mine Tailings	30	1
Municipal (Urbanized High Density Area)	156	6
Municipal Point Source Discharges	780	32
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	1,388	61
Natural Sources	983	34
Naturally Occurring Organic Acids	361	19
Non-irrigated Crop Production	1,820	53
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	1,306	57
Package Plant or Other Permitted Small Flows Discharges	408	23
Petroleum/Natural Gas Activities	118	3
Residential Districts	86	3
Sand/Gravel/Rock Mining or Quarries	30	1
Sanitary Sewer Overflows (Collection System Failures)	314	13
Sediment Resuspension (Clean Sediment)	91	3
Sewage Discharges in Unsewered Areas	223	12
Silviculture Activities	17	1
Silviculture Harvesting	121	3
Silviculture Plantation Management	147	5
Site Clearance (Land Development or Redevelopment)	61	5
Source Unknown	3,629	137
Sources Outside State Jurisdiction or Borders	480	8
Streambank Modifications/destabilization	10	1
Total Retention Domestic Sewage Lagoons	86	8
Unpermitted Discharge (Domestic Wastes)	120	4

Table 3.3.3.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2006 Integrated Report*. (Reported in miles and water body count.)

Upstream Source	382	5
Waterfowl	77	3
Wildlife Other than Waterfowl	437	15

Chapter 4: Lake Water Quality Assessment

Summary of Lake Water Quality Assessments

The figures reported in Table 3.4.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The acres of impaired water bodies identified as being affected by various suspected causes of impairment are shown in Table 3.4.2. The acres affected by various suspected sources of impairment are shown in Table 3.4.3. Tables 3.4.2 and 3.4.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in ERC 33:IX.1123, Table 3, can be found in Appendices A, B, and C.

Table 3.4.1.

Summary of designated use support for Louisiana lakes, *2006 Integrated Report*. (Reported in acres (water body count).)

Designated Use	Size Fully Supporting	Size Not Supporting	Insufficient Data	Not Assessed	Total for Designated Use
Primary Contact Recreation	625,807 (55)	30,222 (6)	0	4,255 (4)	660,284 (65)
Secondary Contact Recreation	629,149 (60)	26,880 (1)	0	4,255 (4)	660,284 (65)
Fish and Wildlife Propagation	85,219 (15)	572,781 (47)	0	2,284 (3)	660,284 (65)
Drinking Water Supply	249,027 (9)	2,690(1)	0	0	251,717 (10)
Agriculture	425,672 (15)	0	0	326 (1)	425,998 (16)

Suspected Causes of Non-Support of Designated Uses

Table 3.4.2.

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2006 Integrated Report*. (Reported in acres and water body count.)

Suspected Causes of Impairment	Size	Count
Ammonia (Total)	89,939	2
Carbofuran	83,840	1
Chloride	112,019	4
Color	2,690	1
Fecal Coliform	27,972	5
Hexachlorobenzene	24	1
Hexachlorobutadiene	24	1
Lead	1,771	2
Mercury	267,814	15
Nitrate/Nitrite (Nitrite + Nitrate as N)	124,931	11

Table 3.4.2.

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2006 Integrated Report*. (Reported in acres and water body count.)

Non-Native Aquatic Plants	319,163	16
Oil and Grease	26,904	2
Oxygen, Dissolved	174,612	22
pH, High	15,680	2
pH, Low	3,846	2
Phosphorus (Total)	124,931	11
Polychlorinated biphenyls	2,260	3
Sedimentation/Siltation	155,098	5
Sulfates	62,355	4
Temperature, water	2,250	1
Total Dissolved Solids	114,195	5
Total Suspended Solids (TSS)	156,343	7
Turbidity	253,053	17

Suspected Sources of Non-Support of Designated Uses

Table 3.4.3.

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2006 Integrated Report*. (Reported in acres and water body count.)

Suspected Sources of Impairment	Size	Count
Agriculture	27,677	4
Atmospheric Deposition - Toxics	267,814	15
Contaminated Sediments	24	1
Discharges from Municipal Separate Storm Sewer Systems (MS4)	24	1
Drought-related Impacts	54,080	2
Forced Drainage Pumping	2,112	1
Industrial Point Source Discharge	2,200	2
Industrial/Commercial Site Stormwater Discharge (Permitted)	84	2
Internal Nutrient Recycling	14,720	1
Introduction of Non-native Organisms (Accidental or Intentional)	319,163	16
Irrigated Crop Production	84,048	2
Managed Pasture Grazing	26,880	1
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	88,910	11
Natural Sources	73,626	7
Naturally Occurring Organic Acids	3,846	2
Non-Irrigated Crop Production	120,340	5
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	3,072	2
Package Plant or Other Permitted Small Flows Discharges	2,112	1
Petroleum/Natural Gas Production Activities (Permitted)	26,880	1
Runoff from Forest/Grassland/Parkland	14,720	1
Sanitary Sewer Overflows (Collection System Failures)	24	1
Sediment Resuspension (Clean Sediment)	44,800	1
Source Unknown	309,089	27
Upstream Source	24	1
Waterfowl	27,840	2

Chapter 5: Estuary and Coastal Water Quality Assessment

Summary of Estuary and Coastal Water Quality Assessments

The figures reported in Table 3.5.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The square miles of impaired water bodies identified as being affected by various suspected causes of impairment are shown in Table 3.5.2. The square miles affected by various suspected sources of impairment are shown in Table 3.5.3. Tables 3.5.2 and 3.5.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in ERC 33:IX.1123, Table 3, can be found in Appendices A, B, and C.

Table 3.5.1.

Individual use support summary for Louisiana estuaries, *2006 Integrated Report*. (Reported in square miles (water body count).)

Designated Use	Size Fully Supporting	Size Not Supporting	Insufficient Data	Not Assessed	Total for Designated Use
Primary Contact Recreation	4,863 (51)	91 (1)	0	0	4,954 (52)
Secondary Contact Recreation	4,954 (52)	0	0	0	4,954 (52)
Fish and Wildlife Propagation	3,094 (37)	1,860 (15)	0	0	4,954 (52)
Oyster Propagation	2,835 (27)	1,433 (13)	0	0	4,268 (40)

Suspected Causes of Non-Support of Designated Uses

Table 3.5.2.

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected causes of impairment, *2006 Integrated Report*. (Reported in square miles and water body count.)

Suspected Causes of Impairment	Size	Count
Ammonia (Total)	6	1
Carbofuran	187	1
Fecal Coliform	1,524	14
Mercury	1,657	9
Nitrate/Nitrite (Nitrite + Nitrate as N)	297	5
Non-Native Aquatic Plants	91	1
Oxygen, Dissolved	299	6
Phosphorus (Total)	297	5
Sedimentation/Siltation	193	2
Total Suspended Solids (TSS)	193	2
Turbidity	193	2

Suspected Sources of Non-Support of Designated Uses

Table 3.5.3.

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected sources of impairment, *2006 Integrated Report*. (Reported in square miles and water body count.)

Source Name	Size	Count
Atmospheric Deposition - Toxics	1,657	9
Discharges from Municipal Separate Storm Sewer Systems (MS4)	2	1
Introduction of Non-native Organisms (Accidental or Intentional)	91	1
Irrigated Crop Production	193	2
Marina/Boating Sanitary On-vessel Discharges	60	2
Municipal Point Source Discharges	200	1
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	2	1
Natural Sources	581	3
Non-Irrigated Crop Production	193	2
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	7	1
Package Plant or Other Permitted Small Flows Discharges	588	4
Petroleum/Natural Gas Production Activities (Permitted)	581	3
Sanitary Sewer Overflows (Collection System Failures)	2	1
Sewage Discharges in Unsewered Areas	72	2
Source Unknown	2,086	12
Sources Outside State Jurisdiction or Borders	200	1
Total Retention Domestic Sewage Lagoons	7	1
Unpermitted Discharge (Domestic Wastes)	67	1
Upstream Source	44	1
Waterfowl	25	2
Wildlife Other than Waterfowl	56	2

Chapter 6: Wetlands Water Quality Assessment

Summary of Wetlands Water Quality Assessments

The figures reported in Table 3.6.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The acres of impaired water bodies identified as being affected by various suspected causes of impairment are shown in Table 3.6.2. The acres affected by various suspected sources of impairment are shown in Table 3.6.3. Tables 3.6.2 and 3.5.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in ERC 33:IX.1123, Table 3, can be found in Appendices A, B, and C.

Table 3.6.1.

Individual use support summary for Louisiana wetlands, *2006 Integrated Report.* (Reported in acres (water body count).)

Designated Use	Size Fully Supporting	Size Not Supporting	Insufficient Data	Not Assessed	Total for Designated Use
Primary Contact Recreation	1,025,280 (6)	0	0	0	1,025,280 (6)
Secondary Contact Recreation	1,032,320 (8)	0	0	3,968 (2)	1,036,288 (10)
Fish and Wildlife Propagation	629,760(5)	402,560 (3)	0	3,968 (2)	1,036,288 (10)
Drinking Water Supply	464,000 (1)	0	0	0	464,000 (1)

Suspected Causes of Non-Support of Designated Uses

Table 3.6.2.

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected causes of impairment, *2006 Integrated Report.* (Reported in acres and water body count.)

Suspected Causes of Impairment	Size	Count
Chloride	7,680	1
Mercury	394,880	2
Oxygen, Dissolved	195,840	1
Sulfates	7,680	1
Total Dissolved Solids	7,680	1

Suspected Sources of Non-Support of Designated Uses

Table 3.6.3.

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected sources of impairment, *2006 Integrated Report*. (Reported in acres and water body count.)

Source Name	Size	Count
Atmospheric Deposition - Toxics	394,880	2
Drought-related Impacts	7,680	1
Non-Irrigated Crop Production	195,840	1
Petroleum/Natural Gas Production Activities (Permitted)	195,840	1
Source Unknown	394,880	2

Development of Wetland Water Quality Standards

LDEQ is in the process of developing a category for wetlands in the water quality standards. This category would carry with it specific water quality criteria to protect types of wetlands in Louisiana. Currently, regulations and implementation procedures are being developed for wetlands which may receive a wastewater discharge. Depending on the situation, before a site is classified as a wetland and assigned appropriate wetlands uses and criteria a feasibility study or Use Attainability Analysis (UAA) will be performed. In Louisiana there is also an interest in the beneficial use of treated wastewater or effluent to provide nutrients for subsiding wetland systems. This process, known as wetland assimilation, is described in more detail in the following section.

Wetlands Assimilation

Subsidence in wetlands in southern Louisiana has been caused by a combination of impoundment by artificial levees and flood control drainage. These features have essentially stopped the inflow of water and natural soil building materials into the wetlands that would normally be present during spring flooding events. Extensive scientific studies UAAs conducted over the past 15 years or more on wetland sites in southern Louisiana have demonstrated that controlled discharges of treated municipal wastewater to these wetlands helps to control subsidence and increases wetland productivity.

LDEQ has successfully implemented a program in southern/coastal Louisiana over the past 15 years (since 1992) for natural wetlands to receive treated and disinfected municipal wastewater. The controlled release of low levels of nutrients from secondarily treated municipal wastewater into the wetlands benefits primarily the receiving wetlands and may also provide some economic benefit to the municipalities involved. These benefits have been documented in UAAs and in peer-reviewed, published scientific papers. The program as implemented:

- Benefits subsiding wetlands by enhanced productivity and vertical accretion and is a component of Louisiana's coastal restoration program.
- Improves water quality by reducing nutrient discharges and loads.
- Provides the basis for water quality standards (including nutrient criteria) to protect Louisiana's unique wetland environment, including appropriate vegetative criteria and nutrient loading rate guidance.

The wetlands assimilation process is being documented in part by amending the water quality standards in LAC 33:IX.Chapter 11 to protect wetland areas that may receive treated wastewater effluent. A wetlands category is being proposed as well as definitions, which include classifications of wetlands types, and biological assessment criteria for wetlands to receive treated and disinfected sanitary effluent. Water quality standards revisions for wetland assimilation are supported by implementation procedures outlined in the department's current Water Quality Management Plan. These procedures, though not part of the regulations, will be cited in the water quality standards.

Discharges to wetlands are evaluated by LDEQ on a site-specific basis. Past projects are outlined in the 1996 and 2000 §305(b) reports (available at: http://www.deq.louisiana.gov/portal/tabid/98/ Default.aspx.). To date, wetland wastewater assimilation projects have been completed and wetland discharge permits have been issued for the cities of Thibodaux, Breaux Bridge, Amelia, St. Martinville, Mandeville, Luling, and Hammond. Several other cities are in the process of completing the assimilation application requirements for a permit to discharge to wetlands. These include facilities on the north shore of Lake Pontchartrain, west bank of Jefferson Parish, and Orleans Parish in eastern Louisiana and facilities in the Vermilion-Teche and Mermentau Basins in western Louisiana. Several facilities in coastal cities impacted by Hurricanes Katrina and Rita in 2005 are being considered for wetland assimilation. By improving the health of subsiding wetlands through the controlled application of treated effluent wetlands may suffer less extensive damage from future hurricanes and storms.

Chapter 7: Public Health/Aquatic Life Concerns

Fishing and Swimming Advisories Currently in Effect

The LDEQ currently issues fish consumption and swimming advisories in conjunction with the Louisiana Department of Health and Hospitals (LDHH). Fish consumption advisories are set using a risk assessment-based method that establishes consumption levels designed to prevent adverse effects on public health. Risk assessments are used to determine safe consumption levels for different segments of the population. For example, children and pregnant or breastfeeding women are often considered separately in developing risk assessments because this population is generally considered to be at greater risk from consumption of contaminated seafood. Therefore, limited consumption advisories will often be stricter for this population.

Swimming advisories are generally established due to fecal coliform contamination of a water body. However, a limited number of swimming advisories have been based on chemical contamination of water or sediments. Fecal coliform contamination of a water body can be caused by a number of possible sources including absent or inadequate sewage treatment systems, poorly maintained septic tanks, direct sewage discharges from camps, pasture and animal holding area runoff, and wildlife. Efforts are being made to correct these problems statewide. For the latest information on advisories please refer to LDEQ's web site at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=1631.

Molluscan Shellfish Restrictions/Closures Currently In Effect

Within the LDHH, Office of Public Health (OPH), the Molluscan Shellfish Program is responsible for establishing and maintaining a classification system that determines the suitability of molluscan shellfish growing areas for harvest and human consumption. The National Shellfish Sanitation Program (NSSP) establishes the criteria.

To provide for the classification of all actual or potential molluscan shellfish (oyster) growing areas, the basic division of these areas as used by LDHH is separated into 30 sub-areas. For the last ten years the Seasonal and Conditional Management Classification lines have been fairly stable, with minor seasonal fluctuations. Approximately 6,000 acres were added this past year (2005) to the Lower Calcasieu Conditional Management Area, which now has about 14,000 acres of public seed grounds. Presently, all growing areas in the Atchafalaya, Mermentau, Mississippi Delta, Pearl, and Sabine Basins are classified "Prohibited" for the harvest of molluscan shellfish. Classifications of molluscan shellfish waters are issued by LDHH, OPH on a seasonal basis: November through February, March through April, May through August, and September through October. Maps showing the closed areas are made publicly available for each season and are available on the LDHH web site. Molluscan shellfish cannot be harvested from "Prohibited" areas for any purposes. Areas may be classified as "Prohibited" based on either actual bacteriological data analysis or the potential for a pollution source to affect the harvest area. Also, the state Health Officer has established a 150-foot "Prohibited" closure area around all man-made habitable structures.

LDHH, OPH has also classified some waters as "Restricted." Molluscan shellfish within waters which are classified as restricted may be used only for relay or transplant purposes and are not allowed to be used for direct market harvest. Special permits must be obtained prior to conducting relay or transplant operations. The necessary permits may be obtained from the OPH Commercial Seafood Program.

Summary of Waterborne Illnesses, Louisiana (2000-2005)

All health care professionals are required to report confirmed cases of reportable diseases to the State of Louisiana. Among the various reportable diseases are cryptosporidiosis and giardiasis. Both of these conditions are categorized as "Class C" diseases; they are required to be reported within five business days after the existence of a case, suspected case, or a positive laboratory result is known.

Cryptosporidium and *Giardia* can be transmitted to humans from farm livestock or pets through fecal-oral transmission. It can also be waterborne, food-borne, or spread person-to-person. Giardiasis usually occurs

sporadically, although outbreaks do occur. The prevalence of *Giardia* in stool specimens submitted for examination ranges from 2% to 5% in industrialized countries and from 20% to 30% in developing countries, and it can be as high as 35% among children attending day care centers in the United States in a non-outbreak setting.

Table 3.7.1.

Incidence of waterborne disease in Louisiana, 2000-2005, numbers of cases.

Illness	Year						Total
	2000	2001	2002	2003	2004	2005	
Cryptosporidiosis	14	8	10	5	7	83	127
Giardiasis	41	14	6	14	58	64	197

** The above data includes water-borne and person-to-person infections.*

In the case of *Cryptosporidium*, waterborne outbreaks have occurred involving contaminated water supplies and swimming pools. Since the parasite is resistant to chlorine, appropriately functioning water filtration systems are critical for the safety of public water supplies.

In 2005, the Infectious Disease Epidemiology section of the LDHH investigated an outbreak of cryptosporidiosis in a water playground of a local municipal park. A total of 31 cases were interviewed. The average duration of illness was 7 days. The principal symptoms were diarrhea, nausea, vomiting, and abdominal cramps. Twelve stool specimens tested positive for the presence of *Cryptosporidium*. Inspections of the playground and installations were also conducted. It was concluded that the event occurred as a result of a fecal accident on the water park grounds.

In waterborne outbreaks due to contaminated drinking water, advisories to boil water may be issued to prevent additional cases until proper water treatment is restored. Persons with diarrhea should not use public recreational water (e.g., swimming pools, lakes, ponds).

Selected Case Histories of Water Bodies Under Health Advisories

Bayou Trepagnier, Subsegment 041202

Bayou Trepagnier is located in the Lake Pontchartrain Basin in southeastern Louisiana, near Norco in St. Charles Parish. The bayou has an overall length of approximately 3.5 miles and flows in a northeast direction through a tidally influenced cypress-tupelo gum, freshwater swamp to join Bayou Labranche. Bayou Labranche then continues through freshwater marshlands into Lake Pontchartrain. Since 1973, Bayou Trepagnier has been a designated "natural and scenic stream" under the State's Natural and Scenic Rivers System. In 1984, in accordance with the Louisiana Water Quality Standards, the water uses of Bayou Trepagnier were designated as primary contact recreation, secondary contact recreation, fish and wildlife propagation, and as outstanding natural resource water.

Through the years, the hydrology of the Bayou Trepagnier - Bayou Labranche system has been altered by anthropogenic activities. During construction of the Bonnet Carré Spillway from 1929 to 1931 by the U.S. Army Corps of Engineers, a segment of Bayou Trepagnier was filled in and all flow was stopped. Flow was diverted to the east through the Airline Highway (U.S. Hwy. 61) Canal to Bayou Labranche and thence to Lake Pontchartrain. During the 20-year period from 1931 to 1951 there was little or no flow in Bayou Trepagnier. From 1951 to 1966 Bayou Trepagnier received municipal and industrial storm water and wastewater from the town of Norco and nearby industries. Since 1966 the only substantial source of dry weather flow has been the treated wastewater and storm water from Shell Oil Company's Norco Refinery, located at the headwaters of the bayou. Average flow from the facility to Bayou Trepagnier was approximately 15 million gallons per day. The bayou also received some flow from the surrounding

wetlands during rainfall events. In 1995, the refinery ceased discharge into the canal and Bayou Trepagnier and diverted treated wastewater and stormwater to the Mississippi River.

LDEQ conducted a survey on Bayou Trepagnier in July 1985 after receiving a report concerning the presence of odorous black sludge deposits on the bayou bottom. Preliminary analytical results of sediment samples collected during the survey indicated relatively high concentrations of oil and grease, chromium, and lead. Strong to slight sulfide odors was noted during sediment sampling. Further monitoring and additional sampling were conducted from May 1986 to March 1987.

In 1989, results of a survey of water and sediment samples showed very low dissolved oxygen concentrations and the presence of zinc and chromium. Levels of these metals were not high, but did demonstrate a tendency to have a lower concentration further downstream. Analysis for volatile organic compounds indicated the presence of very low levels of chloroethane, methylene chloride, and toluene.

Sediment core samples were analyzed and the results showed the presence of elevated levels of chromium, zinc, lead, oil and grease when compared to sediments from the Mississippi River and Bayou LaBranche. The sediment samples showed that chromium and zinc concentrations were higher upstream than downstream. Metals concentrations decreased with distance from Shell's Norco Refinery outfall, while increasing with depth from the surface. Oil and grease concentrations showed similar patterns, with higher concentrations at upstream stations and in deeper layers of the cores. These results indicated that there was a correlation between contaminant concentration and distance from the refinery discharge. It also indicated that the heaviest contamination occurred prior to 1980.

Biological assessments of Bayou Trepagnier conducted by LDEQ included macroinvertebrate and fisheries surveys; ambient water, sediment and effluent toxicity tests; and fish tissue analyses. Results of these assessments were all indicative of a pollution problem within Bayou Trepagnier and again showed that the greatest impact occurs at upstream stations closer to the refinery discharge.

Following completion of the Bayou Trepagnier study, LDEQ met with representatives of Shell Oil Company's Norco Refinery and other state agencies to discuss findings of the study and issues involved in remediation of the bayou. In April 1991, Shell submitted to LDEQ, under order, a report entitled *Remedial Investigation of Bayou Trepagnier* (RI). The objective of this investigation was to further document the extent of contamination in and around Bayou Trepagnier. After LDEQ's approval of the RI in July 1993, Shell submitted a work plan entitled *Feasibility Study on Bayou Trepagnier* to study the alternatives for remediation. Several studies occurred from the mid-1990s to the current period to further characterize contamination in the bayou. Since 2000, Motiva (formerly Shell), various federal and state agencies, and non-governmental organizations (NGOs) have been working in the context of a Work Group to address remediation and natural resource damage issues in a comprehensive approach. At this time an updated Feasibility Study has been completed for Operable Unit 1 (the upper reach of Bayou Trepagnier), with a Decision Document expected to go to public notice in the near future. Once the Decision Document has been approved and signed the remedial action will begin on Operable Unit 1. Development of a remediation plan for Operable Unit 2 (the middle and lower reach) will begin in the future.

In addition to the remediation activity described above, a hurricane protection levee (HPL) has been constructed in the area by the U.S. Corps of Engineers. The HPL provides for hurricane surge protection to St. Charles Parish. The extreme southern end of Bayou Trepagnier was filled in during the levee construction, encompassing the footprint of the levee and adjoining right-of-way. A pumping station has been constructed at the head of Engineer’s Canal to pump stormwater from the city of Norco and surrounding areas during heavy rain events.

Devil's Swamp Lake, Subsegment 070203

Devil's Swamp Lake is a man-made lake created by excavation of borrow for construction of levees at the northern end of the Baton Rouge Barge Harbor in 1973. The lake, which has an approximate surface area

of 24 acres, is surrounded by low-lying bottomlands and receives drainage from the adjacent swamp. It also receives discharges and stormwater runoff from a hazardous waste facility and some industrial facilities. Devil's Swamp Lake also receives floodwater from the Mississippi River during high flow periods. Baton Rouge Bayou drains through Devil's Swamp and flows into the Mississippi River just above the Baton Rouge Harbor Canal.

Since 1980, repeated sampling of water, sediment, and fish tissue has demonstrated the presence of organic compounds, including PCBs, in Devil's Swamp Lake. Testing in March 1986 confirmed the presence of PCBs in lake sediments and the effluent channel used by Rollins Environmental Services (RES). Following these analyses, both LDEQ and LDHH tested for toxic substance residues in edible tissues of fish samples collected from the lake. The tissue analyses revealed PCB concentrations below the FDA action level. However, concentrations of hexachlorobenzene (HCB) and hexachlorobutadiene (HCBD) were found at levels considered potentially health-threatening from the standpoint of long-term chronic exposure. In addition, hazardous levels of lead, mercury, and arsenic were present. Following review of these analytical results, the state epidemiologist recommended issuance of an advisory against swimming in and consumption of fish from Devil's Swamp Lake. The Louisiana Department of Wildlife and Fisheries (LDWF), LDHH, and LDEQ issued a joint advisory in October 1987.

LDWF, LDHH, and LDEQ issued a revised health advisory that included the remainder of Devil's Swamp and Bayou Baton Rouge in June 1993. The revised advisory recommends no swimming or other primary water contact sports in the area of concern. Also, based on elevated levels of HCB, HCBD and mercury in fish from this area, the agencies are advising that consumption of all fish species from these waters be limited to two meals per month. (A meal is considered to be one-half pound of fish.) The boundaries of this advisory may be adjusted in the future to reflect results of new information. The area of concern is bounded on the north by Hall-Buck Marine Road, on the east by the bluffs and the Baton Rouge Barge Harbor, and on the south and west by the Mississippi River. This advisory modified a previous advisory in response to more recent sampling and analysis of water and sediment from south of the Petro-Processors site. The new analysis indicated that the concentrations of arsenic, lead, mercury, HCB, and HCBD were at levels that pose risks to public health.

This site is considerably complex and is divided into five areas:

1. North and west of Petro-Processors: This area has not been extensively studied. No contaminants associated with industrial activities have been detected at concentrations in excess of background levels in samples from this area. It is also situated where it is unlikely that wastes from industrial activities reached it.

2. Immediately south to about 3,000 feet south of the "former Hall-Buck Marine Road": Wastes released from pits during operation of the Petro-Processors site extensively impacted the northeast corner of this area. This area has been extensively investigated. Four remedial processes have been applied. The most contaminated channel was excavated to the maximum depth that could safely be achieved. A second channel has been diverted and the original course filled with clean soil. The remaining less-contaminated sediments are being allowed to continue to naturally attenuate. The sediments are naturally anoxic enough that the chlorinated contaminants are being de-chlorinated. The groundwater is also undergoing remediation by natural attenuation. This area is also reducing enough to readily de-chlorinate the contaminants.

3. Area bounded by the southern boundary of the area described in #2 above and the northern end of "Devil's Swamp Lake": This area is virtually unimpacted. There are scattered detections of chlorinated organics at concentrations that are well below levels that pose threats environmental or human health.

4. Devil's Swamp Lake: The lake and the swamp immediately adjacent have been shown to be contaminated by some of the chlorinated compounds present in the area described in #2, above, and by PCBs. The probable source of these contaminants is the former RES site. U.S. EPA is

going through the process of listing this site on the National Priorities List (NPL). The state of Louisiana has agreed with this action.

5. "South Swamp": This is the area to the south and west of Devil's Swamp Lake that has not been impacted by either site. Photographs are available on the U.S. EPA web site showing current and past conditions before remedial actions http://www.epa.gov/earth1r6/6sf/6sf-la.htm .

Bayou Bonfouca, Subsegments 040907 and 040908

The Bayou Bonfouca Superfund site is located in Slidell, Louisiana, on the north shore of Lake Pontchartrain and includes the former American Creosote Works Plant and a portion of Bayou Bonfouca. The site encompasses more than 54 acres, and there were eight highly contaminated creosote or polynuclear aromatic hydrocarbon (PAH) areas on site. Bayou Bonfouca, which is located in St. Tammany Parish, was placed on the NPL due to contamination by creosote, a chemical commonly used as a wood preservative. The NPL, which is issued by U.S. EPA, is a list of hazardous waste sites eligible for investigation and cleanup under the federal Superfund program.

In 1970, several thousand cubic yards of creosote spilled into Bayou Bonfouca and onto an adjacent land area following a fire and tank explosion at the American Creosote Works plant. Contamination of the area also occurred through a legacy of poor plant operating procedures. The creosote plant had been operating for almost 100 years prior to its closure after the fire. The contamination of Bayou Bonfouca has been categorized as a nonpoint source residual waste problem. A record of decision (ROD) signed in March 1987 outlined a selected remediation plan for the site. In June 1988, it was discovered that the extent and depth of the contamination was much greater than previously estimated. This led to an amendment to the original ROD under the February 1990 explanation of significant difference.

Beginning in January 1996, U.S. EPA and LDEQ began working to correct contamination problems at Bayou Bonfouca under provisions of the federal Superfund program. Both the U.S. EPA and LDEQ are jointly providing funds for cleanup of the site, with U.S. EPA as lead agency in charge of remediation. There was concern that attempts to remediate the contamination in Bayou Bonfouca will stir up the creosote and the overlying sediment. Therefore, LDHH and LDEQ issued an advisory against swimming and consumption of fish from the stream. The area posted extends from one-quarter mile upstream of the American Creosote Works site to one mile south of Louisiana Highway 443. Remediation of the abandoned facility involves the dredging of 169,000 cubic yards of contaminated sediments from Bayou Bonfouca and removal of 8,000 cubic yards of surface waste materials.

The selected remediation and disposal methods for the contaminated site included excavation; capping the site; incineration of creosote waste piles and heavily contaminated bayou sediment; and pumping, treating and monitoring contaminated ground water. A design phase for groundwater remediation was completed in October 1989, and the *in situ* operation began in mid-1991. In November 1993, a cleanup contractor moved an incinerator to the site and completed a trial burn. In early 1994, excavation and incineration of the contaminated sediments was begun. The ash was placed under a Resource Conservation and Recovery Act (RCRA) cap onsite and incineration completed in the summer of 1995. The Source Control Operable Unit conducted this part of the cleanup. The second phase of remediation, which will be handled by the Ground Water Operable Unit, will address dense nonaqueous phase liquids (DNAPLs) in the surficial aquifer. A statutory five-year review of ground water cleanup activity was completed in September 1996, which recommended continued ground water recovery and treatment and an evaluation of treatment performance. In September 1997, U.S. EPA made modifications in the current groundwater recovery and treatment where needed to protect the integrity of the Source Control remedy based on a Performance Evaluation Report. In the spring of 2000, additional groundwater remedial activity began and additional groundwater recovery wells were installed. On July 11, 2001 a second five-year Review was signed and LDEQ took over operations and maintenance. As of November 2006 the Bayou Bonfouca site was in the continuing Operation and Maintenance phase of remediation. Under this phase, groundwater pumping and monitoring will continue for the foreseeable future.