2022
LOUISIANA WATER QUALITY INVENTORY: INTEGRATED REPORT

FULFILLING REQUIREMENTS OF THE FEDERAL CLEAN WATER ACT, SECTIONS 305(b) AND 303(d)

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Acronyms and Abbreviations

AGR	Agriculture
AL	Action Level
ALC	Aquatic Life Criteria
AOI	Area of Interest
ASSET	Aquifer Sampling and Assessment Program
ATTAINS	Assessment, Total Maximum Daily Load, Tracking and Implementation System
AWQMN	Ambient Water Quality Monitoring Network
BEACH	Beaches Environmental Assessment and Coastal Health
BEP	Beneficial Environmental Projects
BFI	Browning-Ferris Industries
BLM	Biotic Ligand Model
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BT	Barataria-Terrebonne
CALM	Consolidated Assessment and Listing Methodology
CAP	Corrective Action Plan
CDL	Cropland Data Layer
CEI	Compliance Evaluation Inspections
CFDA	Catalog of Federal Domestic Assistance
CFR	Code of Federal Regulations
CM	Continuous Monitoring
CO	Compliance Order
CPRA	Coastal Protection and Restoration Authority
CSI	Compliance Sampling Inspections
CWA	Clean Water Act
CWPPRA	Coastal Wetlands Planning, Protection and Restoration Act
CWSRF	Clean Water State Revolving Fund
CyanoHABs	Cyanobacteria Harmful Algal Bloom
DDT	Dichlorodiphenyltrichloroethane
DL	Detection Limit
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DWPP	Drinking Water Protection Program
DWS	Drinking Water Supply
EDD	Electronic Data Deliverable
EDMS	Electronic Document Management System
EQIP	Environmental Quality Incentive Program
FWP	Fish and Wildlife Propagation
GIS	Geographic Information System
HCB	Hexachlorobenzene
HCBD	Hexachlorobutadiene
HUC	Hydrological Unit Code
IR	Integrated Report
IRC	Integrated Report Category
LAC	Louisiana Administrative Code

LAIS	Louisiana Aquatic Invasive Species
LAL	Limited Aquatic Life and Wildlife
LCH	Liquid Chlorinated Hydrocarbons
LDAF	Louisiana Department of Agriculture and Forestry
LDCRT	Louisiana Department of Culture, Recreation and Tourism
LDEQ	Louisiana Department of Environmental Quality
LDH	Louisiana Department of Health
LDNR	Louisiana Department of Natural Resources
LDOTD	Louisiana Department of Transportation and Development
LDWF	Louisiana Department of Wildlife and Fisheries
LEADMS	Louisiana Environmental Analytical Data Management System
LEAU	Louisiana Environmental Assessment Utility
LEQA	Louisiana Environmental Quality Act
LGS	Louisiana Geological Survey
LMRAP	Lower Mississippi River Alluvial Plain
LOSC	Louisiana Office of State Climatology
LOSP	Louisiana Office of State Parks
LOT	Louisiana Office of Tourism
LPDES	Louisiana Pollutant Discharge Elimination System
LSP	Louisiana State Police
LSU	Louisiana State University
LSUS	Louisiana State University Shreveport
LTSA	Louisiana Tourism Satellite Account
MCL	Maximum Contaminant Level
MS4	Municipal Separate Storm Sewer Systems
MSU	McNeese State University
NAD	North American Datum
NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990
NARS	National Aquatic Resource Surveys
NASS	National Agricultural Statistics Service
n.d.	No Date
NGP	National Geospatial Program
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NOPP	Notice of Potential Penalty
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Unit
NWCA	National Wetland Condition Assessment
OEC	Office of Environmental Compliance
OES	Office of Environmental Services
ONR	Outstanding Natural Resource Waters
OYS	Oyster Propagation

PAH	Polycyclic Aromatic Hydrocarbons
PC	Pontchartrain Conservancy
PCB	Polychlorinated Biphenyls
PCR	Primary Contact Recreation
PRP	Potentially Responsible Parties
PS	Point Source
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RECAP	Risk Evaluation/Corrective Action Program
RES	Rollins Environmental Services
RDL	Reporting Detection Limit
ROD	Record of Decision
ROS	Regression on Order Statistics
RPP	Remedial Project Plan
SARA	Superfund Amendments and Reauthorization Act
SCPF	South Central Plains Flatwoods
SCPSTU	South Central Plains Southern Tertiary Uplands
SCPTU	South Central Plains Tertiary Uplands
SCR	Secondary Contact Recreation
SD	Surveillance Division
SEAFWA	Southeastern Association of Fish and Wildlife Agencies
SEAMAP	Gulf States Marine Fisheries Commission, Southeast Area Monitoring and Assessment Program
SMCL	Secondary Maximum Contaminant Level
SONRIS	Strategic Online Natural Resources Information System
SOP	Standard Operating Procedure
SPOC	Single Point of Contact
SPTF	Southern Plains Terrace and Flatwoods
SVOC	Semi-Volatile Organic Compound
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorus
TSS	Total Suspended Solids
TU	Terrace Uplands
UAA	Use Attainability Analysis
UMRAP	Upper Mississippi River Alluvial Plains
UNO	University of New Orleans
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

UTM	Universal Transverse Mercator
VGP	Vessel General Permit
VIDA	Vessel Incidental Discharge Act
VOC	Volatile Organic Compound
WES	Water Enforcement Section
WHIP	Wildlife Habitat Incentive Program
WIC	Water Body Impairment Combination
WIP	Watershed Implementation Plan
WPD	Water Permits Division
WPAD	Water Planning and Assessment Division
WQMP	Water Quality Management Plan
WQS	Water Quality Standards
WQSAS	Water Quality Standards and Assessment Section
WQX	Water Quality Exchange
WRP	Wetland Reserve Program
XP	Expedited Penalty

PART I: EXECUTIVE SUMMARY/OVERVIEW

Summary of Louisiana's Water Quality Assessment Program

Louisiana, well known for its abundance of water resources, contains over 126,000 miles of rivers and streams (i.e., perennial, intermittent, canals), 1,486,650 acres of lakes and reservoirs, 9,849,353 acres of woody and emergent/herbaceous wetlands, and 5,005 square miles of estuaries (U.S. Geological Survey (USGS)-2019a; USGS-National Geospatial Program (NGP) 2019b). These figures, some of which are taken from the high resolution (1:24k) USGS National Hydrography Dataset (NHD), may be conservative estimates in comparison to the actual total area of Louisiana's rivers, lakes, wetlands, and estuaries. It is the responsibility of the Louisiana Department of Environmental Quality (LDEQ) to protect the chemical, physical, biological, and aesthetic integrity of the water resources and aquatic environment of Louisiana. This responsibility is undertaken through the use of public education, scientific endeavors, water quality management, wastewater permitting and inspections, and regulatory enforcement in order to provide the citizens of Louisiana with clean and healthy water now and in the future.

The 2022 Integrated Report (IR) documents LDEQ's progress toward meeting this responsibility. Louisiana's IR is produced, in part, to meet requirements of the Federal Water Pollution Control Act commonly known as the Clean Water Act (CWA) (U.S. Code 1972, 1987). The primary CWA sections addressed by the 2022 IR are §303(d) and §305(b). Section 303(d) states that each state shall identify water quality-limited segments still requiring Total Maximum Daily Loads (TMDL) within its boundaries for which: (1) Technology-based effluent limitations required by sections 301(b), 306, 307 or other sections of the Act; (2) More stringent effluent limitations (including prohibitions) required by either state or local authority preserved by §10 of the Act or federal authority (law, regulation, or treaty); and (3) Other pollution control requirements (e.g., best management practices) required by local, state, or federal authority are not stringent enough to implement any water quality standards applicable to such waters.

Section 305(b) of the CWA requires each state to provide, every two years, the following information to the Administrator of the U.S. Environmental Protection Agency (USEPA):

- A description of the water quality of all navigable waters in the state;
- An analysis of the status of waters of the state with regard to their support of recreational activities and fish and wildlife propagation;
- An assessment of the state's water pollution control activities toward achieving the CWA goal of having water bodies that support recreational activities and fish and wildlife propagation;
- An estimate of the costs and benefits of implementing the CWA; and
- A description of the nature and extent of nonpoint sources (NPS) of pollution and recommendations for programs to address NPS pollution.

For the 2022 IR, LDEQ used USEPA's *Consolidated Assessment and Listing Methodology* (CALM) (USEPA 2002), which contains the IR guidance, as well as USEPA's guidance document, *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* (USEPA 2005). In addition to the previous two documents, USEPA issues updates to the IR guidance in the form of memoranda prior to each IR period (USEPA 2006). Louisiana's water quality regulations (Louisiana Administrative Code

(LAC), Title 33:IX.1101 et seq. (LAC 2021)) were used to determine water quality uses, criteria, and assessment procedures. One of the primary focuses of USEPA's IR guidance is on the use of categories to which water bodies or water body/impairment combinations (WIC) may be assigned. A WIC is a single parameter (e.g., low dissolved oxygen (DO)) or other impairment assigned to a water body subsegment for assessment purposes. Subsegments are watersheds or portions of watersheds delineated as management units for water quality monitoring, assessment, permitting, inspection, and enforcement purposes. Categorization under IR guidance allows for a more focused approach to water quality management by clearly determining which actions are required to protect or improve individual waters of the state. The eight IR categories used by LDEQ can be found in Table 1.1.1.

Table 1.1.1

U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/impairment combinations for the *Louisiana 2022 Integrated Report*; includes Integrated Report Category (IRC) 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.

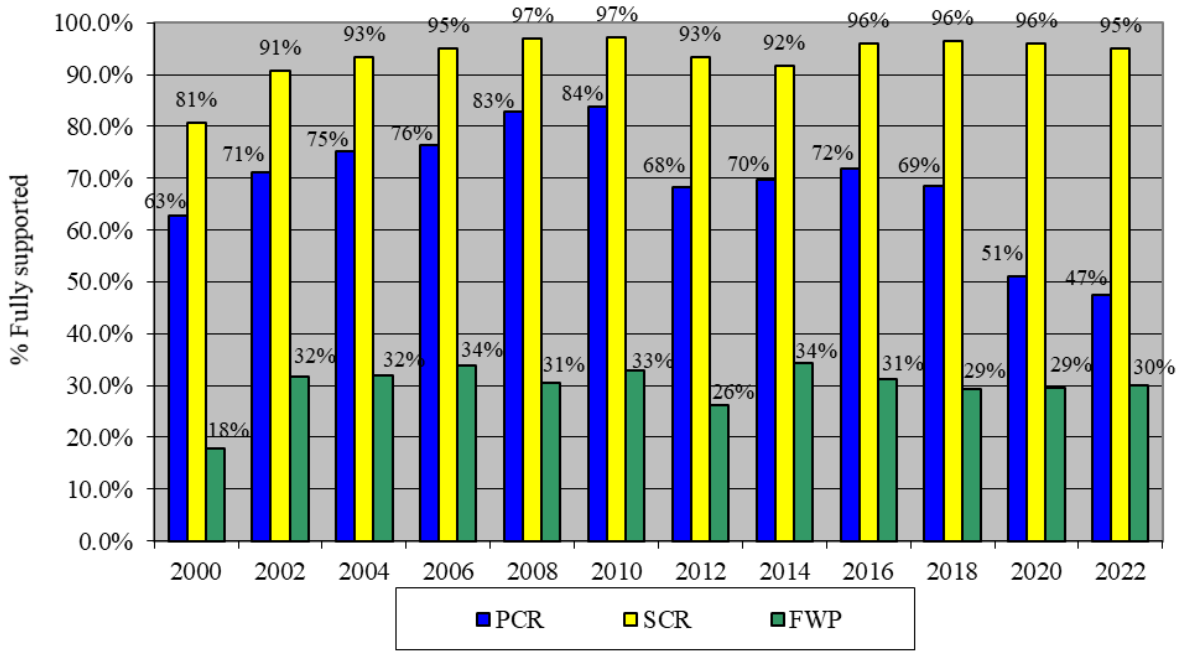
IR Category	IR Category Description
IRC 1	*Specific Water body Impairment Combination* (WIC) cited on a *previous* §303(d) list is now attaining all uses and standards. Also used for water bodies that are fully supporting all designated uses.
IRC 2	Water body is meeting some uses and standards but there 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 and a TMDL has been completed for the *specific WIC* cited.
IRC 4b	WIC exists and 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 and a pollutant (anthropogenic source) does not cause the *specific WIC* cited.
IRC 5	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited. **IRC 5 and its subcategories of IRC 5RC and IRC 5-Alt represent Louisiana's §303(d) list.**
IRC 5RC (Revise Criteria)	WIC exists for one or more uses and a TMDL is required for *the specific WIC* cited; LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments. **IRC 5RC WICs are on Louisiana's §303(d) list.**
IRC 5-Alt (Alternative)	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, based on the §303(d) long-term vision protocol an alternative approach is expected to achieve water quality goals. **IRC 5-Alt WICs are on Louisiana's §303(d) list.**

Summary of Overall Water Quality in Louisiana

For the 2022 IR full support of the designated use of secondary contact recreation (SCR or "boating") once again remained essentially the same at 95% (Figure 1.1.1). Support of the primary contact recreation (PCR or "swimming") use decreased from 51% of assessed water body subsegments down to 47%. Much of the decline in PCR support was due to the implementation of a new enterococci criterion for the PCR use. This resulted in new enterococci testing of many water bodies and the subsequent addition of impairments not previously identified. Of the 249 subsegments impaired for PCR use, 47.8% (119 of 249 impaired subsegments) are due to elevated fecal coliform densities, while 48.2% (120 of 249 impaired subsegments) are due to enterococcus densities. The remaining PCR impairments are due to elevated water temperature (4.4% or 11 of 249) or chemical contamination (0.8% or 2 of 249 subsegments). For SCR use, 100.0% (24 of 24 subsegments) of the impairments are due to fecal coliforms and 4.2% (1 of 24 subsegments) are due to chemical contamination of some sort.

Fish and wildlife propagation (FWP) use support also remained essentially unchanged with 30% of assessed subsegments fully supporting the designated use. Low FWP use support continues to be due in part to the large number of water quality parameters and information used to assess the use. LDEQ currently uses data and information on DO, chlorides, sulfates, total dissolved solids (TDS), turbidity, non-native aquatic plants, pH, oil and grease, seven different metals, and dozens of organic compounds, including pesticides, when assessing water quality for the designated use. In addition to these monitored parameters, the presence of fish consumption advisories due to mercury or organic chemicals also results in impairment to this designated use.

Figure 1.1.1
Comparison over time of designated use support for three primary designated uses of Primary Contact Recreation (PCR), Secondary Contact Recreation (SCR), and Fish and Wildlife Propagation (FWP). 2022 Louisiana Water Quality Integrated Report.



Summary of Suspected Causes of Impairment to Water Quality

Table 1.1.2 lists all suspected causes of impairment for all designated uses. All values reported in summary tables and charts are based solely on subsegments found in Louisiana regulations as designated subsegments (LAC 33:IX.1123.Table 3). This is done to assure a stable baseline for cycle-to-cycle summaries, excluding so called "advisory only" subsegments, which can change based on advisory status. These "advisory only" subsegments are established and noted in Appendix A, which includes all assessments, to account for fish consumption or swimming advisories on small portions of a regulatory subsegment. In these cases, the water body defined in the regulation is not impaired; however, a limited portion or tributary may be impaired due to the advisory.

Low DO, which is used to determine support of the FWP use, continues to be the most frequently cited suspected cause of impairment with 233 subsegments affected, two less than was reported in 2020. Fecal coliform ranks second in terms of the number of subsegments impacted (165). This suspected cause of impairment is used to assess the designated uses of PCR and SCR, as well as drinking water supply (DWS) and oyster propagation (OYS). Enterococcus impairments moved to the third most frequently cited source of impairment (120 subsegments). Mercury in fish tissue dropped to fourth in frequency of impairments with 111 subsegments affected (Table 1.1.2). The large increase in enterococcus impairments was due to an increase in the number of subsegments tested for enterococcus as a result of a newly promulgated criterion. Turbidity remained fifth with 98 subsegments affected. Highly turbid waters, as measured by turbidity, can cause problems for aquatic life and aesthetic concerns for human recreation.

Nutrient listings, including nitrate/nitrite and total phosphorus, were first reported many years ago based on qualitative evaluative assessments rather than on data analysis. Remaining nutrient listings are closely associated with low DO impairments. The suspected impairment causes of TDS, sulfates, and chlorides are all related to the concentration of certain minerals and other natural or introduced substances in the water.

Chemical compounds commonly associated with industrial activities are reported infrequently (Table 1.1.2). These include polychlorinated biphenyls (PCBs); 2,3,7,8-tetrachlorodibenzofuran and other furan compounds; lead; 2,3,7,8-tetrachlorodibenzodioxin and other dioxin compounds; 1,2-dichloroethane; polycyclic aromatic hydrocarbons (PAHs); 1,1,1,2-tetrachloroethane; bromoform; hexachlorobenzene; hexachlorobutadiene; and phenol. LDEQ currently tests for 35 volatile organic compounds (VOCs) on a quarterly basis at all ambient monitoring sites. In addition, three Mississippi River sites are tested monthly for 59 different organic compounds. Between October 4, 2016 and September 22, 2020, 65,769 organic chemical analyses were recorded by LDEQ. Of these, only 520 results, or 0.79 percent of all samples analyzed, resulted in detectable concentrations of the chemical analyzed. The 520 detections resulted in eleven human health drinking water supply or human health non-drinking water supply criteria exceedances. This represents only 0.017 percent of all available chemical sample results. The criterion exceedances included six different compounds in seven different subsegments, and resulted in one overall designated use impairment based on organic compounds. There were no exceedances of aquatic life criteria, again resulting in no overall designated use impairments. All remaining organic chemical detections were either below Louisiana water quality criteria or occurred only once during the last four years. Table 1.1.3 provides a comparison of suspected causes between the 2020

and the current 2022 IR. More information on procedures for assessing organic compounds can be found in Part III, Chapter 2.

In March 2020 it was found that detection levels for a Nonpoint Source Program pesticides study conducted in 2014/2015 were too high to effectively assess the subsegments in question. As a result, 32 subsegments were once again reported as having suspected causes of impairment for one or more of five pesticides (Carbofuran, DDT (Dichlorodiphenyltrichloroethane), Fipronil, Methoxychlor, and Toxaphene). The suspected causes can be found in the 2022 IR assessment spreadsheet and in USEPA's ATTAINS (Assessment, Total Maximum Daily Load, Tracking and Implementation System) database. The affected water bodies will be reevaluated at a later date.

Table 1.1.2

Number of water body subsegments impacted by each suspected cause of impairment; includes all designated uses. 2022 Louisiana Integrated Report assessment.

Suspected Causes of Impairment	River	Lake	Estuary	Wetland	Totals
1,2-Dichloroethane	1				1
2,3,7,8-Tetrachlorodibenzofuran	2				2
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2				2
4,4'-DDT	5				5
Ammonia, Total	4				4
Arsenic		1			1
Atrazine	1				1
Carbofuran	23	1	1		25
Cause Unknown				1	1
Chloride	13	1		1	15
Color	10	3			13
Copper	2				2
Dioxin	1				1
Dioxin - Fish Consumption Advisory	3		4		7
Dissolved Oxygen	186	28	16	3	233
Enterococcus	81		38	1	120
Fecal Coliform	139	6	17	3	165
Fipronil	7				7
Furan Compounds	3		4		7
Hexachlorobenzene		1			1
Hexachlorobutadiene		1			1
Lead	8	1			9
Mercury		1			1
Mercury - Fish Consumption Advisory	81	20	9	1	111
Methoxychlor	1				1
Methyl Parathion	1				1
Nitrate/Nitrite (Nitrite + Nitrate as N)	39	4			43
Non-Native Aquatic Plants	27	16	1		44
Oil and Grease		1			1

Table 1.1.2

Number of water body subsegments impacted by each suspected cause of impairment; includes all designated uses. 2022 Louisiana Integrated Report assessment.

Suspected Causes of Impairment	River	Lake	Estuary	Wetland	Totals
PCBs - Fish Consumption Advisory	3	2	4		9
PCBs In Sediment	1				1
pH, High	3	3			6
pH, Low	18				18
Phenol	1				1
Phosphorus, Total	37	4			41
Polychlorinated Biphenyls (PCBs)	1				1
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	1				1
Sulfate	19				19
Temperature	6	4		1	11
Total Dissolved Solids (TDS)	37	3		1	41
Toxaphene	1				1
Turbidity	73	21	3	1	98
Totals	911	130	103	23	1133

Table 1.1.3

Comparison of the number of suspected causes between the 2020 and 2022 Water Quality Integrated Reports. ***2022 Louisiana Integrated Report.***

2020 and 2022 Suspected Causes of Impairment	2020 Total	2022 Total
1,2-Dichloroethane	1	1
1,1,1,2-Tetrachloroethane	1	0
2,3,7,8-Tetrachlorodibenzofuran	2	2
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	2	2
4,4'-DDT	5	5
Ammonia	NA	4
Arsenic	1	1
Atrazine	1	1
Bromoform	1	0
Carbofuran	25	25
Cause Unknown	1	1
Chloride	16	15
Color	15	13
Copper	2	2
Dioxin	1	1
Dioxin - Fish Consumption Advisory	7	7
Dissolved Oxygen	235	233
Enterococcus	98	120

Table 1.1.3

Comparison of the number of suspected causes between the 2020 and 2022 Water Quality Integrated Reports. ***2022 Louisiana Integrated Report.***

2020 and 2022 Suspected Causes of Impairment	2020 Total	2022 Total
Fecal Coliform	170	165
Fipronil	7	7
Furan Compounds	7	7
Hexachlorobenzene	1	1
Hexachlorobutadiene	1	1
Lead	9	9
Mercury	1	1
Mercury - Fish Consumption Advisory	113	111
Methoxychlor	1	1
Methyl Parathion	1	1
Nitrate/Nitrite (Nitrite + Nitrate As N)	43	43
Non-Native Aquatic Plants	44	44
Oil And Grease	1	1
PCBs - Fish Consumption Advisory	9	9
PCBs In Sediment	1	1
pH, High	7	6
pH, Low	20	18
Phenol	1	1
Phosphorus, Total	41	41
Polychlorinated Biphenyls (PCBs)	2	2
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	1	1
Sulfate	23	19
Temperature	11	11
Total Dissolved Solids (TDS)	41	41
Toxaphene	1	1
Turbidity	96	98
Total Number of Reported Suspected Causes	**1,067**	**1,074**
Number of Subsegments for each IR Reporting Cycle	**499**	**497**
Causes Per Subsegment for each IR Reporting Cycle	**2.14**	**2.16**

Summary of Suspected Sources of Impairment to Water Quality

Table 1.1.4 provides a list of all suspected sources of subsegment impairment across all designated uses. The large number of subsegment listings for *source unknown* and *atmospheric deposition-toxics* is largely due to the high number of mercury-related fish consumption advisories in Louisiana. *Natural sources* were reported for 182 subsegments. This single suspected source was primarily related to low DO, chlorides, sulfates, TDS, and turbidity. In addition to the 182 subsegments specifically reported for natural sources, 51 subsegments were reported for other suspected sources of impairment related to natural conditions.

Table 1.1.4

Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. 2022 Louisiana Integrated Report assessment.

Suspected Source of Impairment	River	Lake	Estuary	Wetland	Total
Agriculture	74	11	1		86
Animal Feeding Operations (NPS)	1				1
Atmospheric Deposition - Toxics	81	19	9	1	110
Construction	3				3
Construction Stormwater Discharge (Permitted)	2	1			3
Contaminated Sediments		1			1
Crop Production (Irrigated)	4				4
Crop Production (Non-Irrigated)	4	1			5
Discharges From Municipal Separate Storm Sewer Systems (MS4)	5	1	1		7
Dredging (e.g., For Navigation Channels)	1				1
Drought-Related Impacts	5				5
Erosion And Sedimentation	2				2
Forced Drainage Pumping	5				5
Golf Courses	2				2
Highways, Roads, Bridges, Infrastructure (New Construction)	1				1
Impacts From Hydrostructure Flow Regulation/Modification	3				3
Industrial Point Source Discharge	9	1	4		14
Industrial/Commercial Site Stormwater Discharge (Permitted)	4	2	2		8
Introduction of Non-Native Organisms (Accidental or Intentional)	55	22	2		80
Landfills	1				1
Livestock (Grazing or Feeding Operations)	8				8
Low Water Crossing	1				1
Manure Runoff	2				2
Marina Boat Maintenance	1				1
Marina/Boating Pumpout Releases			1		1

Table 1.1.4

Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. 2022 Louisiana Integrated Report assessment.

Suspected Source of Impairment	River	Lake	Estuary	Wetland	Total
Marina/Boating Sanitary On-Vessel Discharges	7				7
Municipal (Urbanized High Density Area)	4				4
Municipal Point Source Discharges	29				29
Natural Sources	138	27	13	4	182
Naturally Occurring Organic Acids	4				4
Non-Point Source	1		1		2
On-Site Treatment Systems (Septic Systems And Similar Decentralized Systems)	94	3	7		104
Package Plant Or Other Permitted Small Flows Discharges	52	1	2		55
Pesticide Application		1			1
Petroleum/Natural Gas Activities	2				2
Petroleum/Natural Gas Production Activities (Permitted)	1				1
Point Source(s) – Unspecified	6				6
Reduced Freshwater Flows	5				5
Residential Districts	3				3
Runoff From Forest/Grassland/Parkland	6	1			7
Rural (Residential Areas)	9				9
Sand/Gravel/Rock Mining or Quarries	1				1
Sanitary Sewer Overflows (Collection System Failures)	13	2	1		16
Seafood Processing Operations	1				1
Sediment Resuspension (Clean Sediment)	6	2	1		9
Sewage Discharges in Unsewered Areas	36	6	3		45
Shallow Lake/Reservoir		1			1
Silviculture Activities	14				14
Silviculture Harvesting	24	10	1		35
Site Clearance (Land Development or Redevelopment)	6	1			7
Source Unknown	182	31	40	4	257
Sources Outside State Jurisdiction or Borders	4				4
Transfer of Water from an Outside Watershed	1				1
Unknown Point Source	3	1	1		5
Unspecified Land Disturbance		1			1
Upstream Source	4	1			5

Table 1.1.4

Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. 2022 Louisiana Integrated Report assessment.

Suspected Source of Impairment	River	Lake	Estuary	Wetland	Total
Urban Runoff/Storm Sewers	1				1
Water Diversions	4				4
Waterfowl	6	1	3	1	11
Wet Weather Discharges (Non-Point Source)			1		1
Wetland Drainage	1				1
Wildlife Other Than Waterfowl	18		4	1	23

The high number of low DO impairments reported in Table 1.1.2 was due in part to natural conditions but may also be related to high biochemical oxygen demand (BOD) loading of material that leads to the reduction of oxygen levels in the water. These materials come from a variety of sources including sewage, fertilizers, some sediments, and naturally high levels of plant material in swampy areas.

Twenty-six different categories were reported as suspected sources of subsegment impairment by fecal coliform and enterococcus. In rank order they include: source unknown (114); on-site treatment systems (septic systems) (72); package plant or other permitted small flows discharges (42); natural sources (39); sewage discharges in unsewered areas (34); wildlife other than waterfowl (20); municipal point source discharges (16); waterfowl (9); sanitary sewage overflows (9); marina/boating sanitary on-vessel discharges (6); runoff from forest/grassland/parkland (6); rural (residential areas) (6); introduction of non-native organisms (accidental or intentional) (5); agriculture (4); drought-related impacts (4); livestock (grazing or feeding operations) (4); silviculture harvesting (4); unknown point source (4); discharges from municipal separate storm sewer systems (MS4) (2); manure runoff (2); municipal (urbanized high density area) (2); point source(s)-unspecified (2); animal feeding operations (NPS) (1); marina/boating pump out releases (1); nonpoint source (1); and upstream source (2). Nineteen of the 26 sources identified above are or could be related to nonpoint sources of pollution; highlighting the impact NPS can have on water quality.

Mercury in Louisiana water bodies is largely derived from atmospheric deposition derived from natural sources or coal-fired power plants, as opposed to direct discharges to water from land based facilities. Pirrone et al. (2010) estimated that global natural sources are responsible for 5,207 Mg (Mg = 1,000 kg or 1 metric ton) of mercury released to the atmosphere annually. Roughly half of this naturally released mercury derives from ocean emissions, with the remainder coming primarily from (1) lakes, soil and plant emissions; (2) biomass burning; and (3) volcanoes and geothermal areas. An estimated 2,320 Mg of mercury is emitted directly from anthropogenic sources. Of this total, approximately 810 Mg (35%) is from coal and oil combustion. Artisanal gold mining accounts for 400 Mg (17%), while 310 Mg (13.4%) is from non-ferrous metal production. The eight remaining individual sources of mercury collectively account for approximately 35% of total anthropogenic sources (Pirrone et al. 2010). Based on the preceding estimates, approximately 69% of all annual worldwide mercury emissions to the atmosphere are derived from natural sources. Taking this into account, the primary sources of mercury in Louisiana waters are most likely

national or international in origin and, therefore, largely outside the scope of LDEQ control. More information on mercury in Louisiana can be found at: http://deq.louisiana.gov/page/mercury-initiative.

High turbidity, the fifth most frequently cited cause of impairment (Table 1.1.2) may be caused by poor farming and forestry practices, as well as runoff from construction sites. It can also be naturally occurring in some areas. Chlorides, sulfates, and TDS (collectively referred to as "minerals") are also frequently cited as suspected causes of FWP impairment. Many cases of reported minerals criteria failures may be due to saltwater intrusion in coastal areas. Saltwater from the Gulf of Mexico has naturally higher concentrations of these substances than the freshwater flowing into coastal areas. Water quality criteria for these substances were in some areas originally based on more freshwater conditions; therefore, as coastal areas erode and saltwater intrudes, areas with normally fresher water are now experiencing more brackish (salty) conditions. This may result in more minerals criteria exceedances.

Considering all suspected sources, large percentages are related to what is collectively known as nonpoint source (NPS) pollution. NPS pollution is caused by the runoff of stormwater from land such as agricultural fields, forestry areas, construction sites, and urban or suburban areas. In contrast, point sources (PS) of water pollution are those from a discrete pipe such as a small or large industrial discharger or municipal sewage treatment plant. With this distinction in mind, a large percentage of Louisiana subsegments, 401 (81%), are impacted by NPS related sources (see Table 1.1.4). A total of 113 (23%) subsegments were possibly impacted by point source discharges. A variety of naturally occurring conditions accounted for 206 (41%) suspected subsegment impairments. Each subsegment may be impaired by multiple sources including NPS, PS, natural, and/or a variety of other types of sources. Part II, Chapter 2 provides more information on NPS pollution and Louisiana's efforts to control it.

Although Louisiana has a large industrial sector, only 19 subsegments out of 497 have reported suspected sources of impairment related to industrial activity releases to water. Many of these suspected industrial sources are the result of legacy pollutants which have been or are in the process of being remediated (Part III, Chapter 2 Integrated Report Category 4b Documentation). While industrial activities are certainly a factor impacting Louisiana's water quality, assessments indicate it is not as prevalent as is frequently perceived by the public. This is due in large part to stringent CWA and Louisiana Environmental Quality Act (LEQA) (LEQA 1995) permitting and enforcement directed at point source dischargers to Louisiana's water bodies. Part II, Chapter 2 contains more information on water quality permitting and enforcement in Louisiana.

Summary of River Quality in Louisiana

Figures 1.1.2 through 1.1.4 summarize support of the three most common designated uses for Louisiana rivers. The uses are PCR, SCR, and FWP. Each subsegment may have more than one designated use. Other uses are established for selected water bodies in Louisiana. The status of these uses can be found in Part III, Chapter 4. Summary tables for the suspected causes and sources of impairment to Louisiana's rivers can also be found in Part III, Chapter 4. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.2
Support for primary contact recreation (swimming) for Louisiana rivers, 2022 Integrated Report. (Based on 352 assessed rivers)

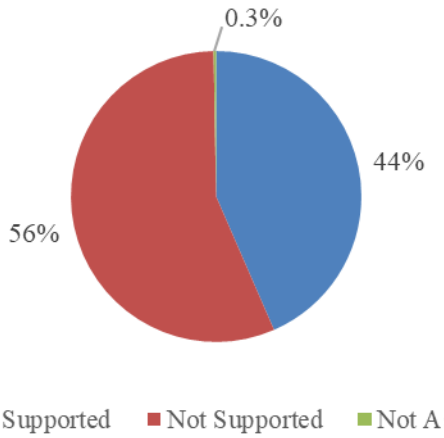


Figure 1.1.3
Support for secondary contact recreation (boating) for Louisiana rivers, 2022 Integrated Report. (Based on 364 assessed rivers)

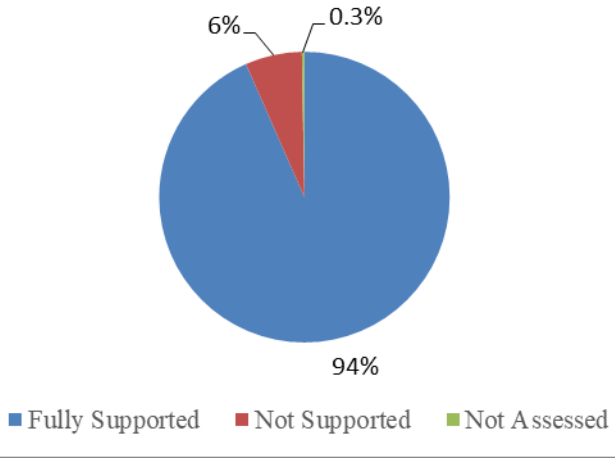
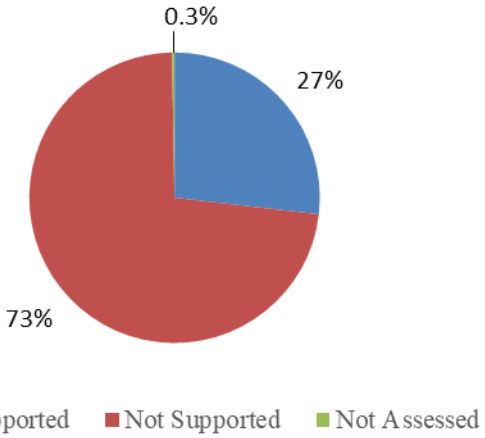


Figure 1.1.4
Support for fish and wildlife propagation (fishing) Louisiana rivers, 2022 Integrated Report. (Based on 358 assessed rivers)



Summary of Lake Quality in Louisiana

Figures 1.1.5 through 1.1.7 summarize support of PCR, SCR, and FWP in Louisiana lakes. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these other uses can be found in Part III, Chapter 5. Summary tables for the suspected causes and sources of impairment to Louisiana's lakes can also be found in Part III, Chapter 5. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.5
Support for primary contact recreation (swimming) for Louisiana lakes, 2022 Integrated Report. (Based on 65 assessed lakes)

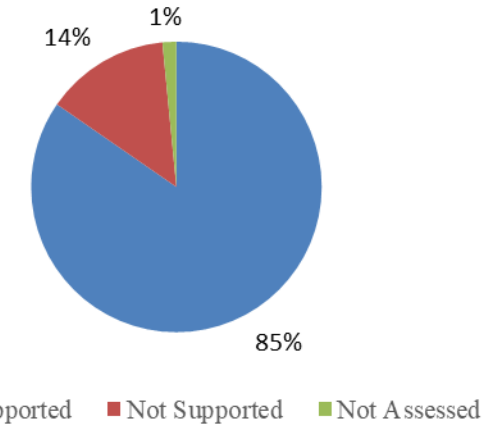


Figure 1.1.6
Support for secondary contact recreation (boating) for Louisiana lakes, 2022 Integrated Report. (Based on 65 assessed lakes)

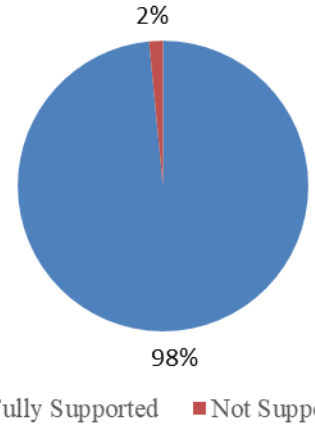
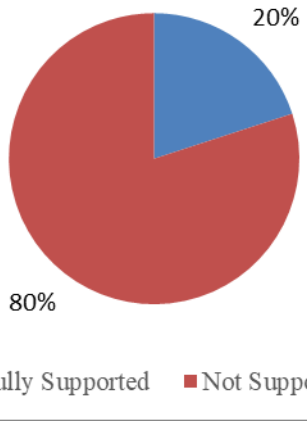


Figure 1.1.7
Support for fish and wildlife propagation (fishing) for Louisiana lakes, 2022 Integrated Report. (Based on 65 assessed lakes)



Summary of Estuary Quality in Louisiana

Figures 1.1.8 through 1.1.10 summarize support of PCR, SCR, and FWP for Louisiana estuaries. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these uses can be found in Part III, Chapter 6. Summary tables for the suspected causes and sources of impairment to Louisiana's estuaries can also be found in Part III, Chapter 6. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.8
Support for primary contact recreation (swimming) for Louisiana estuaries, 2022 Integrated Report. (Based on 52 assessed estuaries)

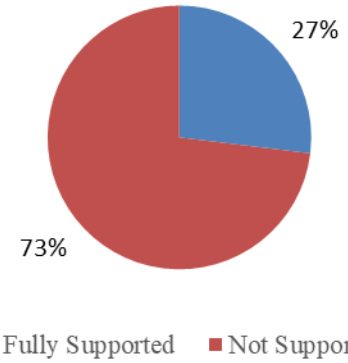


Figure 1.1.9
Support for secondary contact recreation (boating) for Louisiana estuaries, 2022 Integrated Report. (Based on 52 assessed estuaries)

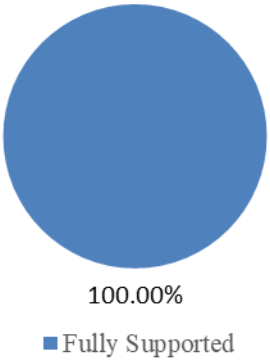
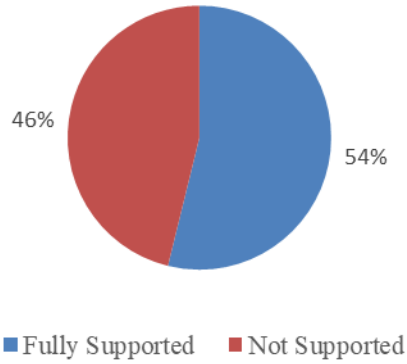


Figure 1.1.10
Support for fish and wildlife propagation (fishing) for Louisiana estuaries, 2022 Integrated Report. (Based on 52 assessed estuaries)



Summary of Wetland Quality in Louisiana

Figures 1.1.11 through 1.1.13 summarize support of PCR, SCR, and FWP in Louisiana wetlands. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these uses can be found in Part III, Chapter 7. Summary tables for the suspected causes and sources of impairment to Louisiana's wetlands can also be found in Part III, Chapter 7. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.11
Support for primary contact recreation (swimming) for Louisiana wetlands, 2022 Integrated Report. (Based on 6 assessed wetlands)

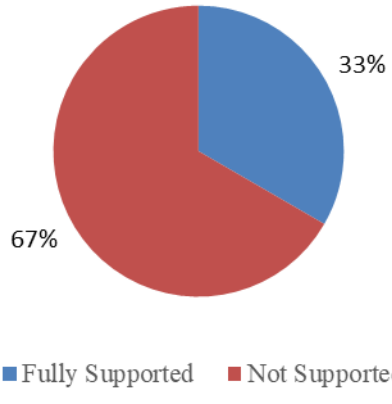


Figure 1.1.12
Support for secondary contact recreation (boating) for Louisiana wetlands, 2022 Integrated Report. (Based on 16 assessed wetlands)

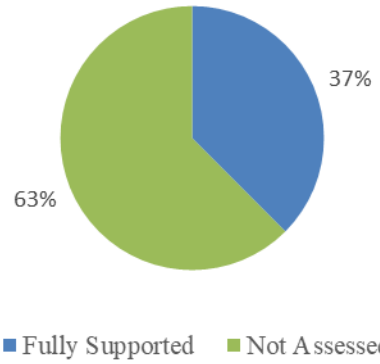
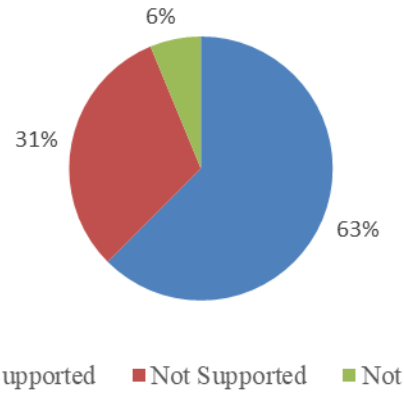


Figure 1.1.13
Support for fish and wildlife propagation (fishing) for Louisiana wetlands, 2022 Integrated Report. (Based on 16 assessed wetlands)



Surface Water Pollution Control Programs

LDEQ has the responsibility of managing the quality of Louisiana's surface waters by implementing pollution control measures and protecting the integrity of those waters where good quality exists. Water pollution controls employed by the agency include establishing water quality standards, conducting intensive surveys, developing TMDLs, writing municipal and industrial wastewater discharge permits, inspecting facilities, responding to complaints and incidents, enforcing permit requirements, reviewing and certifying projects affecting water quality, promoting use of best management practices (BMPs) for NPS pollution, and regular water quality monitoring and assessment of the state's surface waters. More information on LDEQ's surface water pollution control programs can be found in Part II, Chapter 2.

Groundwater Quality in Louisiana

The LDEQ, WPAD, Aquifer Sampling and Assessment (ASSET) Program is an ambient groundwater monitoring program designed to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers, and provides water quality data on these aquifers. Through this program, samples are collected from approximately 200 water wells located in 14 aquifers across the state. The sampling process is designed so that all 14 aquifers are monitored on a rotating basis, within a three-year period, so that each well is monitored every three years.

The USEPA has encouraged states to select an aquifer or hydrogeologic setting and discuss available data that best reflects the quality of the resource. The aquifer and hydrogeologic setting selected for this IR cycle are the Chicot, Chicot Equivalent, Mississippi River Alluvial, North Louisiana Terrace, and Red River Alluvial aquifers, which are within the common hydrogeologic setting of the Pleistocene geologic series. Data presented for this report is from ASSET Program monitoring data collected in state fiscal years 2019 – 2021. Details regarding these aquifers can be found in Part IV of this report.

PART II: BACKGROUND

Chapter 1: Louisiana Resources

Louisiana Geography and Climate

Geography

Louisiana is located in the southeastern continental U.S. and is bordered by Texas, Mississippi, and Arkansas, with the Gulf of Mexico on its southern border. Due to Louisiana's unique geologic past, it is a state rich in resources (e.g., water, minerals). When characterizing the state's geomorphology (i.e. landform features and processes), Louisiana lies entirely in the Coastal Plain physiographic province (within the Atlantic Plain division), which is the flattest province (USGS 1968; National Park Service no date (n.d.)). Within the Coastal Plain, Louisiana is divided into three sections: West Gulf Coast Plain, Mississippi Alluvial Plain, and East Coast Plain (Fenneman and Johnson 1946). Oil and gas fields, as well as salt domes, are numerous across the state, especially in the north and the southern coast (Louisiana Geological Survey (LGS) 2000; Spearing 1995). In the West Gulf Coast Plain, resources include clay, crushed stone, gypsum, sand and gravel, lignite, peat, sulfur, and salt; and the East Gulf Plain provides sand and gravel, and clay (Spearing 1995; USGS 2019c). Within the Mississippi Alluvial Plain, the Mississippi River deposits sediment collected from the central half of the continental U.S., which has generated resources such as natural gas, sulfur, and petroleum (Vigil et al. 2000).

The USEPA delineates four levels of ecoregions that help describe the ecological and environmental resources in the state ranging from a global (I) to local (IV) scale (USEPA n.d. (a)). LDEQ revised the USEPA's ecoregions in the 1990's to incorporate state-specific conditions (e.g., levees, floodgates) (LDEQ 1992). In 2014, LDEQ further refined the ecoregion boundaries with supporting chemical, physical, and biological data creating fifteen total ecoregions (LDEQ 2014). The LDEQ state-level ecoregions provide a framework for regionally appropriate water quality criteria that protect our ecological resources such as the fishing and oyster industries.

Topographic data for the entire state of Louisiana is available as a high-resolution LIDAR (light detection and ranging) dataset (Atlas Lidar n.d.). Maximum elevations in Louisiana are located in the hills of the northwest, where the state's oldest geologic formations are found, including 60-million-year-old shales north of Shreveport; however, the rest of Louisiana's land formations are geologically younger than these shales (Spearing 1995). East of Shreveport, the highest elevation in the state, Driskill Mountain, is only 535 feet (USGS 2001). The elevated features in the northwest, central, and eastern (i.e., Florida Parishes) parts of the state give way to the lower elevation marshes, chenier plains, and delta plains in the southern coast (Spearing 1995). The low elevation (e.g., 0 to 5 feet above sea level) coastal marsh areas extend across the southern portion of Louisiana (approximately south of I-10 and I-12) and represent a valuable fisheries and wildlife resource (Kosovich 2008). Portions of south Louisiana, including the New Orleans area, are below sea level (up to 8 feet or more) due to subsidence resulting from natural and anthropogenic factors, such as surface sediment and aquifer compaction, tectonic movement, organic soil (peat) oxidation, levee construction (loss of deposition), and marsh filling (Burkett et al. 2003; Kosovich 2008; Spearing 1995). Reducing wetland loss to protect the state's coastal resources is an on-going effort through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA 1990).

Climate

Louisiana has a humid subtropical climate with hot summers and shorter and mild winter seasons influenced by the extensive landmass to the north, the Gulf of Mexico to the south, and the subtropical latitude. Prevalent winds from the south/southeast bring in warm, moist air from the Gulf, resulting in abundant rainfall occurring throughout the year, though there is greater rainfall variation in the northern part of the state (Frankson et al. 2017). Louisiana generally receives greater than 60 inches of precipitation a year, while the statewide annual average precipitation varies from 50 inches in the north to 70 inches in the southeast, though snowfall is uncommon (Frankson et al. 2017; Kunkel et al. 2013; Louisiana Office of State Climatology (LOSC) n.d.-a). On average, Louisiana experiences a hurricane every three years, and each year it has over 60 days with thunderstorms (Frankson et al. 2017). Tornadoes produced from severe thunderstorms can occur across the state, though stronger tornadoes are more likely to occur in northern Louisiana (Kunkel et al. 2013). The average annual temperature ranges from 64 °F in the north to 70 °F in the south; though, temperature extremes of 114° F to -16° F have been recorded in 1936 and 1899, respectively (Frankson et al. 2017, LOSC n.d.-b). Additional climate information for Louisiana is available at the National Oceanographic and Atmospheric Administration's (NOAA's) state climate summaries (NOAA 2017).

Water

LDEQ divides the state into 12 major watershed basins, which are named for the major water bodies (i.e., 11 river systems and one estuarine lake) inside each basin. The basins have unique characteristics (e.g., geology, geography, and hydrology) described in Appendix A and shown in Figure 2.1.1 (LDEQ 2021a). Three basins are named for rivers that help define Louisiana's borders—the Mississippi, Sabine, and Pearl. General information about Louisiana's water resources including border and river miles (e.g., perennial and intermittent) is available in Table 2.1.1. Because Louisiana's coastal resources differ significantly in physical, chemical, and hydrological characteristics from inland resources, the information provided for lakes and wetlands has been broken down into two categories: inland and coastal (Table 2.1.1). The Louisiana coastal zone boundary is an area defined using several parameters (e.g., tidal influence, salinity, vegetation) and extends 3 miles offshore (Louisiana Department of Natural Resources (LDNR) n.d.). Water bodies categorized as coastal receive some tidal influx, even though some of the coastal lakes and wetlands are characterized by freshwater vegetation. Surface water resources in Louisiana can be explored further with USGS National Hydrography (USGS n.d. (a)) and USEPA Water Data and Tools (USEPA n.d. (b)).

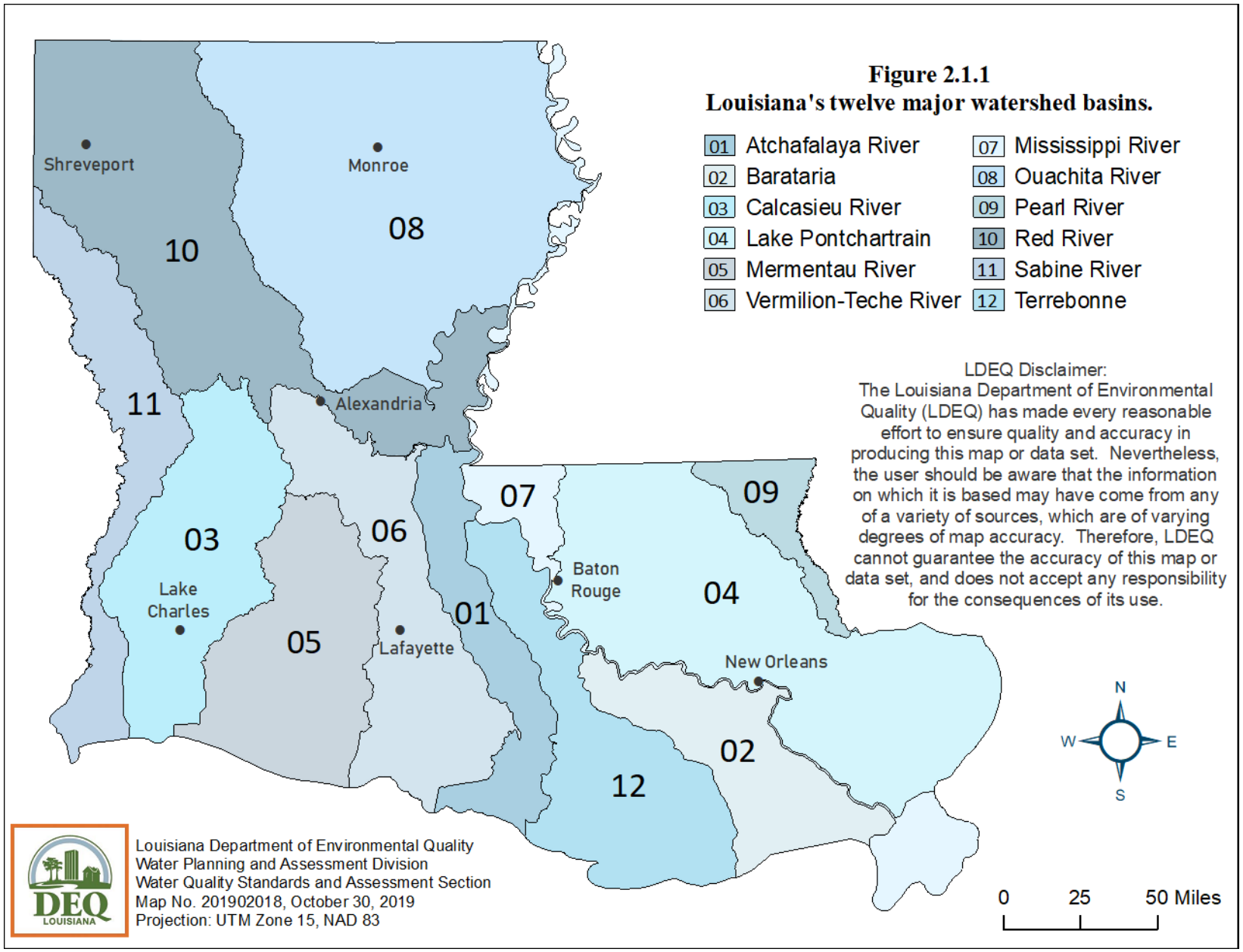


Figure 2.1.1
Louisiana's twelve major watershed basins.
01 Atchafalaya River
02 Barataria
03 Calcasieu River
04 Lake Pontchartrain
05 Mermentau River
06 Vermilion-Teche River
07 Mississippi River
08 Ouachita River
09 Pearl River
10 Red River
11 Sabine River
12 Terrebonne
LDEQ Disclaimer:
The Louisiana 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 map or data set, and does not accept any responsibility for the consequences of its use.
Shreveport
Monroe
Alexandria
Baton Rouge
Lake Charles
Lafayette
New Orleans
N
W
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S
0 25 50 Miles
Louisiana Department of Environmental Quality
Water Planning and Assessment Division
Water Quality Standards and Assessment Section
Map No. 201902018, October 30, 2019
Projection: UTM Zone 15, NAD 83

Table 2.1.1

This table contains geophysical data summaries for Louisiana. Most of the estimated values were derived from the high resolution (1:24k) USGS National Hydrography Dataset (NHD) (USGS-NGP 2019b). The methods to calculate the total count, length, and area estimates are discussed in the footnotes. The perimeter used for the statewide calculations is defined by the Louisiana Department of Transportation and Development (LDOTD) boundary (LDOTD 2005). The coastal zone refers to the Department of Natural Resources Coastal Zone boundary (LDNR n.d.). The geospatial layers used in the summary calculations (e.g., rivers, lakes, wetlands, coastline, and Coastal Zone boundary) are available to view in the LDEQ Geophysical Web Map for the 2022 IR.

State Geophysical Component	Reported or Estimated	Unit
General Information (U.S. Census Bureau (USCB) 2010; USGS n.d. (b))		
2019 Louisiana Population Estimate (USCB-PD 2019)	4,648,794	persons
Land Surface Area (includes intermittent water and marsh/swamp)	43,204	sq. miles
Percent Land	82.5	%
Water Surface Area (perennial only)	9,174	sq. miles
Percent Water	17.5	%
Major River Basins (see Figure 2.1.1)	12	total
Rivers[1] (USGS-NGP 2019b)		
Total NHD Flowline Miles	126,000	miles
Perennial Stream/River	49,357	miles
Intermittent Stream/River	59,774	miles
Undesignated Stream/River	162	miles
Canal/Ditch	16,707	miles
Border Rivers[2] (USGS-NGP 2019b)		
Total Length of Border Rivers	590	miles
Pearl River	119	miles
Mississippi River	205	miles
Sabine River (includes boundary through Toledo Bend	266	miles
Lakes and Reservoirs[3] **(≥ 10 acres)** (USGS-NGP 2019b)		
Total Count of Lake/Ponds and Reservoirs	5, 330	total
Inland	3,870	total
Coastal Zone	1,460	total
Total Area of Lake/Ponds and Reservoirs	1,486,650	acres
Inland	475,775	acres
Coastal Zone	1,010,875	acres
Total Count of GNIS Named Lake/Ponds and Reservoirs	812	total
Total Area of GNIS Named Lake/Ponds and Reservoirs	1,235,050	acres

Table 2.1.1

This table contains geophysical data summaries for Louisiana. Most of the estimated values were derived from the high resolution (1:24k) USGS National Hydrography Dataset (NHD) (USGS-NGP 2019b). The methods to calculate the total count, length, and area estimates are discussed in the footnotes. The perimeter used for the statewide calculations is defined by the Louisiana Department of Transportation and Development (LDOTD) boundary (LDOTD 2005). The coastal zone refers to the Department of Natural Resources Coastal Zone boundary (LDNR n.d.). The geospatial layers used in the summary calculations (e.g., rivers, lakes, wetlands, coastline, and Coastal Zone boundary) are available to view in the LDEQ Geophysical Web Map for the 2022 IR.

State Geophysical Component	Reported or Estimated	Unit
Wetlands[4] (USGS-National Land Cover Database (NLCD) 2021d)		
Total Area of Wetlands (Woody and Emergent/Herbaceous)	9,849,353	acres
Woody	6,569,912	acres
Emergent/Herbaceous	3,279,441	acres
Total Area of Inland Wetlands	5,660,248	acres
Woody	5,373,061	acres
Emergent/Herbaceous	287,187	acres
Total Area of Coastal Zone Wetlands	4,189,105	acres
Woody	1,196,851	acres
Emergent Herbaceous	2,992,254	acres
Total Area of Coastal Wetland by Vegetation Type (Sasser et al. 2014)	4,089,393	acres
Swamp	464,805 (11.4)	acres (%)
Fresh Marsh	956,617 (23.4)	acres (%)
Intermediate Marsh	940,592 (23.0)	acres (%)
Brackish Marsh	997,437 (24.4)	acres (%)
Salt Marsh	729,942 (17.8)	acres (%)
Estuaries and Coast (USGS-NGP 2019b)		
Estuary area	5,005	sq. miles
Coastline (line between open sea and land)	2,410	sq. miles
Shoreline (includes islands, bays, rivers, and bayous up to head of tidewater) (NOAA-Office for Coastal Management[5] n.d.)	7,721	sq. miles

Footnotes for Table 2.1.1.

1. The NHD dataset was exported from the USGS National Map Downloader (USGS 2019a; USGS-NGP 2019b). River miles were summarized using ArcMap 10.5.1 "Summarize" tool on the NHD Flowline FCode field (i.e., codes 33600-Canal/Ditch, 33601-Canal/Ditch Aqueduct, 46000-Stream/River, 46003-Stream/River Intermediate, and 46006-Stream/River Perennial). The summary statistic tool calculated the total length of each FCode in miles. The NHD Area polygon layer and the "Select by Location" query tool retrieved the missing attributes (e.g., perennial, canal/ditch) of the Artificial Paths (FCode 55800); the Artificial Paths were set as the target layer, and the NHD Area polygon was set as the source layer. The "use selected features" option was applied to each NHD Area FCode type (33600, 336001, 4600, 46003, 46006). The spatial method was set as "are within source layer feature" with no search distance applied. For the total miles, the Artificial Paths tables were summarized on the FCode field following the same method as the Flowlines. The Flowlines in the calculation may extend 150 m from the LDOTD state boundary file (using "Buffer" tool on the state boundary and "Clip" tool on original NHD dataset) in order to reduce clipping breaks in the Flowline miles near the state boundary (e.g., Sabine River). Edits were performed in North American Datum 1983 (NAD 83) and projected in Universal Transverse Mercator (UTM) Zone 15.
2. The border river miles were calculated by querying the NHD Flowline dataset on the GNIS Name field for "Pearl River," "Mississippi River," and "Sabine River." The queried Flowlines were then edited to include only lines along the state border—the LDOTD boundary shapefile and the ArcMap 10.5.1 "Split" tool were used in this step. For the Pearl River, the northern split was placed at 31.0019, -89.7525 and the Flowline terminated at Lake Borgne. For the Mississippi Flowlines, 135 records were returned after placing the northern split at 33.0043, -91.1714 and the southern split at 31.0008, -91.6361. For the Sabine River, 329 records were extracted when placing the northern split at 31.9994, -94.0429 and the southern split at 29.9904, -93.7893, which is north of Sabine lake. The miles were summarized for each river's attribute table using the "Summarize" tool on the FCode field. Data was in NAD 1983 and projected in UTM Zone 15 for all edits and calculations.
3. Lakes were selected from the NHD Water Body feature class using the Lake/Pond and Reservoir feature types (FTypes 390 and 436), and lakes were further refined to include relevant FCodes (i.e., 39004, 39009, 39010, 39011, 43600) that generally represent perennial, non-industrial water bodies. Each FCode was reviewed for accuracy using National Agriculture Imagery Program (NAIP) 2015/2017 imagery, and any records found incorrectly attributed were removed (e.g., a sewage-treatment labeled as perennial, a lake on dry land, agricultural fields). Only water bodies with an area greater than or equal to 10 acres were selected in the final calculation as with prior LDEQ lake selection methods (LDEQ 2019a). The clipping tool was used to extract the inland and coastal zone estimates from the NHD Water Body layer. The inland zone was created with the "erase" tool using the coastal zone as the input feature. Calculations were performed in NAD 83, projected in UTM Zone 15.
4. Wetland area was calculated from the 2019 National Land Cover Database (NLCD) raster dataset and includes the Woody Wetland (value 90) and Emergent/Herbaceous Wetland (value 95) classes (USGS 2021, Yang et al. 2018). The acreage was estimated from the pixel count using the appropriate conversion factor of 0.2223945 (i.e., one 900 m^2 pixel is multiplied by the ratio of 0.000247105 acres per 1 m^2; or Acreage = 1 pixel x 0.2223945). The clipping tool was used to extract the inland and coastal zone estimates from the raster with acreage recalculated. The inland zone was created with the "erase" tool using the coastal zone as the input feature. Calculations were performed in NAD 83, projected in UTM Zone 15.
5. National Oceanographic and Atmospheric Administration-Office of Coastal Management

Other Resources

Land Cover

Land cover, or the physical land type of an area, can be used to characterize and monitor Louisiana's resources through time. An area's land cover can be identified through the analysis of satellite imagery and ground-truth data. The United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) provides the Cropland Data Layer (CDL), an annually updated crop-specific dataset that utilizes the National Land Cover Database (NLCD) for non-agriculture classes (USDA NASS 2021). The 2020 CDL for Louisiana was queried through the CropScape web service to retrieve the approximate acreage totals for each land cover category (USDA NASS n.d. (a)). Table 2.1.2 displays an approximate percent by land cover category for CDL 2020 (utilizing NLCD 2016 for non-agriculture categories). These percentages were calculated in Excel after defining Louisiana as the area of interest and exporting the statistics table; however, official commodity estimates are available through NASS Quick Stats (USDA NASS n.d. (b)).

Table 2.1.2

The approximate percent by 2020 Cropland Data Layer category for Louisiana land cover classes summarized from CropScape (USDA NASS n.d. (a)).

Category	Percent
Woody Wetlands	24
Evergreen Forest	22
Herbaceous Wetlands	11
Open Water	9
Developed	7
Grass/Pasture	7
Soybeans	4
Corn	2
Sugarcane	2
Rice	2
Fallow/Idle Cropland	2
Mixed Forest	1
Deciduous Forest	1
Aquaculture	1
Other Hay/Non Alfalfa	1
Cotton	1
Other Crops[1]	<1

1. Alfalfa, Blueberries, Cabbage, Citrus, Clover/ Wildflowers, Double Crops (i.e., Corn, Cotton, Oats, Soybeans, Winter Wheat), Millet, Oats, Peaches, Peanuts, Peas, Pecans, Rye, Sod/Grass Seed, Sorghum, Strawberries, Sunflowers, Sweet Corn, Sweet Potatoes, Winter Wheat

Chapter 2: Water Pollution Control Program

Watershed Approach

LDEQ reports on water quality in the state by basin subsegment. Subsegments are smaller watersheds or portions of watersheds within the 12 larger basins of the state. Louisiana is divided into 12 major watershed basins (Figure 2.1.1), and each basin is further divided into water body subsegments. This subsegment approach divides the state's waters into discrete hydrologic units. The plan for this approach was presented in the 1978 Water Quality Management Plan and underwent a major revision in 1985 to increase hydrologic consistency within each named subsegment. The final draft of the Louisiana Basin and Subsegment Boundaries plan was completed in 1990 and is reviewed periodically to ensure that subsegments are distinct and consistent representations of the state's hydrology. The current version, Volume 4 (LDEQ 2021a), was completed in November 2021. The water body subsegment system within each watershed basin provides a workable framework for evaluation of the state's waters. Subsegments are periodically added or removed as water quality standards related to a subsegment or group of subsegments are revised. Adding or removing subsegments requires detailed analysis and justification prior to revision in LAC 33:IX.1123.

Water Quality Standards Program

Louisiana's water quality standards are the foundation of LDEQ's water quality management and pollution control programs. Water quality standards are based on national goals outlined in the CWA (formally referred to as the 1972 Federal Water Pollution Control Act), Sections 101 and 102, and are authorized by §303 of the CWA and subsequent amendments, the Louisiana Water Control Law (Title 30, Chapter 4 of Louisiana's revised statutes), and the supporting federal regulations found in Title 40, Part 131 of the Code of Federal Regulations (40 CFR 131). Louisiana's water quality standards are adopted as state regulations applicable to surface waters of the state and are contained in Title 33 of the LAC, Part IX, Chapter 11 (LAC 33:IX.1101 et seq., as amended). The water quality standards provide the basis for implementing the state's CWA programs, including water quality assessments and TMDL determinations outlined in the CWA, Sections 303(d) and 305(b), water discharge permitting conducted in conformance with Section 402, NPS pollution management strategies conducted under §319, and certification of federal activities in state waters as outlined in §401.

The minimum federal regulatory requirements for state water quality standards (40 CFR 131.6) are: (1) the designation of uses consistent with the CWA; (2) the methods and analyses used to revise standards; (3) criteria sufficient to support the designated uses; (4) an antidegradation policy; (5) certification by the appropriate state legal authority that water quality standards revisions are adopted in accordance with state law; and (6) general information concerning the acceptability of the scientific basis for standards and policies not covered under the CWA (e.g., variances).

Designated Uses and Water Quality Criteria

Section 101 of the CWA outlines a national goal of water quality that provides for the protection and propagation of fish, shellfish, and wildlife, provides for recreation in and on the water, and

prohibits the discharge of toxic pollutants in toxic amounts. Section 102 of the CWA further outlines that water quality protection programs consider the use of waters for public water supply, agricultural, industrial, and other purposes, including navigation. These goals are also outlined in the federal regulations (40 CFR 131.2).

To achieve the national goals, all Louisiana water bodies were originally assigned or designated uses consistent with CWA mandates that were applied statewide. Criteria to support these designated uses were also assigned statewide in response to federal regulations promulgated to achieve CWA goals. The designated uses adopted for Louisiana's surface waters are: primary contact recreation; secondary contact recreation; fish and wildlife propagation (including a subcategory for limited aquatic life and wildlife); drinking water supply; oyster propagation; agriculture; and outstanding natural resource waters (LAC 33:IX.1111.A).

These uses, along with the total size for each use and water body type combination are shown in Table 2.2.1. Total water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems. Designated uses are established in LAC 33:IX.1123 et seq. The sizes found in Table 2.2.1 are not reflective of the total size for water bodies listed in the Table 2.1.1, above. Rather, these sizes are only for the named water bodies listed as "subsegments" in LAC 33:IX.1123 et seq. Subsegments are watersheds or portions of watersheds delineated as management units for water quality standards, monitoring, assessment, modeling, permitting, surveying, and enforcement purposes.

Table 2.2.1

Total sizes[1] of Louisiana water bodies classified for various designated uses (Louisiana Environmental Regulatory Code 33:IX.1123).

	Water Body Type			
Classified Uses	**Rivers (miles)**	**Lakes (acres)**	**Estuaries (sq. miles)**	**Wetlands (acres)**
Primary Contact Recreation	9,481.2	572,228.5	6,042.7	941,338.9
Secondary Contact Recreation	9,642.4	572,228.5	6,042.7	977,701.3
Fish and Wildlife Propagation	9,550.9	572,228.5	6,042.7	977,701.3
Drinking Water Supply	1,090.7	243,789.2	-0-	356,046.1
Outstanding Natural Resource Waters	1,710.0	28.9	-0-	-0-
Oyster Propagation	597.2	-0-	5,317.5	72,518.7
Agriculture	2,088.7	345,248.9	-0-	-0-
Limited Aquatic Life and Wildlife Use	91.4	-0-	-0-	-0-

1. Total water body sizes are different from those found in prior Integrated Reports due to changes in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

Water quality criteria are elements of state water quality standards expressed as constituent concentrations, levels, or narrative statements representing the quality of water protective of the designated use(s). Louisiana adopted general (narrative) and numeric criteria to protect the designated uses of state waters (LAC 33:IX.1113). General criteria are expressed in a narrative form and include descriptions for aesthetics, color, suspended solids, taste and odor, toxic substances, oil and grease, foam, nutrients, turbidity, flow, radioactive materials, and biological and aquatic community integrity. Numeric criteria are generally expressed as concentrations (e.g.,

weight measured per liter) or scientific units and include pH, chlorides, sulfates, total dissolved solids, dissolved oxygen, temperature, bacteria, and specific toxic substances. USEPA publishes guidance or national criteria recommendations for a number of substances, and a state may incorporate these without modification into its water quality standards.

Human health criteria provide guidelines that specify the potential risk of adverse effects to humans due to substances in the water. Factors considered include body weight, risk level, fish consumption, drinking water intake, and incidental ingestion while swimming. Categories of criteria are then developed for each toxic substance for drinking water supplies and non-drinking water. Primary and secondary contact recreation exposures are protected under both drinking water supplies and non-drinking water criteria.

Aquatic life criteria are designed to protect fish and wildlife propagation use, including plants and animals. There are two types of criteria: "acute" for short-term exposure, and "chronic" for long-term exposure. Separate criteria are also developed for fresh and salt waters. Listings of specific toxic criteria for protection of human health and aquatic life for Louisiana are found in LAC 33:IX.1113.C.6.Table 1.

The development of national aquatic life and human health criteria is a dynamic process that takes into consideration the most recent and best defensible, scientific information available. Since the establishment of designated uses and criteria based on national goals, state and federal agencies have recognized the need to establish site-specific or regional standards that may account for a state's unique water quality. A state may make a determination on whether the designated uses are attainable. A designated use that is not an existing use may be removed, if it is demonstrated through a Use Attainability Analysis (UAA) that the designated use is not feasible due to one or more of the following reasons (LAC 33:IX.1109.B.3):

- Naturally occurring pollutant concentrations prevent the attainment of the use.
- Natural, ephemeral, intermittent, or low flow conditions prevent the attainment of the use.
- Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place.
- Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the original conditions.
- Physical conditions related to the natural features of the water body (e.g., proper substrate) preclude attainment of aquatic life use protection.
- Controls more stringent than those required by §301(b) or §306 of the CWA would result in substantial and widespread economic and social impact.

According to the regulations, a UAA is defined as "a structured scientific assessment of the factors (chemical, physical, biological, and economic) affecting the attainment of designated water uses in a water body." (see also LAC 33:IX.1105 and 40 CFR 131.3(g)). The UAA process entails the methodical collection of data that is scientifically analyzed, summarized, and used to make recommendations for site-specific uses, and the criteria to support the uses. Acceptable methods used in conducting the UAA process are described in USEPA guidance documents. Several water bodies in Louisiana have site-specific criteria and uses based on UAAs developed in coordination with USEPA (see endnotes in LAC 33.IX.1123.Table 3).

Additionally, a state may determine that, while all original designated uses may be supported, the water quality criteria adopted to protect those uses may not be appropriate. In such instances, a state may compile technical documentation to justify a criteria refinement while not conducting a comprehensive UAA. A state is allowed the flexibility to develop, adopt, and implement state-specific criteria provided there is sufficient justification and technical documentation to support the criteria refinements.

Technical support documentation and/or UAAs for site-specific criteria and/or uses may be developed for a specific water body, water body type (e.g., wetlands), ecological region (ecoregion), or watershed. LDEQ recently used an ecoregion and "least-impacted" reference water body approach to establish water quality criteria within an ecoregion. Ecoregions are management units which are spatially grouped ecological regions with similar physical, chemical, and biological characteristics.

Methods and Analyses Used to Revise Standards

Section 303(c)(1) of the CWA requires a state to hold public hearings at least once every three years for the purpose of reviewing its water quality standards and to revise or adopt standards as needed. The CWA also requires USEPA to ensure that a state's standards are consistent with the CWA.

Louisiana's Surface Water Quality Standards provide that "standards are not fixed for all time, but are subject to future revision…" (LAC 33:IX.1109.I). Revisions to the water quality standards occur routinely as new data and information become available. Water quality standards are reviewed to ensure criteria remain protective of existing conditions and uses and for future water quality management goals.

Part of the review process includes an assessment of the state's numeric water quality criteria for toxic pollutants and the occurrence of toxic pollutants in state waters. Technical sources of information are reviewed in order to establish the appropriate criteria for pollutants. The review takes into consideration many factors, including the state's current water quality condition, designated uses, violation summaries, wastewater discharge summaries, Toxics Release Inventory data, survey data, and other pertinent information. LDEQ has adopted numeric water quality criteria for toxic pollutants based on known or suspected occurrences of the substances in Louisiana waters and potential threat to attainment of designated uses.

Based on LDEQ's review of the existing water quality standards, recent USEPA guidance and policies, and public comments, revisions may include, but are not limited to

- New toxics or other criteria;
- Modifications to designated uses;
- Subsegment delineations and/or description revisions (e.g., corrections and changes);
- Clarifications to regulatory language; and
- Updates to water quality policies.

The water quality standards revision process involves procedures for thorough technical review of USEPA-recommended policy and criteria, review by state and federal agencies and the public, final approval by USEPA, promulgation of the revisions into regulations, and certification by the state legal authority (see section on Certification of Standards by State Legal Authority, below) that the standards revision and regulation development process meets all applicable state laws and regulations.

Nutrient Standards Development

Louisiana continues to work with USEPA to collect information that will inform nutrient criteria development and implementation. USEPA recognizes that "one size fits all" nutrient criteria are not appropriate and recommends that each state's nutrient criteria be water body-specific (e.g., lakes, rivers and streams, estuaries, etc.) and applicable within an appropriate ecoregional framework. Louisiana has prioritized inland water bodies with projects in inland rivers and streams, lakes, and reservoirs.

USEPA guidance documents released over the past two decades have outlined approaches to setting nutrient criteria, including alternatives to numeric criteria. In November 2001, USEPA issued guidance in the form of a memorandum that clarified the flexibility that states have in development of defensible nutrient criteria. USEPA is also supportive of using translators for states' narrative nutrient criteria. LDEQ has been using the available guidance in an effort to use stressor-response studies to derive protective nutrient levels. The results from the stressor response studies will be used to develop decision trees and protocols for assessment of possible nutrient impairment.

In May 2016, the department completed the report, *Detecting Nutrient Thresholds for Aquatic Life in Louisiana Inland Rivers and Streams* (LDEQ 2016a). LDEQ collected habitat, water quality (including nutrients), macroinvertebrate, fish, and algal data along a gradient of nutrient impacts from 60 sites within the South Central Plains Flatwoods (SCPF), South Central Plains Southern Tertiary Uplands (SCPSTU), South Central Plains Tertiary Uplands (SCPTU), Terrace Uplands (TU), and the Upper Mississippi River Alluvial Plains (UMRAP) Ecoregions. A piecewise regression model was used to evaluate stressor-response relationships for total nitrogen (TN) and total phosphorus (TP) as stressors with water quality and biological response metrics to determine if change points or thresholds for TN and TP could be detected. Approximately 3,600 biological metrics were calculated and the analyses used resulted in 141 total thresholds detected within the five inland ecoregions.

LDEQ is working to use the findings from this threshold report in combination with the Ambient Water Quality Monitoring Network (AWQMN) and reference site data to develop scientifically defensible nutrient translators for assessment of nutrient impairment in Louisiana inland rivers and streams. A Quality Assurance Project Plan (QAPP 2076) entitled "Development of Translators for Assessment of Narrative Nutrient Criteria in Louisiana Inland Rivers and Streams" was developed and approved by the USEPA on December 21, 2018 (LDEQ 2018). The QAPP details methods to use results from the threshold report to develop a decision tree for assessment of nutrient impairment in inland rivers and streams. A draft report of this work is expected to be delivered to USEPA in 2022.

LDEQ also developed QAPP 3070 for the "Investigation of Biological Nutrient Thresholds in Louisiana Inland Lakes," which was approved by the USEPA on June 13, 2019 (LDEQ 2019a). Between June 2019 and September 2021, LDEQ sampled all 48 lakes that were included in the project. This project used many of the same methods as the USEPA National Lakes Assessment studies in an effort to expand upon and utilize those data sets. LDEQ collected water quality data including nutrients, physical data, and biological data including fish, macroinvertebrates, periphyton, and zooplankton. Data and document management for the inland lakes nutrient stressor response study are ongoing.

LDEQ also continues to inform and seek input from stakeholders about nutrient management for Louisiana's water bodies through implementation of the state's multi-agency Louisiana Nutrient Reduction and Management Strategy (LDEQ 2021b). LDEQ is currently an active member on USEPA's Hypoxia Task Force and participates in Gulf of Mexico Alliance activities.

Ecoregional Dissolved Oxygen Standards Refinement

Appropriate levels of oxygen in water bodies are necessary for the respiration of aquatic life. Although a primary constituent of water, the oxygen contained in a water molecule is unavailable to biota due to chemical bonding; it must be present in its dissolved atmospheric form (O_2) to be of use. The amount of DO that is needed can vary among organisms, their associated habitats, ecosystems, and regions. The concentration of DO present in a water body depends on atmospheric and photosynthetic inputs, metabolism of aquatic biota, physical processes, and environmental variables.

When adopting or revising water quality criteria to establish or reflect site-specific conditions, a determination of attainable uses and criteria for a specific water body may be based on comparisons made between the water body of interest and a "least-impacted" control or "reference" water body (USEPA 1983), or on the basis of natural background conditions of reference water bodies (USEPA 1997). These reference water bodies reside in watersheds (topographic boundaries of various sizes delineating surface water drainage) which, depending on size, may be contained within an ecoregion (areas with similar ecological characteristics that may be used for management) (Omernik and Bailey 1997). Because of the similarity and homogeneity of ecological characteristics such as climate, land use, soil type, land surface form, flora, fauna and hydromodification within an ecoregion, watersheds located within the same ecoregion may be managed on an ecoregional level (Omernik 1987; Omernik and Bailey 1997). Specifically, the ecoregion-based approach may be used to develop regional or even site-specific water quality criteria, management strategies, and implementation plans for water resources (Gallant et al. 1989).

With the support of USEPA, LDEQ has used least-impacted reference sites and an ecoregional approach to refine appropriate DO criteria on a more regional basis in Louisiana (LDEQ 1996 and 2008a). Using this approach, criteria for the different water body types (e.g., streams, lakes, bays, canals, etc.) will be established while accounting for the natural characteristics of Louisiana's ecoregions.

In 2009, LDEQ adopted revised DO criteria on an ecoregional basis for several water body types throughout the Barataria and Terrebonne Basins (LDEQ 2008b). This DO criteria refinement resulted from the *Use Attainability Analysis of Barataria and Terrebonne Basins for Revision of Dissolved Oxygen Water Quality Criteria*, commonly referred to as the BT UAA (LDEQ 2008b).

In 2015, LDEQ refined DO criteria on an ecoregional basis with the *Use Attainability Analysis of Inland Rivers and Streams in the Eastern Lower Mississippi River Alluvial Plains Ecoregion for Review of Dissolved Oxygen Water Quality Criteria* (i.e., the eastern Lower Mississippi River Alluvial Plains (LMRAP) UAA) (LDEQ 2013). The eastern LMRAP Ecoregion study re-evaluated the DO criteria and the critical period in the eastern portion of the LMRAP Ecoregion (on the eastern side of the Mississippi River) by using a qualitative and quantitative ecological comparison with the western portion of the LMRAP Ecoregion (west of the Mississippi River). The western LMRAP DO criteria and critical period refinements had already been well established through the BT UAA. In December 2015, based on the findings presented in the eastern LMRAP

UAA, the DO criteria was revised for 31 subsegments in the eastern LMRAP Ecoregion. Similar to the BT UAA, the DO criteria for those 31 subsegments in the eastern LMRAP Ecoregion was set at 2.3 mg/L DO from March through November and 5.0 mg/L DO from December through February (LDEQ 2013). Water quality assessments based on the eastern LMRAP Ecoregion DO criteria were originally incorporated in the 2018 IR. However, due to litigation against USEPA, those assessments were deferred back to the 2016 IR assessments (pre-eastern LMRAP Ecoregion DO criteria) in USEPA's final decision document for the 2018 IR (USEPA 2019a). As a result of the litigation and USEPA's deferal for the 2018 IR, the original, pre-eastern LMRAP Ecoregion DO criteria were used for the 2022 IR.

The department is continuing the effort to re-evaluate and establish more regionally appropriate DO criteria in Louisiana water bodies with the *Evaluation of Dissolved Oxygen in Inland Rivers and Streams within Louisiana's Southern Plains Terrace and Flatwoods (SPTF) Ecoregion* (LDEQ 2019b). LDEQ collected continuous monitoring water quality data, habitat assessments, and fish sampling at several least-impacted reference streams in the SPTF Ecoregion. The SPTF ecoregion spans the Florida Parishes (i.e., East Baton Rouge, Livingston, Tangipahoa, and St. Tammany) and is characterized as a transitional area with moderate relief and slope between the lower elevation LMRAP Ecoregion to the south and the higher elevation Terrace Uplands Ecoregion to the north (LDEQ 2014). The current criteria for this freshwater inland area is 5 mg/L based on EPA's national recommendations. LDEQ will evaluate the findings to determine the appropriate criteria to support the fish and wildlife propagation designated use for this ecoregion.

Coastal Dissolved Oxygen Criteria Refinement

The LDEQ sets DO criteria to ensure protection of aquatic biota at all life stages via the fish and wildlife propagation use designation in accordance with §303(c) of the CWA. State wide criteria for DO in Louisiana which were set forth in 1972 via a memo from the USEPA, were augmented with the publication of "*The Gold Book*" in 1986, and consist of minimum values of 5 mg/L for fresh and coastal marine waters and 4 mg/L for estuaries (USEPA memo Busch to Lafleur 1972; *Quality Criteria for Water*, EPA 440/5-86-001, The Gold Book, (USEPA 1986); LAC 33:IX.1113.C.3). At the outset, Louisiana voiced that many of its waterways had natural deviations from the recommended national criteria, and has continuously revised and promulgated new DO criteria though extensive processes. The majority of marine and estuarine waters are, however, still defined by water quality criteria recommendations from over 40 years ago.

In an effort to update and refine DO criteria to reflect conditions present in Louisiana coastal waters, the LDEQ has evaluated USEPA and other state/regional approaches. New scientific methods and information, history of impairments, water quality data from various sources, and physical and environmental dynamics that may limit oxygen availability have been evaluated. Three coastal subsegments, LA120801_00, LA021102_00, and LA070601_00, are under consideration for DO criteria revision. These estuarine and marine waters will be addressed together as coastal waters. Major study components have included the following:

- Approach determination for the development of revised coastal DO criteria: (a) laboratory generated concentration limits based on the acute, chronic, and recruitment sensitivity of select organisms to dissolved oxygen concentrations; and (b) the use of natural conditions in un-impacted or least impacted locations to set appropriate criteria. Both of these procedures have been assessed, and the use of laboratory-defined concentrations have been determined to be most suitable for state coastal waters,

primarily due to limited availability of least impacted conditions (mainly in the Mississippi and Atchafalaya river basins) and available resources.

- Historic DO impairments of Louisiana's coastal waters were reviewed for 14 years of data in relation to salinity regimes, TMDLs, and suspected natural conditions. The presence of these impairments in relation to potential revised criteria (non-stratified waters), the impact of promulgation of new criteria, and the effect on anti-degradation policy are under consideration.
- The conceptual approach to criteria revision was submitted to USEPA on October 31, 2016 (LDEQ 2016b) under a document entitled *Conceptual Approach to Revise Dissolved Oxygen Criteria in Louisiana's Stratified Coastal Waters*.
- Various chapters necessary for the revision document have been completed concerning geologically historic hypoxia, LDEQ study(s), conceptual diagrams, as well as QAPP development and updates necessary for project completion.
- An integrated approach, utilizing focal species, life history parameters, USEPA methodology, and laboratory and field DO sensitivity values is under development to determine protective DO criteria for these three subsegments. A potential ecological component for criteria endpoints is under evaluation. And long-term data analyses concerning nearshore shelf hypoxia in these subsegments is underway.

As a part of this study, three ambient water quality monitoring site locations (LDEQ Site Numbers 0962, 0927, and 1092) now undergo profile sampling in addition to the typical 1 m depth used in the AWQMN program within the coastal subsegments. Sampling time and procedures (with the exception of profile sampling and the addition of new parameters) follow AWQMN procedures. These data are collected under the Coastal Ambient Pilot Project and are used for assessment purposes as well as to inform conditions present in Louisiana's nearshore coastal environment.

For 2022 IR assessment purposes DO, pH, and temperature data were analyzed using the routine criterion assessment procedure outlined in Table 3.2.2. Based on the data collected for this project, DO in LA120806_00 was reported as impaired for FWP in the 2022 IR assessment. All other parameters were fully supported.

Coastal Recreation Criteria

The CWA, as amended by the Beaches Environmental Assessment and Coastal Health (BEACH) Act in 2000, requires each state having coastal recreation waters to adopt and submit to the USEPA water quality criteria for those pathogens and pathogen indicators for which USEPA has published criteria under CWA §304(a). Coastal recreation waters are defined as: (1) the Great Lakes; and (2) marine coastal waters (including coastal estuaries) that are designated under CWA §303(c) by a state for use for swimming, bathing, surfing, or similar water contact activities (USEPA 2000). Louisiana has marine coastal waters that are designated as primary contact recreation (i.e., swimming) waters; therefore, Louisiana is bound by the requirements of the BEACH Act.

Previous to the 2000 BEACH Act, USEPA had published recommended enterococci pathogen criteria for protection of marine recreational waters in 1986. At that time, Louisiana did not adopt the updated pathogen criteria based on the 1986 recommendations, which resulted in USEPA promulgating coastal pathogen criteria for Louisiana, and 20 other states, in 2004 (USEPA 2004). Pursuant to the BEACH Act, USEPA updated pathogen criteria to protect recreational waters and published the updated recommendations in December 2012 (USEPA 2012), which again required Louisiana to adopt the use of the updated enterococci criteria in marine coastal waters or risk

promulgation of federal criteria by the USEPA. On May 20, 2016 LDEQ adopted enterococci criteria for its coastal marine and estuarine recreation waters. The adoption of enterococci criteria provides for: (1) an expanded definition of illness; (2) the ability to capture more pathogens in the testing methods; and (3) the use of a multi-criteria system when and where fecal coliform criteria still apply. Each one of these factors, together or on its own, provides for an improved public health protection monitoring program. Beginning with the 2018 IR, coastal marine and estuarine enterococci criteria, where required, have been applied using enterococci data obtained by LDEQ and in some cases the Louisiana Department of Health (LDH).

Triennial Review

The CWA and federal regulations require that states hold public hearings at least once every three years to review applicable surface water quality standards and, as appropriate, adopt new or modified standards, taking into consideration public concerns, USEPA guidance, and new scientific and technical information. This process is called a *triennial review*. The triennial review also provides an opportunity to discuss the priorities and commitments the agency makes with USEPA and others regarding surface water quality standards.

Louisiana's Water Quality Standards (WQS) can be found in LAC 33:IX.Chapter 11. A triennial review is conducted to evaluate the need to update or revise the WQS in order to remain consistent with state and federal law. The review will also ensure that Louisiana's WQS continue to reflect the best available science and support sound water quality management policies to improve and protect the water resources of the state.

The triennial review began on January 20, 2016 with a potpourri notice in the *Louisiana Register* announcing the review and soliciting comments on the WQS. A public hearing was held on March 30, 2016 to solicit oral comments. Written comments were received from the public and within LDEQ. After the comment period closed on March 30, 2016, all comments were reviewed, summarized, prioritized and responses were developed based on the needs of the department, resources available, and staffing and time constraints. A Report of Findings from the 2016 Triennial Review was submitted to the USEPA-Region 6 on March 9, 2017 (LDEQ 2017). Additionally, the LDEQ drafted a summary of all CWA §304(a) criteria recommendations for the 2016 Triennial Review on November 22, 2019. The results of these triennial review efforts were developed into a rule (WQ097). The final rule for WQ097 was published in the November 2020 edition of the *Louisiana Register* (Louisiana Register 2020) and approved by USEPA on January 28, 2021. The next cycle of the triennial review was initiated on March 20, 2021.

Minerals Criteria Review

Louisiana's numeric water quality criteria for minerals, specifically chloride, sulfate and TDS, were last revised in 1994. Other than the site-specific UAAs that have demonstrated minerals levels are protective of designated uses, LDEQ's minerals criteria were not established with a direct connection to support a particular designated use. Therefore, LDEQ began a review of the numeric water quality criteria for minerals. A detailed report reviewing the minerals criteria was completed in March 2016 (LDEQ 2016c). The purpose of this report was to: (1) compile a comprehensive dataset of minerals-related water quality parameters from several LDEQ projects; (2) establish a range of mineral ion components in state waters; and (3) provide a foundation for future minerals-related water quality standards development.

The LDEQ is evaluating WQS development for chloride and sulfate. In July 2019, LDEQ contracted with the USGS-Columbia Environmental Research Center to conduct a toxicity study in accordance with USEPAs *Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses*. This study was developed to consider chloride and sulfate toxicity in water quality conditions typical to Louisiana, particularly low hardness which affect toxicity. Results of this study are expected in 2022.

Turbidity Criteria Review

The turbidity criteria have two main components; narrative criteria (LAC 33:IX.1113.B.9.a), and numeric criteria (LAC 33:IX.1113.B.9.b.i-vi). The current numeric criteria for turbidity in Louisiana have remained the same since 1984. Smaller freshwater rivers and streams are not included amongst the major habitat types listed in the criteria. Multiple watersheds with impairments for total suspended solids (TSS), sedimentation, or turbidity have had TMDLs completed since 1984. The status of these impairments and TMDLs are difficult to interpret when subsegments do not have numeric criteria for turbidity, specifically smaller freshwater streams and rivers.

A study was initiated in 2020 (LDEQ 2020a) to review existing turbidity data and supporting information to determine methods for developing appropriate numeric turbidity criteria for select water bodies in Louisiana. The study initially focused on subsegments without numeric criteria, and it has evolved to also consider revisions of existing numeric criteria where changes are appropriate. LDEQ evaluated using TMDL targets as numeric criteria and determined some TMDL targets are appropriate as criteria but most are not. Methods are being evaulated using literature and available data to determine appropriate turbidity criteria to protect Fish and Wildlife Propagation and Outstanding Natural Resource designated uses.

Antidegradation Policies

The CWA and federal regulations require all states to have an antidegradation policy and to identify the methods for implementing the policy (40 CFR. 131.12). Louisiana's Antidegradation Policy (the Policy) and Implementation Plan (the Plan) are contained in the Surface Water Quality Standards (LAC 33:IX.1109.A and 1119). The Policy and Plan provide the basis for the protection of state waters from activities that may cause degradation of the water quality and impairment of the existing and designated uses. The Antidegradation Policy and Implementation Plan have been approved by USEPA-Region 6 and meet the requirements of the federal regulations. LAC 33:IX.1119 specifies that implementation procedures and methods will be included in the Continuing Planning Process, with additional Water Quality Management Plan documentation developed as needed. LDEQ has been working with USEPA-Region 6 to develop more detailed implementation procedures, in part, to fulfill federal and state regulatory requirements, as well as to provide specific guidance to permit applicants and consolidate all specific procedures related to antidegradation into one document.

Certification of Water Quality Standards by State Legal Authority

In accordance with §303(c) of the CWA and the certification process outlined in 40 CFR 131.21, an official copy of the final regulation, as published in the Louisiana Register, is submitted, by LDEQ's Executive Counsel, to USEPA-Region 6. USEPA will either approve or disapprove the state-adopted water quality standard, and only a USEPA-approved standard is suitable for CWA implementation.

Basis for Standards and Policies Not Covered by the CWA

The Louisiana Water Quality Standards, in addition to meeting minimum federal and state water quality protection requirements, contain standards and policies that are not driven by federal statute or regulation. The additional standards and policies include, but are not limited to: (1) allowance for compliance schedules, variances and short term activity authorizations; (2) classification of non-perennial and other water body types such as manmade water bodies; (3) establishment of critical flows for water quality assessments and permitting activities; (4) allowance of mixing zones for permitted dischargers; and (5) implementation policies and procedures for general criteria.

Water Quality Monitoring and Assessment Program

LDEQ conducts extensive surface and groundwater sampling throughout Louisiana in order to obtain information regarding the quality of Louisiana's surface water and groundwater resources. Data obtained from this program is used to develop reports, including the *2022 Water Quality Inventory: Integrated Report*, in order to inform the public, state agencies, and federal agencies about the quality of Louisiana water. More information on this program can be found in Part III of this report.

Point Source Control Program

Introduction

Louisiana's water pollution control program is carried out primarily by LDEQ. LDEQ operates to preserve the integrity of Louisiana's waters through the use of various point source and NPS programs. All offices within LDEQ have some responsibility for implementing water pollution control programs. These offices include the Office of the Secretary (regulatory development), the Office of Management and Finance (grants and contracts, information services, clean water state revolving fund), the Office of Environmental Services (OES) (municipal and industrial wastewater discharge permitting, and water quality certification program), the Office of Environmental Assessment (water quality standards, water quality assessment, nonpoint source program, TMDL development), and the Office of Environmental Compliance (OEC) (surveillance and enforcement of permit requirements and pollution control regulations, investigation of complaints and spills). An overview of LDEQ's organizational structure for all activities can be found at: http://deq.louisiana.gov/page/org-charts. The following sections address various facets and recent activities of the point source water pollution control program.

Clean Water State Revolving Fund Program

The Clean Water State Revolving Fund (CWSRF) Program provides financial assistance for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities. Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A new authority was created, allowing USEPA to make grants to capitalize State Water Pollution Control Revolving Funds. On the state level this authority is granted by, R.S. 30:2011(D)(4), and R.S. 30:2301-2306 (Act 296 of the 2010 Regular Session of the Louisiana legislature). This statute established a state revolving loan fund capitalized by federal grants (Capitalization Grants for

CWSRF, Catalog of Federal Domestic Assistance (CFDA) 66:458), by state funds when required or available, and by any other funds generated by the operation of the clean water revolving loan fund. Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full. After a two-year construction period, loan recipients begin repayment of principal to LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of June 2021, USEPA, through LDEQ, has awarded $537,011,923 in fund capitalization grants to Louisiana. With the required 20% state match of $98,783,105, less 4% for administration fees, there is a total of $517,239,702 that has been made available for loans to communities. In addition, a total of $682,521,923 of repaid "recycled" loan monies has been made available for loans.

As of June 2021, 265 loans to communities totaling $1,192,682,887.12 have been closed utilizing USEPA grants, state match, and recycled payments from previous loans. Another 19 borrowers have been awarded funding for loans totaling $177,416,000. For more information on the Clean Water State Revolving Fund refer to: http://www.deq.louisiana.gov/CWSRF.

Water Discharge Permits

Water discharge permits are official authorizations developed and issued by the OES of LDEQ. The Louisiana Pollutant Discharge Elimination System (LPDES) permit establishes the effluent limitations and conditions for wastewaters discharged into waters of the state. The permitting process allows the state to control the amounts and types of wastewaters discharged into its surface waters. A permit is required for the discharge of pollutants from any point source discharge into waters of the state of Louisiana (Table 2.2.2). In 1996, LDEQ assumed responsibility for administering the permitting, compliance, and enforcement activities of the National Pollutant Discharge Elimination System (NPDES) from the USEPA. USEPA retained responsibility for the federal sewage sludge disposal program. More information on LDEQ's water discharge permits program can be found at: http://deq.louisiana.gov/pages/lpdes.

Table 2.2.2

Louisiana Pollutant Discharge Elimination System water discharge permits and modifications issued from October 1, 2016 through September 30, 2020.

State Permit	Number of Permits	Number of Permits (including modifications)
Minor Sanitary	300	309
Major Sanitary	73	79
Minor Industrial	445	478
Major Industrial	83	101
Major MS4[1]	3	5
Stormwater General[2]	2,388	2,390
Non-Stormwater General[3]	1,727	1,948
Totals	**5,019**	**5,310**

1. Major Municipal Separate Storm Sewer System Permits
2. Does not include 7,353 permits re-authorized when master general permits were reissued
3. Does not include 1,623 permits re-authorized when master general permits were reissued

Use or Disposal of Sewage Sludge and Biosolids

Use or disposal options for sewage sludge and biosolids in Louisiana consist of incineration, disposal in a permitted landfill, or treatment of the sewage sludge into biosolids for beneficial use through land application as a soil conditioner and/or crop fertilizer. An alternative is to have sewage sludge pumped out and transported offsite for additional treatment for final use and disposal. Sewage Sludge and Biosolids Use or Disposal Permits are official authorizations developed and issued by the OES of LDEQ. The Sewage Sludge and Biosolids Use or Disposal Permit establishes the monitoring requirements, sampling frequency, operational standards, and recordkeeping for sewage sludge and biosolids that is pumped out and transported offsite for additional treatment for use or disposal, biosolids disposed in a landfill, land application of biosolids, and incineration of biosolids. Effective January 1, 2013, all regulated LPDES-permitted sewage treatment facilities must have applied for or obtained a Sewage Sludge and Biosolids Permit. Transporters of sewage sludge must register annually with LDEQ, comply with the standards for vehicles transporting sewage sludge, maintain accurate records through daily logs and manifests, and submit reports to LDEQ on an annual basis (Table 2.2.3). More information on LDEQ's sewage sludge and biosolids program can be found at: http://www.deq.louisiana.gov/page/sewage-biosolids.

The LDEQ has not yet assumed the Sewage Sludge Management Program from the USEPA; therefore, issuance of coverage does not exempt the individual/company/facility from having to meet the USEPA requirements for the "Standards for the Use or Disposal of Sewage Sludge" at 40 CFR Part 503.

Table 2.2.3

Sewage Sludge and Biosolids Use or Disposal Permits and Modifications Issued from October 1, 2016 through September 30, 2020.

State Permit	Number of Permits	Number of Permits (including modifications)
Individual Commercial Preparer – Out-of-State	11	11
Individual Commercial Preparer – Exceptional Quality	3	3
Individual Commercial Preparer – Class B	4	4
LAJ650000 (Disposal in a Landfill)	29	29
LAJ660000 (Pump Out and Haul Off)[1]	---	---
Totals	**47**	**47**
Sewage Sludge Transporter Registrations[2]	**291**	**291**

1. All LPDES permitted facilities that have a sanitary outfall are automatically covered under the LAJ660000 permit unless a different disposal method for sewage sludge is used. Currently, 6,868 facilities have coverage.
2. Total number of registered transporters as of 9/30/2020.

Surveillance Division Compliance Assurance Inspections

Municipal, industrial, federal, and agricultural point source dischargers are monitored to verify compliance with permitted effluent limitations and compliance schedules. The information derived

from this program can also be applied to the interpretation of state water quality data and can be used as input to water quality plan development (Table 2.2.4).

The types of compliance inspections undertaken by the Surveillance Division (SD) that are reported here include:

- Compliance Evaluation Inspections (CEI): Non-sampling inspections are designed to verify permittee compliance with applicable LPDES permit requirements and compliance schedules.
- Compliance Sampling Inspections (CSI): Samples of the influent and/or effluent are collected and analyzed to determine permit compliance, in addition to the inspection activities performed in the CEIs.

Table 2.2.4

Surveillance Division Water Quality Compliance Inspections[1] performed October 1, 2016 through September 30, 2020.

Inspection Type	Number of Inspections
Compliance Evaluation Inspections	1,794
Compliance Sampling Inspections	9
Total WQ Compliance Inspections	**1,803**

1. Does not include complaint or release/spill-related inspections.

Surveillance Division Incident Investigations

The SD of the OEC received 22,855 Incident Notifications (Complaints or Release/Spills) across all media (air, water, hazardous waste, underground storage tanks, etc.) from October 2016 through September 2020 (Table 2.2.5). Each notification requires an investigation and an incident report. If action is deemed necessary following the initial investigation, the investigator refers the situation to the appropriate division for enforcement action, permit action, or remedial action. The division receives notifications that include reports of oil spills, sewage overflows, bypasses, water permit excursions, chemical spills, fish kills, unusual coloring in a stream, and illegal discharges. Environmental complaints are made to LDEQ's Single Point of Contact (SPOC) at: https://www.deq.louisiana.gov/page/file-a-complaint-report-an-incident. Notifications of emergencies and spill and release notifications are reported to the Louisiana State Police (LSP). LSP then notifies the LDEQ staff person on-call. More information on LDEQ's Surveillance Division can be found at: http://deq.louisiana.gov/page/surveillance.

Table 2.2.5

Surveillance Division incident investigations performed October 1, 2016 through September 30, 2020.

Notification Type	Number of Notifications
Complaint Notifications	12,986
Release/Spill Notifications	10,869
Total Notifications	**22,855**

Surveillance Division Identification of Unpermitted Point Sources

The LDEQ Compliance Monitoring Strategy (LDEQ 2021c) outlines approaches for monitoring permit compliance to aid in addressing potential point source issues. The SD conducts two primary types of inspections. "Water Inspections" are scheduled inspections or routine compliance inspections that are conducted each fiscal year (majors, significant minors, and oil and gas facilities). The SD conducts inspections each year on a percentage of the total number of facilities in the state. "Watershed Based Inspections" are part of a separate project that each region conducts or attempts to conduct each fiscal year. These projects focus on a particular subsegment(s) in each region where inspectors go from business to business looking for unpermitted discharges. From October 1, 2016 through September 30, 2020, the LDEQ Surveillance Division conducted 1,803 Water Inspections within 497 subsegments in Louisiana. Additionally, the LDEQ Surveillance Division performs Watershed Based Inspections under the Compliance Monitoring Strategy to identify nonpoint sources and unpermitted point source dischargers within targeted subsegments. From October 1, 2016 through September 30, 2020, the LDEQ Surveillance Division conducted Watershed Based Inspections in twenty subsegments (Table 2.2.6).

Table 2.2.6

Surveillance Division, Watershed Based Inspection Project results from October 1, 2016 through September 30, 2020.

Subsegment Number	Water Body Segment Description	Inspections	Notice of Deficiency
LA020301_00	Bayou Des Allemands – From US-90 to Lake Salvador	46	20
LA020601_00	Intracoastal Waterway – From Bayou Villars to Mississippi River	298	57
LA030401_00	Calcasieu River – Calcasieu Ship Channel below Moss Lake to the Gulf of Mexico (Estuarine – includes Monkey Island Loop)	39	34
LA030403_00	Black Lake (Estuarine)	28	22
LA030702_00	English Bayou – Headwaters to Calcasieu River	19	12
LA031002_00	Intracoastal Waterway – West Calcasieu River Basin Boundary to Calcasieu Lock (Estuarine)	4	0
LA040914_00	Bayou Cane – From US Hwy 190 to CDM Ecoregion boundary	66	14
LA050601_00	Lacassine Bayou – Charenton Canal to Wax Lake Outlet	13	7
LA060211_00	West Atchafalaya Borrow Pit Canal – From Bayou Courtableau to Henderson; includes Bayou Portage	34	13
LA060501_00	Bayou Teche – Charenton Canal to Wax Lake Outlet	6	3
LA060903_00	Bayou Tigre – From headwaters to Bayou Petite Anse	13	4
LA080604_00	Bayou D'Arbonne Lake	19	19

Table 2.2.6

Surveillance Division, Watershed Based Inspection Project results from October 1, 2016 through September 30, 2020.

Subsegment Number	Water Body Segment Description	Inspections	Notice of Deficiency
LA080903_00	Big Creek – From headwaters to Boeuf River; includes Big Colewa Bayou	5	5
LA080905_00	Turkey Creek - From headwaters to Turkey Creek Cutoff; includes Turkey Creek Cutoff, Big Creek, and Glade Slough	19	19
LA081001_00	Bayou Macon – From Arkansas state line to Tensas River	28	28
LA081203_00	Lake Bruin	4	4
LA100403_00	Cypress Bayou – headwaters to Cypress Bayou Reservoir	1	0
LA110304_00	Sabine Pass (Estuarine)	21	8
LA110602_00	Black Bayou – Intracoastal Waterway to boundary between segments 1103 and 1106 (Estuarine)	18	5
LA120605_00	Bayou Pointe Au Chien – From headwaters to St. Louis Canal	12	4

Water Quality Certification

Water quality certification is an activity of the General and Municipal Permits Section of the Water Permits Division (WPD) in the OES of LDEQ. Certification is required for any federal license or permits that result in a discharge to navigable waters. The certification indicates that any such discharge will not violate water quality standards of the state. Activities that may result in discharges include land clearance, excavating, grading and/or filling for residential and commercial development, oil and gas activities, and municipal infrastructure projects. Section 401 of the CWA requires water quality certification for all §404 permits administered by the U.S. Corps of Engineers and certain federal licenses administered through the Federal Energy Regulatory Commission. From October 1, 2016 through September 30, 2020, 936 water quality certifications for individual permit actions were issued by LDEQ. More information on LDEQ's water quality certification program can be found at: http://deq.louisiana.gov/page/quality-certifications.

Enforcement

The enforcement activities of the LDEQ Water Enforcement Section (WES) are designed to ensure that all possible infringements of water quality standards, rules, and regulations are handled in a rapid and consistent manner (Table 2.2.7 and Table 2.2.8). To prevent pollution of the waters of the state and to ensure remediation in the event of pollution, the WES coordinates its enforcement activities with other sections in LDEQ, especially the WPD in the OES and the SD of the OEC. Field investigations, file reviews, permit noncompliances, and reviews of discharge monitoring reports are all used to initiate enforcement actions. The WES initiates all formal enforcement actions and follows the actions through all appropriate levels to ensure full compliance with state

laws and regulations. LDEQ seeks to provide a clean, healthy environment through protection of the state's water resources by the reduction of pollution, education of the public, and consistent, open, and accountable application of standards, rules, and regulations. More information on LDEQ's WES can be found at: http://deq.louisiana.gov/page/water-enforcement.

Table 2.2.7

Louisiana water quality environmental enforcement actions issued from October 1, 2016 through September 30, 2020.

Enforcement Actions	Number
Notice Of Corrected Violations/ Notice of Violations	47/59
Compliance Orders (CO)[1]	611
Amended Compliance Orders	69
Notice of Potential Penalty (NOPP)	47
Administrative Orders	9
Penalties[2]	259
Settlement Agreements	109[3]
Attended Educational Class (Sanitary Wastewater Assistance Training)	203

1. Includes CO and Consolidated CO/NOPP
2. Includes Penalties and Expedited Penalties (XP)
3. Includes Water and Multi-Media Settlement Agreements that have a water component

Table 2.2.8

Louisiana water quality environmental penalties issued from October 1, 2016 through September 30, 2020.

Penalties	Dollar Value
Penalties Issued	$1,409,624.61
Penalties Paid	$3,619,086.64
Penalties Appealed	6
Cash From Settlement Agreements[1]	$3, 322,284.43
Total Value of BEPs[2]	$1,150,578.00

1. Includes Multi-Media Settlement Agreements
2. Beneficial Environmental Projects

Nonpoint Source Program

Section 319 of the Clean Water Act

Section 319 of the CWA required the governor of each state to develop a Nonpoint Source Assessment Report and an NPS Management Plan to identify NPS pollutants and describe management strategies and a timeline for implementation (USEPA 2022a). In response to this federal law, the Louisiana Legislature passed Revised Statute 30:2011, signed by the governor in 1987 as Act 272. This law directed LDEQ, designated as lead agency for the NPS program, to develop and implement an NPS Management Program. The NPS Management Program was developed to facilitate coordination with appropriate state agencies including, but not limited to LDNR, Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Department of

Agriculture and Forestry (LDAF), and Louisiana State Soil and Water Conservation Commission, in areas pertaining to their respective jurisdictions.

Nonpoint Source Management Program

Section 319(b) required states to prepare an NPS Management Plan, including these elements (all references to sections, subsections, paragraphs, and subparagraphs are from CWA §319):

- An identification of BMPs and measures which will be undertaken to reduce pollutant loadings resulting from each category, subcategory, or particular NPS designated under paragraph (1)(B), taking into account the impact of the practice on groundwater quality.
- An identification of programs (including, as appropriate, non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects) to achieve implementation of BMPs by categories, subcategories, and particular nonpoint sources designated under subsection (A).
- A schedule containing annual milestones for: (1) utilization of program implementation methods identified in subparagraph (B); and (2) implementation of BMPs identified in subparagraph (A) by the categories, subcategories or particular nonpoint sources designated under paragraph (1)(B). Such schedule shall provide for utilization of the BMPs at the earliest practicable date.
- A certification of the attorney general of the state or states (or the chief attorney of any state water pollution control agency which has independent legal counsel) that the laws of the state or states, as the case may be, provide adequate authority to implement such management program or, if there is not such adequate authority, a list of such additional authorities as will be necessary to implement such management program, and a schedule and commitment by the state or states to seek such additional authorities as expeditiously as practicable.
- Sources of federal and other assistance and funding (other than assistance provided under subsections (h) and (i)) which will be available in each of such fiscal years for supporting implementation of such practices and measures and the purposes for which such assistance will be used in each of such fiscal years.
- An identification of federal financial assistance programs and federal development projects for which the state will review individual assistance applications or development projects for their effect on water quality pursuant to procedures set forth in Executive Order 12372 as in effect on September 17, 1983, to determine whether such assistance applications or development projects would be consistent with the program prepared under this subsection; for the purposes of this subparagraph, identification shall not be limited to the assistance programs or development projects subject to Executive Order 12372 but may include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the state's NPS pollution management program.

In 1993, USEPA approved Louisiana's NPS Assessment Report and Management Plan. In November 2012, USEPA-Region 6 approved Louisiana's revised NPS Management Plan. In April, 2019, USEPA approved LDEQ's Addendum to the 2012 NPS Management Plan (LDEQ 2012) as an approved plan for the period 2018 through 2022, and as such, provides an update of milestones, schedule of implementation, and short- and long-term goals to address water quality. Louisiana

has prioritized thirty-four watersheds to improve or restore use support through implementation to be guided by watershed-based plans.

Watershed Planning and Management

USEPA and LDEQ developed a watershed approach as a geographically-based, systematic process to reduce NPS pollution and improve water quality. Watershed planning can be an effective management strategy to protect healthy waters and/or restore impaired waters. Through watershed assessment, water quality data is analyzed; if the water body is impaired, a TMDL or alternative plan is developed and implemented. Once a TMDL is completed, the load allocation from that calculation is used to determine the NPS load reductions required to meet the water quality criteria to support designated uses. A nine key-element watershed-based plan, or Watershed Implementation Plan (WIP), is written describing the BMPs that will be implemented in the watershed to achieve the load allocation.

USEPA outlined a set of nine key elements for an acceptable WIP, and LDEQ utilizes this outline as a guide in partnering with stakeholders on protection and/or restoration of NPS waters. These nine key elements include:

- An identification of geographic extent of the watershed, measurable water quality goals, causes, and sources to be controlled to restore water quality.
- A description of NPS management practices to achieve estimated load reductions.
- A description of agencies and programs to implement NPS management practices.
- An identification of sources and amounts of financial and technical assistance to implement NPS management practices.
- An educational outreach component to implement the WIP.
- A reasonably expeditious schedule for implementing the WIP.
- A description of interim, measurable milestones for determining whether NPS management practices or other control actions are being implemented.
- An adaptive implementation process that includes a set of criteria that can be used to determine: (1) whether NPS load reductions are being achieved; (2) whether substantial progress is being made toward attaining or assuring continued attainment of water quality standards and, if not, the criteria for determining whether WIPs should be revised; and (3) where an NPS TMDL has been established, whether an NPS TMDL needs to be revised or a new TMDL developed.
- A monitoring component to evaluate effectiveness of WIPs in restoring water quality and designated uses in NPS waters.

Implementation

The Louisiana Administrative Code (LAC 33:IX.1105. Definitions) defines NPS pollution as "a diffuse source of water pollution that does not discharge through a point source, but instead, flows freely across exposed natural or manmade surfaces such as agricultural or urban runoff and runoff from construction, mining, or silviculture activities that are not regulated as point sources."

NPS pollutants are typically undiscernible or unconfined discharges that enter a water body during rainfall events. Land-use activities identified as contributing to NPS pollution include agriculture, forestry, urban, home sewage treatment systems, construction, hydromodification, and resource extraction (sand and gravel mining). The type of NPS pollution associated with land-use activities

includes sediment, nutrients, metals, organic material, and bacteria. Some of these pollution sources are managed through stormwater permits, and others are managed through NPS programs.

LDEQ's NPS Program focuses on improving water quality in impaired waters and protecting healthy waters from becoming impaired. The primary objective of the NPS Management Program is to implement BMPs as well as educational outreach programs to reduce NPS pollution. The watershed planning process relies on many partnerships and collaborative efforts to provide information on water quality conditions and land-use activities. As water quality improves, causes of impairment may be removed from the state's §305(b) report and/or the §303(d) list, and a success story can be published on USEPA's NPS success story website (USEPA 2022b).

Through the NPS Program, watershed groups have partnered with LDEQ-NPS to assist in restoring watersheds on a local level. They identify and engage local stakeholders to get involved and contribute resources and assistance. The stakeholders assist in planning, water quality monitoring, education and outreach, and BMP implementation.

An important partner in Louisiana's NPS Program is the LDAF; this agency implements the agricultural component of the program. LDAF currently applies directly to USEPA for the incremental portion of §319 funds and utilizes those funds for BMP implementation in watersheds where TMDLs and WIPs have been developed. LDEQ and LDAF prioritize impaired watersheds and exchange information on water quality data and land-use practices.

Two more important partners in Louisiana's NPS Program are the Drinking Water Protection Program (DWPP) (LDEQ 2022a) and the Aquifer Sampling and Assessment (ASSET) Program (LDEQ 2022b). DWPP partners with local communities in Louisiana to protect drinking water supplies from existing and potential contamination from NPS pollution. One of DWPP's priorities has been reducing bacterial problems from home sewage treatment systems for many communities in Louisiana. Since bacterial problems cause water bodies to be included on the §303(d) list, DWPP has focused its efforts on water bodies designated as drinking water supplies, such as Bayou Lafourche, Sibley Lake, and Lake Bruin. The ASSET Program is an ambient groundwater sampling and assessment program that monitors Louisiana's major freshwater aquifers. These aquifers, such as the Sparta, Chicot, and Southern Hills Aquifer System, are also sources of drinking water that could be contaminated by NPS pollution.

One of the remaining challenges in Louisiana is partnering with urban area communities on their NPS pollution problems. Many cities are now required to manage pollutants through stormwater permits. Innovative technologies such as rain gardens, porous pavements, green roofs, and small wetland detentions, or swales, could be effective in retaining nutrients on site rather than discharging them to water bodies. LDEQ will continue to provide information to cities and rural communities on innovative solutions for reducing urban NPS pollutants.

Chapter 3: Cost/Benefit Assessment

Cost Information

A true cost/benefit assessment for the water quality management efforts of LDEQ is very difficult to obtain because research on the economic value of incremental improvements in water quality is not currently available. While recent economic research has begun to place monetary values on otherwise intangible environmental benefits such as wilderness for nonconsumptive recreation, such efforts have not taken place in the area of water quality. In lieu of a formal cost/benefit assessment of water quality improvements, LDEQ is providing information on pollution abatement capital expenditures and operating costs. To place these expenditures in perspective, financial information on activities that benefit from this investment is also provided.

Much of LDEQ's water quality-related budget is self-generated through permit fees and enforcement actions; however, a portion is derived through federal grants. The grants include the CWA §319 grant for NPS management activities, the §604 grant for state water quality management planning activities, and the §106 grant for water pollution control activities. Money from each of the grant's programs is divided throughout the water quality-related program areas and provides funding for personnel, equipment, survey work, TMDL development, water quality management planning, monitoring, assessment, surveillance, and enforcement. See Table 2.3.1 for an illustration of LDEQ's approximate yearly costs to implement the CWA. Described below are a few of the programs and activities supported by each of these federal grants and state funds.

Under the §319 grant for NPS management issues, LDEQ continues to work with a number of partners on projects targeting NPS pollutants from urban runoff, forestry, agriculture, sand and gravel operations, and home sewage treatment systems. Other agency and funding programs that are also aimed at improving water quality through implementation of BMPs and cost incentives include Environmental Quality Incentive Program (EQIP), Wildlife Habitat Incentive Program (WHIP), and the Wetland Reserve Program (WRP). These programs, along with LDEQ's NPS Program, are intended to reduce water quality impacts from agricultural production in Louisiana. In Part II, Chapter 2, the Nonpoint Source Program section has more information on this topic as well as other efforts by the NPS Program at LDEQ. For more information on LDEQ's NPS Program refer to: https://www.deq.louisiana.gov/page/nonpoint-source.
Section 604 grant monies are used to support the development and revisions of TMDLs. Section 303(d) of the CWA requires the identification and listing of impaired waters and prioritization of the impaired waters for TMDL development. For more information on LDEQ's TMDL program refer to: http://deq.louisiana.gov/page/tmdl.

Table 2.3.1.

Approximate yearly costs to implement the Clean Water Act by the Louisiana Department of Environmental Quality and its contractors, October 1, 2020 – September 30, 2021.

Description	Amount
Federal Funds	
CWA Section 106	$4,998,000
CWA Section 106 supplemental (estimate)	$15,694
CWA Section 604(b) (three year cost)	$147,000
CWA Section 319	$1,937,500
FY17 Exchange Network Grant (estimate)	$3,600
Clean Water State Revolving Loan Fund (Administrative Costs) (FY2019)	$2,114,297
Total Federal Funds	**$9,216,091**
State Funds	
Environmental Trust Fund and Other Fees	$9,088,741
General Fund	$0
Total State Funds	**$9,088,741**
Grand Total	**$18,304,832**

The §106 grant provides funding support for the entire water pollution control/water quality management program. Activities supported by the §106 grant include ambient water quality monitoring, assessment of ambient water quality data, development of the Water Quality Integrated Report, revision of Louisiana's Water Quality Management Plan, development and revision of surface water quality standards, development and issuance of wastewater discharge permits, compliance inspections, complaint investigations, and development of enforcement actions. (Table 2.3.1).

The Clean Water State Revolving Fund Program, which was described above, provides financial assistance to communities for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities. Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A new authority was created, allowing USEPA to make grants to capitalize State Water Pollution Control Revolving Funds. On the state level, R.S. 30:2011(D)(4) and R.S. 30:2301-2306 (Act 296 of the 2010 Regular Session of the Louisiana legislature) were enacted. These statutes established a state revolving loan fund capitalized by federal grants (Capitalization Grants for Clean Water State Revolving Funds, CFDA 66:458), by state funds when required or available, and by any other funds generated by the operation of the clean water revolving loan fund. Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full. After a two-year construction period, loan recipients begin repayment of principal to

LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of June 2019, USEPA, through LDEQ, has awarded $502,074,923 in fund capitalization grants to Louisiana. With the required 20% state match of $91,795,705, less 4% for administration fees, there is a total of $532,415,087 that has been made available for loans to communities. In addition, a total of $622,118,764 of repaid "recycled" loan monies has been made available for loans.

As of June 2019, 251 loans to communities totaling $1,192,404,049 have been closed utilizing USEPA grants, state match, and recycled payments from previous loans. Another 17 borrowers have been awarded funding for loans totaling $217,173,000. For more information on the Clean Water State Revolving Fund refer to: http://www.deq.louisiana.gov/CWSRF.

The following U.S. Census Bureau (USCB) program has been discontinued; therefore, the following information is the most recent available update. If new information becomes available in the future, it will be included in subsequent IRs. Data on pollution abatement capital expenditures and operating costs from the USCB publication Pollution Abatement Costs and Expenditures: 2005 has been included to provide estimates of costs to industry related to water quality protection and improvement. For 2005, the most recent year for which data is available, industry in Louisiana spent $89.2 million in capital expenditures to protect water quality, with the petroleum industry ($61.2 million), chemical industry ($25.3 million), and paper industry ($0.8 million) leading in dollars spent. For the same period, water quality-related pollution abatement operating costs for Louisiana industry totaled $530.4 million with spending led by the chemical sector ($301 million), petroleum industry ($173.1 million), and paper industry ($40.6 million). This represents a $619.6 million outlay for water pollution control-related expenses (USCB 2008).

In an attempt to place state and industry expenditures in perspective and to provide an approximation of a cost/benefit assessment, information is provided below on the size of Louisiana's water resource base and its direct and indirect economic benefits to the state.

Benefits Information

Louisiana's perennial water resources occupy 9,174 square miles of the total state surface area of 53,378 square miles (USBC 2010). LDEQ is thus directly or indirectly responsible for protecting the water quality of approximately 17.5% of the total surface area of the state. In many instances, protection of surface waters also involves the management of stormwater runoff from land-based activities such as farming, aquaculture, forestry, and suburban/urban areas. This greatly increases the effective water quality protection area for which LDEQ is either directly or indirectly responsible.

Many Louisiana citizens depend on good water quality, not only for drinking water sources and consumptive/nonconsumptive recreation, but also for commercial purposes, and these activities produce revenue for the state through license sales. *The LDWF 2018-2019 Annual Report* (LDWF 2019) states that the agency issued 59,000 commercial fishing licenses, generating in excess of $3 million in revenue from license sales. Boat registration/title transactions for 2018-2019 numbered 290,000; bringing in over $4.3 million in revenue. Over 233,000 commercial fishing trips were reported, producing more than 155 million pounds of seafood. The total 2016 economic effect of the commercial fisheries industry in Louisiana was $2.0 billion (NOAA 2016).

NOAA also reports that the shrimp fishery is Louisiana's most valuable commercial fishery. Louisiana continued to lead the nation in shrimp landings with approximately 98 million pounds landed in 2016. The dockside value was about $138 million. Additionally, Louisiana blue crab landings for 2016 totaled 40.1 million pounds, bringing in $50 million dockside.

Louisiana regularly leads the U.S. in oyster production, averaging approximately 1/3 of the nation's oyster landings. Oysters routinely have a total annual economic impact on the Louisiana economy of roughly $300 million. In 2016, Louisiana provided over 12 million pounds of oysters, with a dockside value of more than $68 million (NOAA 2016). Louisiana consistently ranks number one in landings among Gulf of Mexico states, bringing in over 50% of all oysters landed.

Louisiana's commercial crawfishing industry also depends on good water quality. The Louisiana State University (LSU) Agricultural Center estimates commercial harvest figures of $201,039,839 million for aquaculture crawfish and $13,075,595 million in wild-caught crawfish for 2019. Gross value of Louisiana aquaculture for 2019 was $369,453,681 million, reported by the LSU AgCenter. Fur animal and alligator harvesting also added $5.2 million to the 2019 total (LSU AgCenter 2019).

Recreational fishing made an important contribution to Louisiana's economy with a total 2016 economic impact of approximately $10 billion (NOAA 2016). In 2018-2019, anglers took over 2 million recreational fishing trips (LDWF 2019). A survey presented in the *2014-2019 Louisiana Statewide Comprehensive Outdoor Recreation Plan* revealed that "Fishing/Crabbing" was number one out of the Top 10 2014 Important Outdoor Recreational Activities Among Households (Louisiana Office of State Parks (LOSP) 2014).

Both recreational and commercial fishing have an obvious relationship to Louisiana's water resources. Not so obvious is the connection between high quality water resources and hunting/nonconsumptive wildlife activities. Hunting is popular in Louisiana, and it is widely acknowledged that terrestrial wildlife and especially waterfowl are dependent on the availability of high quality waters. A total of 136,000 deer hunters participated in hunting activities during the 2018-2019 deer season. There were also 36,000 duck hunters, 17,100 dove hunters, 600 quail hunters, 1,800 woodcock hunters, and 10,800 turkey hunters (LDWF 2019).

The total retail sales figure associated with hunting in Louisiana in 2011 was $564 million (U.S. Fish and Wildlife Service (USFWS) 2013). In 2011, an estimated 1,010,000 participants engaged in wildlife watching (nonconsumptive recreation), resulting in a total economic effect of $542.7 million to the state (USFWS 2013).

In 2006, the most recent year for which these figures are available, fishing, hunting, and wildlife activities generated an estimated $4.61 billion in retail sales, $6.75 billion in total economic effect, $446.2 million in state and local tax revenues, and supported 76,700 jobs after adjusting for multiple counting of boat purchases (Southwick and Assoc. 2008). In fiscal year 2018-2019, LDWF sold more than 2 million recreational hunting, fishing, trapping, and nonconsumptive use licenses to more than 800,000 customers, generating in excess of $22 million in revenue (LDWF 2019).

The wildlife, fishing, and boating resources of Louisiana generate substantial economic benefits to state residents and to the common good. Industry investment in water pollution abatement capital expenditures and operating costs protects a multibillion-dollar industry. This financial outlay typically amounts to less than 10% of the value of the annual benefits. Moreover, hunters and nonconsumptive users alike are less likely to participate in their preferred activities in areas of

questionable water and aesthetic quality. An all-encompassing approach to environmental and resource management requires that consideration be given to all wildlife, aquatic and terrestrial, because all require clean water for their survival. While the total contribution of fishing, hunting, and nonconsumptive recreation cannot be directly related to water resources, almost all of it can be associated with the need for clean water. In a 2005 survey of 403 Louisiana citizens by the Southeastern Association of Fish and Wildlife Agencies (SEAFWA), "Polluted water/water quality" was named the second most important fish and wildlife issue, led only by "Habitat loss" (SEAFWA 2005).

Clean water is also important to the tourism industry. Travel statistics indicate that 17% of resident visitors participate in some sort of outdoor activity during their visit, as do 6% of international visitors. The number of visitors statewide continues to exceed 2004 levels (pre-Hurricane Katrina), but dropped due to the COVID-19 pandemic with 31.7 million people visiting the state in 2020 (Louisiana Office of Tourism (LOT) 2020). According to *The 2011 Louisiana Tourism Satellite Account (LTSA): An Update* (Terrell and Bilbo 2013), in 2011, tourists in Louisiana spent $10 billion, surpassing pre-Hurricane Katrina levels. Travel and tourism now account for 8.2% of state government revenues (Terrell and Bilbo 2013). Approximately 8% of the state workforce (147,000-plus people) work directly in the Louisiana travel industry; the LTSA report also states that 56,034 additional Louisiana jobs were created as an indirect effect of travel and tourism expenditures.

In FY 2018-19, approximately 1,593,084 visitors came to Louisiana State Parks and Historic sites (Louisiana Department of Culture Recreation and Tourism (LDCRT) 2020). State recreational areas cover over 1,510,298 acres. Out-of-state visitors to state parks spend almost $12 million in Louisiana annually. The LDCRT estimates that visitor spending at state parks returns $3.23 in state taxes for every dollar spent on park operation and maintenance (University of New Orleans (UNO), LSU, McNeese State University (MSU), Louisiana State University Shreveport (LSUS) 2006). In the LOSP *Strategic Plan for FY 14-15—18-19*, program objectives include sustaining the number of visitors served by the park system at an annual minimum of 2,200,000 by the end of FY 2018-2019, and sustaining a level of 175,000 individuals annually participating in interpretive programs and events by the end of fiscal year 2018-2019 (LOSP 2014). LOSP has three strategies directly dependent on water quality to meet these objectives (LDCRT 2020):

- Strategy 2.1 – Maintain and operate all state park sites and facilities according to the highest national and international standards of quality
- Strategy 2.8 – Introduce new initiatives such as the American Wetlands Program and participation in other tourism programs in order to further enhance visitation
- Strategy 2.17 – Increase the focus on native resources

For summaries of recent improvements to state parks, many involving waterfront and wetland sites, see the *2020 Sunset Report* (LDCRT 2020, 35-44).

There are also 23 National Wildlife Refuges in the state, all-encompassing some portion of Louisiana waterways. People use the U.S. Forest Service (USFS) refuges for hunting, fishing, birding, photography, and environmental education while spending money in localities near these sites. For more information on USFS refuges in Louisiana refer to: https://www.fws.gov/refuges/find-a-wildlife-refuge/.

Although not all of Louisiana's outdoor recreational and scenic opportunities are water-based, water quality is an important consideration in the overall environmental perception of travelers.

Because water quality often plays an important part in this recreation, it is imperative that it be enhanced and protected. Along with other quality-of-life parameters, environmental perception is a factor when Louisiana is contemplated as a place to relocate or start a business.

Louisiana invests a great deal of money in its efforts to enhance and maintain its water quality. In return, the citizens of Louisiana and visitors derive a number of benefits, both financial and aesthetic, from the state's abundant water resources. With the combined efforts of LDEQ, federal and state agencies, industry, and the citizens of Louisiana, our waters will continue to provide abundant recreational and commercial benefits for everyone.

PART III: SURFACE WATER MONITORING AND ASSESSMENT

Chapter 1: Surface Water Monitoring Program

The surface water monitoring programs of the LDEQ, OEC are designed to provide data for the following objectives:

- Measure progress toward achieving water quality goals at state and national levels.
- Establish and review the state water quality standards.
- Determine the assimilative capacity of the waters of the state.
- Establish permit limits for wastewater discharges.

The surface water monitoring program is composed of an AWQMN, intensive surveys, special studies, and wastewater discharge compliance sampling. Some components of the state water monitoring program are briefly described below.

Ambient Water Quality Monitoring Network

The primary use of the data from the AWQMN is to determine if water quality standards are being attained. To accomplish this, core indicators are monitored and used to determine designated use support (Table 3.1.1). Data may also be used for/by other programs within LDEQ (e.g., standards/criteria determination, modeling, permitting, project planning) and by external entities.

Data is collected systematically to obtain water quality monitoring data on selected water subsegments defined in the Surface Water Quality Standards (LAC 33:IX Chapter 11). The current approach to ambient surface water monitoring consists of a four-year rotating sampling plan with approximately one-fourth of the selected subsegments in the state sampled each year. Long-term monitoring sites are located in 10 of the 12 basins and are sampled every year throughout the four-year cycle. Under this plan LDEQ conducts a nearly complete census of all subsegments identified in LAC 33:IX.1123, Table 3 during the four-year rotation. There are, however, some subsegments that are difficult to sample within the physical and time constraints imposed upon the regional staff. These difficult-to-monitor subsegments will be evaluated individually to determine what type of monitoring and assessment can best be performed to assess the water quality of that subsegment.

Surveillance Division personnel conduct the AWQMN sampling. At each sampling site, the sample collector takes in situ field measurements and collects water samples for laboratory analysis for the parameters outlined in Table 3.1.1.

The Water Quality Program management decisions are made from conclusions that are based on data. Therefore, it is imperative that water quality data be diligently managed in a structured database. Water quality monitoring data managed by the Water Planning and Assessment Division (WPAD) is stored in a set of related Oracle tables and referred to as the Louisiana Environmental Assessment Utility (LEAU) database. Data management is accomplished through a variety of tools, including Microsoft Access append and import queries, Microsoft Excel worksheets, and direct entry into Oracle tables through a Microsoft Access front end. Beginning in October 2018, the LEAU database is accessible through a public water data portal. The LEAU Web Portal (waterdata.deq.louisiana.gov) provides user-friendly access to the AWQMN and other special

project data (e.g., Mercury). Data can be queried by project type or an interactive site map, and then be exported for use. Depending on the site's available data, certain core indicators (e.g., pH and temperature) may be automatically graphed in the "Visualization and Analysis" section of the site page.

Table 3.1.1

Designated uses for Louisiana water bodies and the core indicators used to determine water quality standards attainment.

Designated Use	Core Indicators	Basis for Use Support Decision
Fish and Wildlife Propagation	Dissolved Oxygen (mg/L) (Routine grab ambient)	Percent exceedance[1]
	Dissolved Oxygen (mg/L) (Continuous Monitoring)	Percent exceedance[1]
	Temperature	Percent exceedance
	pH	Percent exceedance
	Chloride	Percent exceedance
	Sulfate	Percent exceedance
	Total Dissolved Solids	Percent exceedance
	Turbidity	Percent exceedance
	Toxic Substances	Less than two exceedances in three years
	Ammonia	Less than two exceedances in three years
	Metals	Less than two exceedances in three years
Limited Fish and Wildlife Use	Dissolved Oxygen	Percent exceedance[1]
	Dissolved Oxygen (mg/L) (Continuous Monitoring)	Percent exceedance[1]
Primary Contact Recreation	Fecal Coliform	Percent exceedance
	Enterococci[2]	Percent exceedance and geometric mean
	Temperature	Percent exceedance
	Toxic Substances	Less than two exceedances in three years
Secondary Contact Recreation	Fecal Coliform	Percent exceedance
	Toxic Substances	Less than two exceedances in three years
Drinking Water Supply	Color	Percent exceedance
	Fecal Coliform	Percent exceedance
	Toxic Substances	Less than two exceedances in three years
	Metals	Less than two exceedances in three years
Outstanding Natural Resource Waters	Turbidity	Percent exceedance
Agriculture	None (indicated by support of other designated uses)	
Oyster Propagation	Fecal Coliform	Percent exceedance

1. LDEQ's AWQMN Dissolved Oxygen (DO) routine grab samples are used as an initial screening for DO criteria assessments. In the event the criterion is not met, continuous monitoring for DO may be initiated.
2. Enterococci criteria apply only to coastal marine waters, gulf waters to the state three-mile limit, coastal bays, estuarine waters, and adjacent subsegments with recreational beach waters. (LAC 33:IX.1113.C.5.a.i.)

Data are collected or received for a variety of water quality monitoring projects including, but not limited to: (1) Ambient Water Quality Monitoring Network; (2) Mercury Contaminant Study; (3) TMDL and alternative studies; (4) Special Projects. Data management procedures will be followed for most water quality projects; should alternate data management procedures be required for a special project, those procedures may be outlined in a QAPP, an additional Standard Operating Procedure (SOP), or included in the next revision of the Data Management SOP as appropriate.

In situ water quality field data are recorded at the time of sample collection on the LDEQ Surface Water Quality Field Measurements form or the Ambient Water Quality Site Information Sheet. In addition to meter results, field data include date, collection time, sampling location, and collector's name. The Surveillance Division and Water Surveys Section staffs are responsible for submitting field data to the Louisiana Environmental Analytical Data Management System (LEADMS) and field records to LDEQ's Electronic Data Management System (EDMS). The WPAD, Water Quality Standards and Assessment Section (WQSAS) is responsible for transferring field data from LEADMS to the LEAU database.

Laboratories are required to produce analytical data narrative reports in PDF format and Electronic Data Deliverables (EDDs) in the LEADMS format. The deliverables include analytes, sample date, methods of analysis, date of analyses, chemists performing the analyses, reporting limits, quality control information, and the results associated with the sample. EDDs and PDF reports are transmitted to LDEQ's Laboratory Contract Management Section by contract laboratories for initial quality control review and then forwarded to WPAD, WQSAS in the form of emails. The WQSAS uploads the new data to LEAU after which WQSAS, Data Evaluation, Assessment, and Reporting unit reviews the laboratory deliverables for quality assurance and either requests additional information from the laboratories or forwards the laboratory deliverables to WQSAS data management personnel for final data management in LEAU (LDEQ 2021d).

Data from the AWQMN is sent to USEPA's Water Quality Exchange (WQX) annually for the period that was sampled two years prior to the submittal. The agency is utilizing the WQX node for data submittal. Data is extracted from the LEAU database by .SQL scripts and then used to populate the WQX staging database. It is then transformed to .XML and submitted through the WQX node to USEPA.

Mercury Monitoring Program / Fish Tissue Monitoring Activities

In July 2015 LDEQ began planning for a restart of its former mercury monitoring program for fish tissue. Funding for the restart was provided through a Beneficial Environmental Project (BEP) with a major electrical utility company. Sampling resumed on February 11, 2016 on Bayou Queue de Tortue in southwest Louisiana and has continued since then with sampling of approximately 45-50 sites per year. Sampling began with those water bodies and sites where fish consumption advisories are currently in place. Additional sites are added each year as time and funding become available to fill the schedule of the responsible samping crew with the WPAD Water Surveys Section. Additional sites are on water bodies where previous sampling indicated elevated levels of mercury but concentrations were not sufficiently high to warrant an advisory.

Beginning in June of 2021, the Louisiana State legislature provided general fund money to continue fish tissue sampling by LDEQ. Then in January of 2022 a second BEP, this one with a major oil refinery, was approved for use on the maintenance of mercury fish consumption advisory signage. Sign maintenance and updating is also conducted by the Water Surveys Section. As

advisories are updated by LDH, LDEQ, and LDWF revised advisory stickers are placed on existing signs with new signs installed where needed.

Samples are composites of three to nine individual fish or in some cases a single large fish. Freshwater target species include largemouth bass (*Micropterus salmoides*), bowfin (*Amia calva*), flathead catfish (*Pylodictis olivaris*), freshwater drum (*Aplodinotus grunniens*), blue catfish (*Ictalurus furcatus*), channel catfish (*I. punctatus*) and crappie (*Pomoxis sp.*). Other appropriate species include spotted bass (*Lepomis punctatus*), striped bass (*Morone saxatilis*), white bass (*M. chrysops*), buffalo (*Ictiobus sp.*), redear sunfish (*L. microlophus*), bluegill (*L. macrochirus*), and warmouth (*L. gulosus*). Saltwater targeted species are spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*), red snapper (*Lutjanus campechanus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*S. maculatus*), and other appropriate species when available.

Fish tissue analysis is done by the University of Louisiana Monroe, Environmental Analysis Laboratory. All sample results are forward to the LDH, Section of Environmental Epidemiology and Toxicology for risk assessment. LDH scientists determine the need for new, revised, or rescinded advisories and advise both LDEQ and the LDWF. Once the agencies concur with the LDH recommendations, new or revised advisories are announced by press release and posted on the LDH and LDEQ websites.

Since July of 2018, the agencies have revised or issued new advisories for 24 of 50 fish consumption advisories due to mercury. Seventeen of these updates were made since May of 2020. As a result, nearly half of the mercury related advisories are less than four years old. Resampling of the remaining advisory water bodies has been completed, with LDH actively working on developing updates. In addition to resampling of current advisory water bodies, LDEQ continues to sample additional water bodies as they are identified and scheduling allows.

More information on Louisiana's mercury monitoring program can be found at: http://deq.louisiana.gov/page/mercury-initiative. More information on Louisiana's fish tissue and advisory program can be found at: http://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories.

Intensive Surveys and TMDL Studies

LDEQ works on new TMDLs, TMDL alternatives, and revisions of existing TMDLs in watersheds systematically prioritized and submitted to USEPA. Work continues on several priority water bodies included in the first round of the Long-Term Vision for Assessment, Restoration, and Protection under the CWA §303(d) Program also referred to as the New Vision (2016-2022), as well as planning the New Vision 2.0 (2023-2032).

For both new TMDLs and TMDL alternatives, work includes surveys, laboratory analysis, and evaluations of the point source and nonpoint source loads in the watershed. New TMDLs are expected to include water quality modeling. While TMDL alternatives are expected to focus on data analysis and implementation activities, they may also include modeling. In the case of TMDL revisions, surveys and laboratory analysis conducted for the original TMDLs should suffice for the revisions. However, additional survey work and data analysis may be required in some cases. These will be determined on a case-by-case basis. For each TMDL revision, work may include an evaluation and update of point source and nonpoint source loads in the watershed, updates to

modeling and calculations based on new data, updates to the TMDL, and updates to the report. Critical stream conditions for flow, temperature, and dissolved oxygen may be updated based on new data.

The following list indicates the water bodies that are expected to be the focus of LDEQ's efforts during the 2024 IR cycle, along with the type of activity planned for each water body:

- Subsegment 050304 Bayou Blue (fecal coliform) – new TMDL
- Subsegment 050201 Bayou Plaquemine Brule (dissolved oxygen) – TMDL revision
- Subsegment 040404 New River – TMDL alternative
- Subsegment 040504 Natalbany River – TMDL alternative
- Subsegment 070502 Bayou Sara – TMDL alternative
- Subsegments 040401 and 040403 Blind River – TMDL alternative

Total Maximum Daily Load Development Program

Total Maximum Daily Load Status

Between April 2002 and March 2012, USEPA was under a Court Ordered Consent Decree for completion of TMDLs. Louisiana completed its Consent Decree commitments as of March 6, 2012. Following completion of these commitments, ongoing TMDL development has been focused on revising existing dissolved oxygen TMDLs where the criteria have been revised. TMDL progress is shown in Table 3.1.2. More information on USEPA's TMDL program can be found at: https://www.epa.gov/tmdl.

In addition, LDEQ continued activities on water bodies prioritized in accordance with the first round of the New Vision. In June 2021, LDEQ began focusing on the second round of the New Vision. More information on this vision can be obtained at: https://www.deq.louisiana.gov/page/newvisionprogram.

Table 3.1.2

Louisiana Department of Environmental Quality Total Maximum Daily Load progress from January 1, 2014 to December 31, 2021.

Revised TMDLs Developed by LDEQ and Approved by USEPA					
Water Body	**Subsegment Number**	**Basin**	**Date Finalized**	**TMDL Parameters**	**TMDL Status**
Lower Grand/Belle River	LA120201_00	Terrebonne	9/23/2014	Dissolved Oxygen/ Nutrients	Final
Bayou Terrebonne	LA120301_00	Terrebonne	11/23/2015	Dissolved Oxygen/ Nutrients	Final
Bayou L'eau Bleu	LA120303_00	Terrebonne	10/20/2016	Dissolved Oxygen/ Nutrients	Final

Table 3.1.2

Louisiana Department of Environmental Quality Total Maximum Daily Load progress from January 1, 2014 to December 31, 2021.

Revised TMDLs Developed by LDEQ and Approved by USEPA					
Water Body	**Subsegment Number**	**Basin**	**Date Finalized**	**TMDL Parameters**	**TMDL Status**
Bayou Poydras, Bayou Choctaw, Chamberlin Canal, Bayou Plaquemine, Upper Grand River and Lower Flat River, Intracoastal Waterway, and Bayou Cholpe	LA120102_00 LA120103_00 LA120105_00 LA120106_00 LA120107_00 LA120109_00 LA120110_00	Terrebonne	8/2/2021	Biochemical Oxygen Demanding Substances	Final

Cyanobacteria Harmful Algal Bloom Pilot Study

Cyanobacteria Harmful Algal Blooms (CyanoHABs) in surface waters are detrimental to designated uses (primary and secondary contact recreation, and potentially fish and wildlife propagation), present public health risks due to toxin formation, influence the economy, and are aesthetically offensive. CyanoHABs are typically found in freshwater throughout the US, and are rising in frequency due to excessive nutrients (Heisler et al. 2008; Hudnell et al. 2010). The Mississippi/Atchafalaya River Basin carries sediment, nutrients, and other constituents to southern Louisiana distributaries and shelf waters from 41% of the contiguous US (Hypoxia Task Force 2021) and seasonal or event-based floodwaters can influence the occurrence of CyanoHABs by providing conditions conducive to cyanobacteria growth.

A pilot study was initiated in 2020 (LDEQ 2020a) for select coastal lakes and areas in southeast Louisiana to determine the composition, environmental conditions, and toxicity associated with cyanobacteria blooms. This project will sample six lakes (Lac des Allenmands, Lakes Verrret, Palourde, Salvadour, Maurpas, and Pontchartrain) during the recreational season using satellite imagery as a guide for bloom presence and severity for sampling locations. Several coastal sites will also be sampled. Routine field and laboratory parameters will be collected along with additional nutrient metrics, algal pigment parameters, and phycology. Field parameters and algal pigments will be collected throughout the water column. The study is expected to last 2-3 years depending on bloom formation, and data will be used to inform current conditons of state waters and steps forward concerning CyanoHABs.

Biotic Ligand Model Methodology to Derive Aquatic Life Criteria for Metals

LDEQ currently utilizes a hardness-based methodology to derive aquatic life criteria (ALC) for metals that is not applicable to brackish and marine waters, does not fully account for all bioavailability pathways [particularly dissolved organic carbon (DOC)], and has been found to be either over or under protective to aquatic species (USEPA, 2007). In 2007, USEPA published a

revised methodology for calculating freshwater ALC for copper using the Biotic Ligand Model (BLM), a metal bioavailability model that uses receiving water body characteristics and monitoring data to develop site-specific water quality criteria. In 2016, USEPA released draft estuarine/marine ALC for copper (USEPA, 2007 and 2016a); as well as freshwater ALC for selenium, which included multiple approaches to developing criteria (USEPA 2016b). The BLM is primarily driven by DOC, along with dissolved ions, which are not routinely collected by LDEQ. Louisiana currently does not have water quality criteria for selenium.

A study was initiated in 2019 (LDEQ 2019c) to collect data for five metals (copper, lead, zinc, and aluminum, from sixty sites, and selenium from twelve sites, across a range of pH, salinity, ecoregion type (depositional, erosional, and transitional), water body types (lakes, streams and estuaries), and water body flow regimes (lentic, lotic, or tidal). Input data necessary for the BLM includes ten parameters: (1) pH; (2) alkalinity; (3) temperature; (4) chloride; (5) sulfate; (6) calcium; (7) magnesium; (8) sodium; (9) potassium; and (10) DOC. Because DOC is one of the primary drivers of the BLM, LDEQ will also collect total organic carbon (TOC) to evaluate the relationship between it and DOC. The study is expected to last four years, and data will be used to evaluate the validity of the BLM in water quality criteria development for metals in Louisiana waters.

Chapter 2: Water Quality Assessment Methods and Integrated Report Rationale

Introduction

Statutes and Regulations

The Louisiana Department of Environmental Quality (LDEQ) prepared reports to meet the requirements outlined in §303(d) and §305(b) of the federal Water Pollution Control Act (United States Code, Title 33, §1251 et seq., 1972) (commonly known as the Clean Water Act (CWA)) and supporting federal regulations found in Title 40 of the Code of Federal Regulations (CFR), Parts 130.7 and 130.10 (40 CFR 130.7, 130.10). Section 303(d) of the CWA and supporting regulations require each state to identify water quality-limited segments (i.e., Louisiana subsegments that do not meet water quality standards) requiring development of TMDLs and to prioritize the water quality-limited segments for TMDL development. States are required to assemble and evaluate existing and readily available water quality-related data and information to develop the list. Additionally, each state must provide documentation to support listing decisions, including: a description of the method used to develop the list; a description of the data and information used to identify (i.e., list) waters; a rationale for any decision not to use existing and readily available data and information; and other information to demonstrate "good cause" for not including waters on the §303(d) list pursuant to 40 CFR 130.7(b)(6).

Section 305(b) of the CWA and supporting regulations require states to report on the quality of state waters every two years; the biennial reports are due April 1 of even-numbered years. Section 305(b) requires 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. Louisiana submits the §303(d) list and the §305(b) report as one document, commonly referred to as the Integrated Report or simply the IR.

Guidance

The United States Environmental Protection Agency (USEPA) issues guidance for the assessment, listing, and reporting of states' water quality to meet the requirements of CWA §303(d) (list of impaired waters requiring TMDL) and §305(b) (water quality inventory) (USEPA various dates). USEPA guidance outlines the compilation and reporting of state water quality in a combined report—the Integrated Report (IR). USEPA's guidance further outlines the use of categories to classify the quality of watersheds in each state. Integrated Report categories are outlined in Table 3.2.1.

Integrated Report Development

The 2022 IR contains new assessments for subsegments in all 12 Louisiana basins: Atchafalaya (01), Barataria (02), Calcasieu (03), Pontchartrain (04), Mermentau (05), Vermilion/Teche (06), Mississippi (07), Ouachita (08), Pearl (09), Red (10), Sabine (11), and Terrebonne (12). Due to the four-year cyclical nature of LDEQ's AWQMN, typically approximately half of the assessments for the 2022 IR will be new, while the remaining half will be carried forward from the previous IR. Beginning with the 2022 IR the data collection period of record ended in September of even-numbered years. This allowed for sufficient time for LDEQ data verification and entry into the Louisiana Environmental Assessment Utility (LEAU) database prior to use of the data for the 2022

and subsequent IRs. This period of record was implemented to avoid deferral of IR submittal due to delays in receipt, validation, and processing of data. Data from October 1, 2016 through September 30, 2020 were used for the 2022 IR.

Table 3.2.1.

U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body impairment combinations for the *Louisiana 2022 Integrated Report*; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.

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. Also used for water bodies fully supporting all designated uses.
IRC 2	Water body is meeting some uses and standards but there is insufficient data and/or information to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 3	There is insufficient data and/or information to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 4a	WIC exists and a TMDL was completed for the *specific WIC* cited.
IRC 4b	WIC exists and 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 and a pollutant (anthropogenic source) does not cause the *specific WIC* cited.
IRC 5	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited. **IRC 5 and its subcategories represent Louisiana's §303(d) list.**
IRC 5RC (Revise Criteria)	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments.
IRC 5- Alt (5-Alternative)	WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, LDEQ will implement alternative strategies under its 303(d)/Vision process to ensure the water body will meet water quality standards in the future.

Water Quality Assessment Methods

The following outlines the methods LDEQ used to develop the CWA §303(d) list and water body categorizations found in the 2022 IR. LDEQ used assessment procedures developed and updated over a number of years. Procedures followed USEPA guidance documents for §305(b) reports and §303(d) lists and USEPA's CALM guidance (USEPA various dates). LDEQ based water quality assessments and §303(d) listings on specific water body subsegments as defined in Louisiana's Surface Water Quality Standards (Louisiana Administrative Code (LAC) 33:IX.1101-1123).

Louisiana surface water quality standards define seven designated uses for surface waters: primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP) (with subcategory of limited aquatic and wildlife use (LAL)), drinking water supply (DWS), oyster propagation (OYS), agriculture (AGR), and outstanding natural resource waters (ONR). Designated uses have specific suites of ambient water quality parameters used to assess their support. Links between designated uses and water quality parameters, as well as water quality assessment procedures, can be found in Table 3.2.2. Additional details of Louisiana's IR assessment process can be found in Louisiana's Standard Operating Procedures for Production of Water Quality IR (LDEQ 2021e).

Water Quality Data and Information

LDEQ prepared assessments using existing and readily available water quality data and information in order to comply with rules and regulations under §303(d) of the CWA (33 U.S. Code §1313 and 40 CFR 130.7). LDEQ primarily relied on data and information supplied through LDEQ's routine ambient monitoring program to conduct water quality assessments for the 2022 IR. LDEQ conducts monitoring on nearly all water quality subsegments on a four-year statewide monitoring cycle. Approximately one-quarter of the state's subsegments are monitored each year; a limited number of subsegments are monitored (and continue to be monitored) every year (i.e., long-term monitoring sites). Each monitoring cycle or "water-year" begins in October and ends in September of the following year. LDEQ collected monthly and quarterly (organics) water quality data (LDEQ 2019d; 2021b; 2021c). Ambient water quality data are available on LDEQ's website at: http://deq.louisiana.gov/page/ambient-water-quality-monitoring-data.

LDEQ compiled and assessed data from the AWQMN collected between October 1, 2016 and September 30, 2020. Typically, between one year (conventional sites, 12 samples) and up to four years (long-term trend sites, 48 samples) of data were available (LDEQ 2019d; 2021b; 2021c). Except where noted in Table 3.2.2, the minimum sample size for IR assessments for all AWQMN parameters is five. Where more than one site within a subsegment was sampled the data was combined as appropriate for assessment of the subsegment.

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2022 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	**Partially Supporting[2]**	**Not Supporting**
Primary Contact Recreation (PCR) (Designated swimming months of May-October, only)	Fecal coliform[3]	0-25% do not meet criteria	-	>25% do not meet criteria
	Enterococci[4,5]	0-10% of individual samples do not meet single sample criteria and rolling three-month geometric mean ≤ 35 cfu/100 mL	-	>10% of individual samples do not meet single sample criteria and rolling three-month geometric mean > 35 cfu/100 mL
	Temperature	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Metals[6,7,8] and Toxics	<2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	≥2 exceedances 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 *2022 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	**Partially Supporting[2]**	**Not Supporting**
Secondary Contact Recreation (SCR) (All months)	Fecal coliform[3]	0-25% do not meet criteria	-	>25 % do not meet criteria
	Metals[6,7,8] and Toxics	<2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters
Fish and Wildlife Propagation (FWP)	Dissolved oxygen (routine ambient monitoring data)[9]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
	Dissolved oxygen (follow-up continuous monitoring data, if needed)[9]	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
	Ammonia[7,10] Metals[6,7,8] and Toxics	<2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters	-	≥2 exceedances 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 *2022 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	**Partially Supporting[2]**	**Not Supporting**
Drinking Water Source (DWS)	Color	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Fecal coliform[3]	0-30% do not meet criteria	-	>30 % do not meet criteria
	Metals[6,7,8] and Toxics	<2 exceedances of drinking water criteria in most recent consecutive three-year period, or one-year period for newly tested waters	-	≥2 exceedances of drinking water criteria in the most recent consecutive three-year period, or one-year period for newly tested waters
Outstanding Natural Resource Waters (ONR)	Turbidity	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
Agriculture (AGR)	None	-	-	-
Oyster Propagation (OYS)	Fecal coliform[3]	Median fecal coliform ≤ 14 MPN/100 mL; and ≤ 10% of samples > 43 MPN/100 mL	-	Median fecal coliform > 14 MPN/100 mL; and > 10% of samples > 43 MPN/100 mL
Limited Aquatic and Wildlife (LAL)	Dissolved oxygen[9]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2022 Integrated Report.*[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially Supporting[2]	Not Supporting

1. Where deviations from the decision process described in Table 2 occur, detailed information will be given to account for and justify those deviations. For instance, circumstances that may not be accounted for in the plain electronic analysis of the data will be explored and may be used to either not list the water body or to put the Water body Impairment Combination (WIC) into a different category. Those circumstances will be fully articulated.
2. While the assessment category of "Partially Supporting" is included in the statistical programming, any use support failures will be recorded in ATTAINS (Assessment, Total Maximum Daily Load, Tracking and Implementation System) 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. For most water bodies, fecal coliform criteria are as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL; DWS, 2,000 colonies/100 mL; OYS, 43 colonies/100 mL (LAC 33:IX.1123).
4. LDH beach monitoring enterococci data only applies to the LDH monitored beaches. Refer to page 21 for details.
5. Enterococci criteria for water bodies other than designated LDH beaches apply only to selected subsegments and only during the swimming season of May-October (LAC 33:IX.1113.C.5.a.i.; LAC 33:IX.1123, Table 3).
6. Determination of the application of marine or freshwater metals criteria is made based on LAC 33:IX.1113.C.6.d.
7. Parameters collected quarterly (metals and organics) require a minimum of three samples.
8. Ultra-clean metals sampling was discontinued in March 2015 due to lack of funding. It may be resumed in the future, if additional funding and personnel become available. Assessment methods for metals results remain in Table 2 in the event metals sampling is resumed in the future (LDEQ 2015).
9. In the event that analysis of routine ambient monitoring data for dissolved oxygen results in partial support or non-support, continuous monitoring (CM) data, where available, was used for follow-up assessment. CM data runs were approximately 48-72 hours in duration. CM data was evaluated as follows: All of the 15-minute interval dissolved oxygen observations from a CM sample run were analyzed to determine if more than 10% of the data points were below minimum criteria. Water bodies that fell below the criteria greater than 10% of the time were reported as IRC 5 and are therefore on the §303(d) list. Water bodies that fell below the criteria less than or equal to 10% of the time were placed in IRC 1, fully supported. If ambient monitoring indicated impairment and CM data was not available for analysis, the water body was placed in IRC 5 until CM data can be collected during the critical season of May 1 through October 31. In some cases, CM data was not collected because it was determined by LDEQ headquarters and regional staff that CM data collection efforts were not warranted due to conditions in the field.
10. Alternative use support decision rules may be evaluated when data for more than one water cycle year is available for performing assessments. In addition, the date of an exceedance will be evaluated when more than 2 exceedances occur at a site to determine use support.

Subsegments with Downstream or Upstream Monitoring Sites

LDEQ used ambient monitoring data and information collected from within or immediately downstream or upstream of a water body subsegment to evaluate each of the subsegment's designated uses, using the assesment decision processes shown in Table 3.2.2. Ten subsegments used for the 2022 IR had sites less than 1.0 mile downstream or upstream of the subsegment boundary (i.e., LA030101_00, LA030304_00, LA030506_00, LA041802_00, LA070203_00, LA080101_00, LA081603_00, LA090203_00, LA100502_00, and LA100706_00); in each case there were no known inputs between the subsegment boundary and the sample site. Seven

subsegments had sample points between 1.0 and 4.0 miles upstream or downstream from the subsegment boundary (i.e., LA010101_00, LA030301_00, LA030501_00, LA040905_00, LA042209_00, LA050802_00, and LA080912_00). One subsegment (LA110701_00) had a site located in coastal waters with open water between the subsegment boundary and the sample site. One subsegment (LA030503_00) had a sample point 5.4 miles downstream. In each case, there were no reasonable alternatives for sampling within the subsegment boundary and each site was determined to be representative of the assessed subsegment.

Subsegments with Long-Term Monitoring Sites

LDEQ collected data at 21 sites in subsegments with long-term monitoring stations. LDEQ applied assessments for a monitoring station indicating use impairment to the entire subsegment. Where more than one site within a subsegment was sampled the data was combined as appropriate for assessment of the subsegment.

Metals

Ultra-clean metals sampling was discontinued in March 2015 due to lack of funding. It may be resumed in the future, if additional funding and personnel become available. Assessment methods for metals results remain in Table 3.2.2 in the event metals sampling is resumed in the future (LDEQ 2015).

Dissolved Oxygen

Beginning in 2008, when appropriate, LDEQ collected two sets of data to conduct dissolved oxygen (DO) assessments. If routine ambient monitoring DO data indicated potential impairment of the use, LDEQ may have collected and used continuous monitoring DO datasets to make a final determination on use support. Continuous monitoring data allows evaluation of the 24-hour diurnal DO fluctuations and an improved determination of whether the frequency of DO exceedances is impairing the use (LDEQ 2008). Deployment of continuous monitors was also dependent on available resources and a determination of whether collecting the extra dataset was appropriate (e.g., if stream impairment was already known, there was no benefit to be gained by deploying a continuous monitor until additional pollution control measures were implemented). In some cases it was determined that conditions in the water body were severly impacted by drought, flooding, or other natural or anthropogenic conditions. If such conditions were considered severe enough, it was determined the subsegment would be unable to attain DO criteria even with the use of continuous monitoring. In these cases continuous monitors were not deployed in order to reduce costs and eliminate risk to equipment.

For water quality data used in the 2022 IR a total of 27 dissolved oxygen continous monitoring (DOCM) runs were conducted following DO grab samples from the ambient water quality monitoring program. These covered 23 different subsegments. Anaylsis of the DOCM data resulted in the following: no subsegments changed from the initial DO assessment; six subsegments remained fully supporting the DO criterion; and 17 subsegments remained impaired for low DO.

Coastal Subsegments with Shared Monitoring Sites

Beginning in 2010, LDEQ evaluated coastal subsegments for the potential to have shared data points for contiguous and similar subsegments. This was done to address subsidence and other land-altering activities that created open water areas between subsegments that were previously separated by land. Paired and/or adjacent subsegments were sampled on an alternating basis (one

subsegment sampled one month, the paired subsegment sampled the next month). For the 2016 IR, all historical data for each site/subsegment for DO, turbidity, pH, temperature, salinity, alkalinity, and hardness and all fecal data from 2004 to present was analyzed to determine which sites/subsegments were not significantly different and, therefore, could be combined for assessment purposes. For the 2018 IR, additional statistical analyses were conducted to verify if combining data from the paired subsegments remained a valid option. The additional 2018 IR analyses used seasonal blocking and employed power and effect analysis for parametric and robust statistical procedures. For the 2020 IR, 1,412 new data points were added to the dataset. These data were re-examined to account for recent changes in coastal conditions that affected orginal sample site choices for these subsegments. Two sample permutation test and one way ANOVA permutation method were used for the comparisons and correction values were employed to improve statistical test performance and to address statistical assumption requirements that may not have been met for all site comparisons. Sites were considered different if at least one parameter was significantly different. Subsegment/sites considered different were not combined for assessment.

The following sites were analyzed as paired subsegments in the 2020 IR with data from the 2018/2019 or 2019/2020 ambient monitoring cycles: LA010901_00; LA041701_00; LA041704_00; LA061001_00; LA061002_00; LA061104_00; LA110303_00; LA110304_00; LA120802_00; LA120803_00; and LA120804_00. Because the subsegments had sufficient monthly data for a twelve month period during the same ambient monitoring cycles, assessments for the 2022 IR were performed separately for each subsegment. Table 3.2.3 shows the results of 2022 IR analyses. Where sites were statistically similar, data from both sites were combined and conventional assessment protocols found in Table 3.2.2 were used for assessment. When sites were not determined to be statistically similar data was assessed individually for each subsegment and parameter. Assessment results are found in Table 3.2.4. Additional information on the statistical approaches used to determine the suitability of combining sites is available upon request.

Table 3.2.3.

Coastal subsegments/sites assessed for shared water quality monitoring and assessment. Parameters in parenthesis were significantly different.

Subsegment	Site	Permutation Results
LA042104_00 LA042102_00	0007 1080	Should not be combined. (Hardness, pH, salinity)
LA042201_00 LA042202_00	1090 1082	Should not be combined. (Hardness, salinity)
LA042203_00 LA042204_00	1089 1091	Should not be combined. (Hardness, pH, salinity)
LA042207_00 LA042208_00	1083 0006	Not significantly different
LA042205_00 LA042206_00	1088 1087	Not significantly different
LA060803_00 LA060804_00	0678 0679	Not significantly different
LA120406_00 LA120708_00	0937 0955	Not significantly different

Table 3.2.4.

Assessments for coastal subsegments with shared ambient monitoring sites. Percentages indicate percent of samples failing to meet the criterion. (FS = Fully Supported; NS = Not Supported; AI = Assessed Independently; N/A = Not Applicable)

Assessment Subsegment	Entero PCR[1]	Fecal PCR[2]	Temperature PCR	Fecal SCR	Fecal OYS	DO FWP	pH FWP	Turbidity FWP	Temperature FWP
LA042102_00	No Data	0% FS	0% FS	0% FS	50% NS	0% FS	0% FS	0% FS	0% FS
LA042104_00	N/A	0% FS	0% FS	0% FS	33.3% NS	0% FS	0% FS	N/A[3]	0% FS
	AI	**AI**	**AI**	**AI**	**AI**	**AI**	**AI**	**AI**	**AI**
LA042201_00	NS	N/A	0% FS	0% FS	0% FS	16.6% NS	0% FS	N/A[3]	0% FS
LA042202_00	NS	N/A	0% FS	0% FS	0% FS	0% FS	0% FS	N/A[3]	0% FS
	AI	**N/A**	**AI**	**AI**	**AI**	**AI**	**AI**	**N/A**	**AI**
LA042203_00	NS	N/A	0% FS	0% FS	0% FS	0% FS	0% FS	N/A[3]	0% FS
LA042204_00	NS	N/A	0% FS	0% FS	0% FS	16.7% NS	0% FS	N/A[3]	0% FS
	AI	**N/A**	**AI**	**AI**	**AI**	**AI**	**AI**	**N/A**	**AI**
LA042207_00	NS	N/A	0% FS	0% FS	16.7% NS	0% FS	0% FS	N/A3	0% FS
LA042208_00	NS	N/A	0% FS	0% FS	16.7% NS	0% FS	0% FS	N/A3	0% FS
Combined	**NS**	**N/A**	**0% FS**	**0% FS**	**16.7% NS**	**0% FS**	**0% FS**	**N/A**	**0% FS**
LA042205_00	NS	N/A	0% FS	0% FS	0% FS	0% FS	0% FS	N/A[3]	0% FS
LA042206_00	NS	N/A	0% FS	0% FS	0% FS	0% FS	0% FS	N/A[3]	0% FS
Combined	**NS**	**N/A**	**0% FS**	**0% FS**	**0% FS**	**0% FS**	**0% FS**	**N/A**	**0% FS**
LA060803_00	NS	N/A	0% FS	0% FS	N/A[4]	0% FS	0% FS	33.3% NS	0% FS
LA060804_00	NS	N/A	0% FS	0% FS	N/A[4]	33% NS	0% FS	66.7% NS	0% FS
Combined	**NS**	**N/A**	**0% FS**	**0% FS**	**N/A**	**16.7% NS**	**0% FS**	**50% NS**	**0% FS**
LA120406_00	NS	N/A	0% FS	0% FS	0% FS	0% FS	0% FS	N/A[3]	0% FS
LA120708_00	NS	N/A	0% FS	0% FS	60% NS	0% FS	0% FS	N/A[3]	0% FS
Combined	**NS**	**N/A**	**0% FS**	**0% FS**	**25% NS**	**0% FS**	**0% FS**	**N/A**	**0% FS**

[1] Enterococci criteria apply only to selected subsegments during swimming season of May-October (LAC 33:IX.1123, Table3); [2] Fecal coliform data available but criteria do not apply during swimming season of May-October. Enterococci criteria apply during the swimming season. (LAC 33:IX.1113.C.5.a); [3] No turbidity criterion for these subsegments; [4] No oyster propagation use for this subsegment (LAC 33:IX.1123,Table 3).

Assessment of Wetlands Approved for Wastewater Assimilation Projects

LDEQ compiled and assessed data from the Annual Wetland Monitoring Reports received from 2016 to 2020, which are prepared by the permitted dischargers approved for wastewater assimilation projects as a requirement of the LPDES Permit Program.

The annual wetland monitoring data was compiled for the reporting period of 2016 to 2020, representing the most recent complete five-year period as of the end of 2020. No other data was used for wetland assimilation area assessments. In review of the data, any quality issues identified, such as incorrect units or suspect extreme values, were communicated to the permittee and updated information was resubmitted by the permittee to LDEQ. Original and updated annual wetland monitoring reports submitted by the permittees are contained in LDEQ's EDMS under the appropriate wastewater permittees agency interest number (LDEQ 2021f).

The criteria for assessment of biological integrity for wetlands approved for wastewater assimilation projects (LAC 33:IX.1113.12.b) (LDEQ 2021g) is no more than a 20% reduction in the rate of total above-ground wetland productivity over a five-year period as compared to a reference area. The total above-ground productivity or net primary productivity is the sum of the perennial (stem growth) and ephemeral (litterfall) productivity for forested sites, and is the ephemeral (end-of-season live biomass) productivity for marsh sites. The Near site (which is the site in the discharge area closest to point of effluent addition) and the Reference site (site that is not within the discharge area) for the same wetland type of forested or marsh are used in this assessment.

The following methods were performed for the assessment:

1. Compile the productivity data for the determined five-year period for the Near site and the Reference site for the same wetland type for each assimilation wetland project.
2. Determine the total above-ground wetland productivity (NPP) at the Near site and Reference site for the same wetland type for each assimilation wetland project.
   a. For a Forest Wetland site, sum the mean perennial productivity (PP) and ephemeral productivity (EP) for each year to determine each annual NPP (Equation 1)

      Equation 1: $NPPForest = PP + EP$

      Results for a Forest site will include an NPP Forest value for each year (Yr1, Yr2, Yr3, Yr4, and Yr5) over the five-year period where data is available.
   b. For a Marsh Wetland site, determine the mean end-of-season live biomass (EOSL) for each year to determine mean annual NPP (Equation 2).

      Equation 2: $NPPMarsh = EOSL$

      Results for a Marsh site will include an NPP Marsh value for each year (Yr1, Yr2, Yr3, Yr4, and Yr5) over the five-year period where data is available.
3. If multiple Forest, Marsh, or Reference sites (combined sites) are available for an assimilation area, then the average percent change for the sites is used for the assessment.
   a. Calculate the year-to-year percent change for each site.
   b. Calculate the average of year-to-year percent changes for the combined sites, if available.
4. If a Near site is not available, then the next closest site is used for the comparison to the Reference site.
5. For each year-to-year comparison is there a reduction in growth at the Test Site as indicated by a negative growth percentage?
   a. No (e.g., $\geq$ 0% growth) – **Not impaired for that year-to-year comparison**

b. Yes (e.g., < 0% growth) – Is there a reduction or increase at the Reference Site?
    1. Reference Site Reduction – Is the Test Site reduction less than the Reference Site reduction?
        a. Yes (e.g., Reference Site -30% and Test Site -10% = Lower rate of reduction at Test Site – **Not impaired for that year-to-year comparison**
        b. No – See next step
    2. Reference Site Reduction – Is the Test Site reduction more than 20 percentage points less than the Reference Site reduction?
        a. Yes (e.g., Reference Site -5% and Test Site -30% = 25 percentage points (>20%) reduction below Reference Site) – **Impaired for that year-to-year comparison**; also,
        b. No (e.g., Reference Site -5% and Test Site -20% = 15 percentage points (<20%) reduction below Reference Site) – **Not impaired for that year-to-year comparison**
    3. Reference Site Increase – Is the Test Site reduction more than 20 percentage points less than the Reference Site increase?
        a. Yes (e.g., Reference Site +5% and Test Site -20% = 25 percentage points (>20%) reduction below Reference Site) – **Impaired for that year-to-year comparison**
        b. No – (e.g., Reference Site +5% and Test Site -10% = 15 percentage points (<20%) reduction below Reference Site) – **Not impaired for that year-to-year comparison**

6. Over the five-year period, how many year-to-year impairments occurred?
    a. One year-to-year impairment – **Not impaired for the IR assessment**
    b. Two or more year-to-year impairments – **Impaired for the IR assessment**

Table 3.2.5 shows the 2022 Water Quality Integrated Report assessments for wetland assimilation projects and the associated subsegments.

Table 3.2.5.

Summary of Mean Percent Change in NPP for a five-year period for wastewater assimilation projects.

Luling Wetland, St. Charles (LA020305_00)			
Forested Site			
Year	**% Change Near Test Site (4626)**	**% Change Reference Site (4629)**	**Assessment of Year-to-Year Support**
2016 to 2017	-15.4%	-22.1%	Meet - Test percent loss at lower rate than reference site loss
2017 to 2018	39.5%	-1.4%	Meet - Positive growth at test site
2018 to 2019	-40.0%	9.1%	Fail - Test percent loss >20 percentage points below reference site
2019 to 2020	17.2%	-16.2%	Meet - Positive growth at test site
			One annual failure over four year-to-year comparisons - Supports FWP

South Slough Wetland, Hammond (LA040607_00)			
Marsh Site			
Year	**% Change Near Test Site (4635)**	**% Change Reference Site (4638)**	**Assessment of Year-to-Year Support**
2016 to 2017	-8.6%	23.3%	Fail - Test percent loss >20 percentage points below reference site
2017 to 2018	-22.6%	-21.9%	Meet - Test percent loss within 20 percentage points of reference site
2018 to 2019	-21.6%	21.7%	Fail - Test percent loss >20 percentage points below reference site
2019 to 2020	52.9%	-9.3%	Meet - Positive growth at test site
			Two annual failures over four year-to-year comparisons - Impaired for FWP

Table 3.2.5.

Summary of Mean Percent Change in NPP for a five-year period for wastewater assimilation projects.

Chinchuba Swamp Wetland, Mandeville (LA040805_00)			
Year	**% Change Near Test Site (4609)**	**% Change Reference Site (4608)**	**Assessment of Year-to-Year Support**
2016 to 2017	-14.9%	-27.9%	Meet - Test percent loss at lower rate than reference site loss
2017 to 2018	13.7%	2.9%	Meet - Positive growth at test site
2018 to 2019	5.7%	38.3%	Meet - Positive growth at test site
2019 to 2020	-11.7%	-21.2%	Meet - Test percent loss at lower rate than reference site loss
			No annual failures over four year-to-year comparisons - Supports FWP

East Tchefuncte Marsh Wetland, Mandeville (LA040806_00)			
Forested Site[1]			
Year	**% Change Near Test Site (4612)**	**% Change Reference Site (4608)**	**Assessment of Year-to-Year Support**
2016 to 2017	-19.5%	-27.9%	Meet - Test percent loss at lower rate than reference site loss
2017 to 2018	22.7%	2.9%	Meet - Positive growth at test site
2018 to 2019	-1.3%	38.3%	Fail - Test percent loss >20 percentage points below reference site
2019 to 2020	26.2%	-21.2%	Meet - Positive growth at test site
			One annual failure over four year-to-year comparisons - Supports FWP

Table 3.2.5.

Summary of Mean Percent Change in NPP for a five-year period for wastewater assimilation projects.

Cote Gelee Swamp Wetland, Broussard (LA060807_00)			
Year[2]	**% Change Near Test Site (4617)**	**% Change Reference Sites (4615, 4616)**	**Assessment of Year-to-Year Support**
2012 to 2013	-39.6%	-62.6%	Meet - Test percent loss at lower rate than reference site loss
2013 to 2014	81.4%	89.6%	Meet - Positive growth at test site
2014 to 2015	-10.3%	-2.2%	Meet - Test percent loss within 20 percentage points of reference site
2015 to 2016	-10.4%	-0.6%	Meet - Test percent loss within 20 percentage points of reference site
			No annual failures over four year-to-year comparisons - Supports FWP

Breaux Bridge Swamp Wetland, Breaux Bridge (LA060805_00)			
Year	**% Change Near Test Site (4588)**	**% Change Reference Site (4586)**	**Assessment of Year-to-Year Support**
2016 to 2017	0.1%	-11.3%	Meet - Positive growth at test site
2017 to 2018	-19.3%	-33.0%	Meet - Test percent loss at lower rate than reference site loss
2018 to 2019	36.6%	80.0%	Meet - Positive growth at test site
2019 to 2020	-16.8%	-30.6%	Meet - Test percent loss at lower rate than reference site loss
			No annual failures over four year-to-year comparisons - Supports FWP

Table 3.2.5.

Summary of Mean Percent Change in NPP for a five-year period for wastewater assimilation projects.

Cypress Island Coulee Swamp Wetland, St. Martinville (LA060806_00)			
Year	**% Change Near Test Sites (4591, 4592, 4595)**	**% Change Reference Sites (2016-2018, Site 4586; 2018 to 2020, Sites 4586, 4921, 4922)**	**Assessment of Year-to-Year Support**
2016 to 2017	75.8%	-11.3%	Meet - Positive growth at test site
2017 to 2018	-23.8%	-33.0%	Meet - Test percent loss at lower rate than reference site loss
2018 to 2019	16.0%	61.2%	Meet - Positive growth at test site
2019 to 2020	-5.8%	-20.6%	Meet - Test percent loss at lower rate than reference site loss
			No annual failures over four year-to-year comparisons - Supports FWP

Thibodaux Swamp Wetland[3], Thibodaux (LA120207_00)			
Year	**% Change Near Test Site (4645)**	**% Change Reference Sites (4644, 4751, 4752)**	**Assessment of Year-to-Year Support**
2016 to 2017	43.1%	-9.4%	Meet - Positive growth at test site
2017 to 2018	99.5%	-21.4%	Meet - Positive growth at test site
2018 to 2019	64.3%	10.6%	Meet - Positive growth at test site
2019 to 2020	-41.6%	-5.2%	Fail - Test percent loss >20 percentage points below reference site
			One annual failure over four year-to-year comparisons - Supports FWP

Table 3.2.5.
Summary of Mean Percent Change in NPP for a five-year period for wastewater assimilation projects.

Bayou Ramos Swamp Wetland, Amelia (LA120208_00)			
Year	**% Change Near Test Site (4603)**	**% Change Reference Sites (4604, 4605, 4606)**	**Assessment of Year-to-Year Support**
2016 to 2017	69.3%	42.8%	Meet - Positive growth at test site
2017 to 2018	5.0%	-17.8%	Meet - Positive growth at test site
2018 to 2019	72.2%	473.2%	Meet - Positive growth at test site
2019 to 2020	-36.1%	-45.2%	Meet - Test percent loss at lower rate than reference site loss
			No annual failures over four year-to-year comparisons - Supports FWP

1. A marsh site was also run for this wetland; however, the location was determined to be unsuitable for assessment and was not used. The marsh site will be reevaluated in the future.
2. No new data was available for Cote Gelee Wetland due to COVID traveling restrictions and 2019 data was incomplete due to Hurricane Laura, therefore, 2018 IR data and assessment, which was also used for the 2020 IR, was carried forward for the 2022 IR.
3. Near site is comprised of a small percentage of actual trees (<25%), majority is floating marsh, which is measured by end of season live biomass.

Reevaluation of Nonpoint Source Pesticides Study and Assessment

In March 2020 it was found that detection levels for a Nonpoint Source Program pesticides study conducted in 2014/2015 were too high to effectively assess the subsegments in question. As a result, 32 subsegments were once again reported as suspected causes of impairment for one or more of five pesticides (Carbofuran, DDT, Fipronil, Methoxychlor, and Toxaphene). The suspected causes can be found in the 2022 IR assessment spreadsheet. A new study has been initiated by LDEQ to reevaluate these 32 subsegments with lower detection levels. Results will be incorporated into a future IR at the conclusion of the study.

Additional Data and Information

LDEQ's routine ambient monitoring data (described above) provided the primary set of data and information used for water quality assessments and listing decisions. However, LDEQ also used additional datasets and information which are described below.

Nonpoint Source Program Monitoring Data

LDEQ's Nonpoint Source (NPS) Program focuses on restoration efforts to address NPS runoff in those subsegments suspected of impairment by *nonpoint sources* in the IR. In the 2022 IR, water quality sampling at AWQMN sites by the NPS Program provided an additional set of data used for water quality assessments and listing decisions. All NPS monitoring projects were conducted using USEPA and LDEQ approved QAPPs. As a result of the inclusion of NPS monitoring data the following IR assessment changes occurred:

- LA040301_00 – Low pH impairment was added to FWP use for the subsegment, overall FWP use support remained as not supporting;
- LA060801_00 – Fecal coliform impairment was added to SCR use for the subsegment, changed SCR use support to not supporting;
- LA060910_00 – DO is now meeting the criteria for the subsegment, FWP use remained impaired due to other suspected causes of impairment;
- LA070505_00 – DO is now meeting the criteria for the subsegment, changed FWP use to fully supporting;
- LA080903_00 – DO is now meeting the criteria for the subsegment, FWP use remained impaired due to other suspected causes of impairment;
- LA081101_00 – DO impairment was added to FWP use for the subsegment, changed FWP use to not supporting; and
- LA081609_00 – Fecal coliform is now meeting the PCR criteria for the subsegment, changed PCR use to fully supporting.

Coastal Louisiana Water Quality Study and Assessment

In 2018, the Coastal Protection and Restoration Authority (CPRA) established a monitoring transect extending from Barataria Pass, Louisiana to the inner shelf in order to better understand water quality changes from restoration activities. This transect was developed in collaboration with Louisiana State University, LDEQ, and The Water Institute of the Gulf (CPRA 2018). This region is a key intersect for the interactive effects of multiple ecosystem change drivers (e.g., restoration projects, riverine nutrient loading, hypoxia, oil pollution, climate change) on living resources in

the Gulf of Mexico. The datasets extend monitoring from inshore to offshore, increasing the understanding of: 1) baseline conditions for coastal restoration projects; 2) inshore to offshore water quality dynamics; and 3) changes in extent and severity of hypoxia. The initial project came to an end in 2020, however, the USEPA released funds to Hypoxia Task Force member states in order to support nutrient strategies, and the transect study is expected to provide data through 2022 (USEPA 2019b, 2020).

Data and samples for this project were collected in the field by LDEQ. Data collection for this study includes DO and related in situ meter parameters at three monitoring stations within two subsegments of Louisiana's state territorial waters of the Gulf of Mexico:

- LA021101_00 – Barataria Bay; includes Caminada Bay, Hackberry Bay, Bay Batiste, and Bay Long (Estuarine)
- LA021102_00 – Barataria Basin Coastal Bays and Gulf Waters to the State 3-mile limit

Depth profile monitoring was perfomed where total depth at each site was first recorded and used to determine the depth of each meter reading at the site. Electronic meter readings and water quality samples were taken at three depths – surface, mid, and bottom. Bottom depth readings were taken within one meter above the bottom to avoid embedding the probe in sediments which could affect the readings. For 2022 IR assessment purposes, DO, pH, turbidity, and temperature data were analyzed using the routine criterion assessment procedure outlined in Table 3.2.2. Based on the data collected for this project, DO in LA021102_00 was reported as impaired for FWP in the 2022 IR assessment. The other parameters were fully supported based on the Coastal Louisiana Water Quality Study data (Table 3.2.6.).

Louisiana Department of Health Fish Advisory and Beach Monitoring Data

LDEQ used LDH fishing and swimming advisory information and enterococci bacteria datasets collected for the state's Beach Monitoring Program. For water bodies with fish consumption or swimming advisories within a subsegment, but not the named subsegment water body, the advisory water body was also named in the 2022 IR. Impairments of this nature are water body-specific issues not directly related to the overall subsegment.

LDEQ evaluated the LDH beach monitoring data based on the federally-promulgated enterococci criteria for Louisiana and used by LDH for determining beach closures. Enterococci data collected as part of LDH's beach monitoring were evaluated using USEPA's assessment rule of 10%. Under this rule, if more than 10% of samples exceed the statistical threshold value of 130 cfu/100 mL over the period of record used for the IR, then an impairment for enterococci is reported. If the enterococci geometric mean was > 35 cfu/100mL over a one month interval, or up to a three month rolling average, during the period of record used for the IR, then an impairment is reported (LAC 33:IX.1113.C.5.a.i.). Duplicate samples in the dataset were treated as QC samples and were not averaged with the target sample to keep evaluation methods consistent with LDEQ protocol.

Third-Party Data

LDEQ published a request for data and information during a 30-day public notice period which ended July 16, 2021. The St. Tammany Parish Government provided datasets for several inland and/or coastal waters studies. In addition to the previously described data for the 2022 IR, LDEQ located and assessed third-party datasets from sources that are known to collect and/or store water quality information that are relevant to assessment. This resulted in the analysis of data from four organizations: 1) Pontchartrain Conservancy (PC); 2) U.S. Geological Survey (USGS); 3) National

Oceanic and Atmospheric Administration (NOAA); and 4) the Gulf States Marine Fisheries Commission, Southeast Area Monitoring and Assessment Program (SEAMAP). Project plans and data were reviewed to determine if it met LDEQ quality assurance/quality control requirements by being collected and analyzed with approved quality assurance project plans or other recognized data collection and validation methods.

Data from each organization was obtained either through contact with the organization or through available internet resources. All data was limited to samples collected between October 1, 2016 – September 30, 2020. Sites were located using GIS to determine which Louisiana subsegments they represented and were limited to only those sites within Louisiana territorial waters. Where more than one site within a subsegment was sampled by an organization, the data was combined for assessment of the subsegment. To assess a depth profile from a site, samples closest to each 0.5 meter increment were used, regardless of the collection instrument, starting from the first surface sample and proceeding down to the bottom-most depth sample. Samples that fell between these nearest half-meter readings were not included. Varying programs collected varying parameters; data pertinent to LDEQ assessments was used for each program, although there was not consistency of parameters among third-party sources. Assessments were made based on the appropriate LDEQ water quality criteria using conventional rules. See Table 3.2.2 for more details on assessment methods for additional parameters available in the datasets.

A summary of all assessments on subsegments for which third-party data was available is found in Table 3.2.6. A total of thirty-one subsegment assessments included additional datasets. Fifteen of the subsegments with both additional and LDEQ ambient program data had all parameter assessments in agreement. Sixteen subsegments showed disagreement for one or more parameters between the additional and LDEQ ambient program dataset assessments. LDEQ's reconciliation of additional data assessments is provided in the last column of Table 3.2.6. Full datasets and more details concerning additional data assessments and LDEQ ambient program assessments are available upon request.

Table 3.2.6.

Third-party parameter-specific data assessments and Louisiana Department of Environmental Quality 2022 Water Quality Integrated Report conventional data assessments (FS = Fully Supported; NS = Not Supported).

Subsegment Number	Collecting Organization	Parameter	Third-Party Assessment Results	LDEQ Assessment Results	Third-Party Data Reconciliation with LDEQ 2022 IR Assessments
LA010501_00	USGS	DO pH Temperature	NS FS FS	NS FS FS	All assessments agree – **No change**
LA010901_00	SEAMAP	DO Temperature	NS FS	FS FS	SEAMAP dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
LA020902_00	USGS	DO pH Temperature	FS FS FS	FS FS FS	All assessments agree – **No change**
LA020903_00	USGS	DO pH Temperature	FS FS FS	FS FS FS	All assessments agree – **No change**
LA020904_00	USGS	DO pH Temperature	FS FS FS	FS FS FS	All assessments agree – **No change**
LA021001_00	USGS	DO pH Temperature	FS FS FS	FS FS FS	All assessments agree – **No change**

Table 3.2.6.

Third-party parameter-specific data assessments and Louisiana Department of Environmental Quality 2022 Water Quality Integrated Report conventional data assessments (FS = Fully Supported; NS = Not Supported).

Subsegment Number	Collecting Organization	Parameter	Third-Party Assessment Results	LDEQ Assessment Results	Third-Party Data Reconciliation with LDEQ 2022 IR Assessments
LA021101_00	PC	DO	NS	FS	PC dataset indicating failure to support DO criterion is not sufficient to override USGS, LDEQ-Coastal, and LDEQ assessments – **No change**
		Temperature	FS	FS	
	USGS	DO	FS	FS	
		pH	FS	FS	
		Temperature	FS	FS	
	LDEQ-Coastal	DO	FS	FS	
		pH	FS	FS	
		Temperature	FS	FS	
		Turbidity	FS	FS	
LA021102_00	NOAA	DO	NS	FS	NOAA and LDEQ-Coastal dataset indicating failure to support DO criterion is sufficient to override SEAMAP and LDEQ assessment; **Report as impaired for DO**
		pH	FS	FS	
		Temperature	FS	FS	
	SEAMAP	DO	FS	FS	
		Temperature	FS	FS	
	LDEQ-Coastal	DO	NS	FS	
		pH	FS	FS	
		Temperature	FS	FS	
LA040803_00	PC	DO	NS	FS	PC dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
		Enterococci	NS	NS	
		Fecal coliform	FS	FS	
		pH	FS	FS	
		Temperature	FS	FS	
		Turbidity	FS	FS	

Table 3.2.6.

Third-party parameter-specific data assessments and Louisiana Department of Environmental Quality 2022 Water Quality Integrated Report conventional data assessments (FS = Fully Supported; NS = Not Supported).

Subsegment Number	Collecting Organization	Parameter	Third-Party Assessment Results	LDEQ Assessment Results	Third-Party Data Reconciliation with LDEQ 2022 IR Assessments
LA040804_00	PC	DO	FS	FS	PC dataset indicating failure to support Fecal coliform and Turbidity criterion is sufficient to override LDEQ assessment; **Report as impaired for Fecal coliform and Turbidity**
		Fecal coliform	NS	FS	
		pH	FS	FS	
		Temperature	FS	FS	
		Turbidity	NS	FS	
LA040807_00	St. Tammany	DO	FS	FS	All assessments agree – **No change**
		Fecal coliform	FS	FS	
		Temperature	FS	FS	
LA040904_00	PC	DO	FS	NS	PC dataset indicating full support of DO criterion is sufficient to override LDEQ assessment of not supported; **Report as meeting criteria for DO**
		Enterococci	NS	NS	
		Fecal coliform	FS	FS	
		pH	FS	FS	
		Temperature	FS	FS	
		Turbidity	FS	FS	
LA040915_00	St. Tammany	DO	NS	NS	St. Tammany dataset indicating failure to support Fecal coliform is sufficient to override LDEQ assessment; **Report as impaired for Fecal coliform**
		Fecal coliform	NS	FS	
		Temperature	FS	FS	
LA040916_00	St. Tammany	DO	NS	NS	All assessments agree – **No change**
		Fecal coliform	FS	FS	
		Temperature	FS	FS	
LA041001_00	PC	DO	FS	FS	All assessments agree – **No change**
		Enterococci	NS	NS	
		Fecal coliform	FS	FS	
		pH	FS	FS	
		Temperature	FS	FS	
		Turbidity	FS	FS	

Table 3.2.6.

Third-party parameter-specific data assessments and Louisiana Department of Environmental Quality 2022 Water Quality Integrated Report conventional data assessments (FS = Fully Supported; NS = Not Supported).

Subsegment Number	Collecting Organization	Parameter	Third-Party Assessment Results	LDEQ Assessment Results	Third-Party Data Reconciliation with LDEQ 2022 IR Assessments
LA041301_00	PC	DO Enterococci Fecal coliform pH Temperature Turbidity	FS NS FS FS FS FS	FS FS FS FS FS FS	PC dataset indicating failure to support Enterococci criterion is sufficient to override LDEQ assessment; **Report as impaired for Enterococci**
LA041401_00	PC	DO Temperature	NS FS	NS FS	All assessments agree – **No change**
LA041901_00	PC	DO Temperature	NS FS	NS FS	All assessments agree – **No change**
LA042001_00	PC	DO Temperature	NS FS	FS FS	PC dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
LA042201_00	PC	DO Temperature	NS FS	NS FS	All assessments agree – **No change**
LA042202_00	PC	DO Temperature	NS FS	FS FS	PC dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
LA042203_00	PC	DO Temperature	FS FS	FS FS	All assessments agree – **No change**
LA042204_00	PC	DO Temperature	FS FS	NS FS	PC dataset indicating Full Support of DO criterion is not sufficient to override LDEQ assessment – **No change**
LA042206_00	PC	DO Temperature	NS FS	FS FS	PC dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**

Table 3.2.6.

Third-party parameter-specific data assessments and Louisiana Department of Environmental Quality 2022 Water Quality Integrated Report conventional data assessments (FS = Fully Supported; NS = Not Supported).

Subsegment Number	Collecting Organization	Parameter	Third-Party Assessment Results	LDEQ Assessment Results	Third-Party Data Reconciliation with LDEQ 2022 IR Assessments
LA042207_00	PC	DO Temperature	NS FS	FS FS	PC dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
LA042209_00	PC	DO Temperature	NS FS	FS FS	PC dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
LA050901_00	NOAA	DO pH Temperature	NS FS FS	FS FS FS	NOAA dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
LA060801_00	USGS	DO Temperature	NS FS	NS FS	All assessments agree – **No change**
LA070301_00	USGS	DO pH Temperature	FS FS FS	FS FS FS	All assessments agree – **No change**
LA070601_00	NOAA SEAMAP	DO pH Temperature DO Temperature	NS FS FS NS FS	FS FS FS FS FS	NOAA and SEAMAP datasets indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**
LA120806_00	NOAA	DO pH Temperature	NS FS FS	FS FS FS	NOAA dataset indicating failure to support DO criterion is sufficient to override LDEQ assessment; **Report as impaired for DO**

Rationale for Not Using Readily Available Data and Information

LDEQ conducted evaluations of datasets to determine usability in accordance with standard operating procedures for the IR (LDEQ 2021e) and data quality objectives outlined in the QAPP for the AWQMN (LDEQ 2019d) approved by USEPA-Region 6. Data quality issues that may have necessitated qualifications to datasets resulting in limited and/or no usability include, but are not limited to: limited geospatial data and/or representativeness; limited temporal data and/or representativeness; limited quality control data; and quality control data indicating data that are of limited use (e.g., blank contamination, incorrect laboratory procedures).

Good Cause for Not Listing Waters

In accordance with CWA §303(d) and federal regulations, LDEQ listed waters as impaired and requiring TMDL development (IRC 5, IRC 5RC, and IRC 5-Alt; see Table 3.2.1) if sufficient data of appropriate quality were available. Conversly, if insufficient or incomplete datasets were available through LDEQ's ambient water quality monitoring or other sources, then the water body was reported as unassessed or prior IR assessments were carried forward.

Use of Flow Rating for Assessments

As part of its ambient water quality monitoring program LDEQ includes a qualitative flow rating, which is recorded at the time water quality samples and meter readings are collected. LDEQ's flow ratings are found in Table 3.2.7. For the 2022 IR flow ratings of "no flow" were identified and evaluated to determine if the "no flow" rating may have impacted the water quality samples used for the report. "No flow" was reported for 164 samples at 68 sites. After reviewing the sites in question it was determined that no flow conditions are a common occurence for all of the streams. A flow rating of "Dry" was reported for 24 samples at 9 sites. In some cases the sample size for these sites was unavoidably reduced. However, in most cases assessments could still be conducted for the subsegments.

"Flood" was reported for 127 data points on 67 sites. This was likely due to the extreme rain events that occurred during the period of record for the 2022 IR. Identification of these "Flood" sample events led to further investigation of Ouachita River, subsegment LA080101_00. During the investigation it was found that all of the low DO occurances coincided with high water at the USGS gage station on the Ouachita River at Felsenthal. Footnote 15 of LAC 33:IX.1123, Table 3, which refers to subsegment LA080101_00 states:

> These seasonal criteria may be unattainable during or following naturally occurring high flow (when the gage at Felsenthal Dam exceeds 65 feet and also for the two weeks following the recession of flood waters below 65 feet), which may occur from May through August. *Naturally occurring conditions that fail to meet criteria should not be interpreted as violations of the criteria* (emphasis added).

Therefore, DO results collected when the gage at Felsenthal was > 65 feet were considered rejected for assessment purposes. When these values were removed, subsegment LA080101_00 was determined to be fully supporting the DO criterion.

Table 3.2.7.

Flow severity ratings for suitable streams in Louisiana's ambient water quality monitoring network.

LDEQ Flow Code	LDEQ Flow Description
0 = Not Applicable	Used for lakes, estuaries, bays with no normal flow or only tidal flows.
1 = Dry	Streambed is completely dry with no visible pools.
2 = Intermittent	Streambed has water visible in naturally occurring isolated pools.
3 = No Flow	Streambed has water from bank to bank but flow is not detectable.
4 = Low Flow	Flows are detectable.
5 = Normal Flow	Flows greater than low flow but stay within the stream channel.
6 = High Flow	Flows that leave the normal stream channel but stay within the stream banks.
7 = Flood	Flows that leave the normal confines of the stream channel and move out on to the flood plain over the stream bank (either side of the stream).

Suspected Sources of Impairment

In addition to the use of water quality data in making assessments, LDEQ, Office of Environmental Compliance, Surveillance Division staff familiar with local watershed conditions and activities provide input regarding significant suspected sources of impairment. Surveillance Division staff also provide input in cases where natural sources were potentially causing criteria exceedances. In such cases, LDEQ will evaluate the need for a Use Attainability Analysis or other water quality survey for potential criteria revision. Suspected sources for all water body impairment combinations are provided in the 2022 IR Appendix A spreadsheet and USEPA's ATTAINS database.

Integrated Report Category Determination

LDEQ made a preliminary determination of IR categorization (Table 3.2.1) based on statistical assessment of criteria exceedances and subsequent determination of a water body's designated use support (Table 3.2.2). LDEQ used additional information such as previous TMDL development (IRC 4a), insufficient data determinations (IRC 3), environmental events (e.g., droughts, severe weather, oil spill) (IRC 3 or IRC 4b), remediation activities (IRC 4b), and suspected sources of impairment to determine appropriate IR categories. Multiple IR categories may be assigned to a single subsegment which has multiple criteria for multiple uses.

IR Category 3 was used for selected subsegments with potential nutrient enrichment concerns but which did not already have a TMDL developed. Listings for nitrate/nitrite nitrogen and total phosphorus were historically based on evaluative assessments. However, the evaluative assessments were based on best professional judgment with no numeric nutrient criteria basis. LDEQ is currently coordinating with USEPA to collect data that will inform the nutrient criteria development process and allow more appropriate assessments in the future.

Total Maximum Daily Load Prioritization

The CWA Section 303(d) Program provides a mechanism for integration of implementation efforts to restore and protect the nation's aquatic resources. Through this process the nation's waters are assessed, restoration and protection objectives are systematically prioritized, and TMDLs and

alternative approaches are adaptively implemented to achieve water quality goals with collaboration of state and federal agencies, tribes, the regulated community, and the public. A New Vision has been described whereby states may identify and prioritize water bodies for these restoration and protection efforts under the §303(d) Vision Program (USEPA 2013). The primary goals/elements of this vision include prioritization, assessment, protection, TMDL alternatives, engagement, and integration.

This vision requires that states establish a prioritization framework by which the states will establish a list of priority watersheds to be addressed during the period FY2016-FY2022. As a part of the first round of the New Vision, LDEQ developed such a framework and solicited public feedback. Comments received were considered during the development of the final list of priority watersheds. The prioritization framework was made available to the public via LDEQ's website at: http://deq.louisiana.gov/page/clean-water-act. Electronic notices were sent out via Louisiana's electronic notification system.

In addition to conducting a public review of the prioritization framework, LDEQ delivered presentations at various conferences and workshops to inform stakeholders and the public. LDEQ also met with various state agencies, local governments, and watershed-based organizations. LDEQ commits to continuing engagement with stakeholders and the general public as it undertakes the next round of the New Vision. The list of priority watersheds for the next round of the New Vision are shown below in Table 3.2.8.

Table 3.2.8.

Draft list of TMDL candidate watersheds for the period FY2023 – FY2032.

Subsegment	Water Body Name	Projected Plan Type
LA050304_00	Bayou Blue	New TMDL (fecal coliform)
LA050201_00	Bayou Plaquemine Brule	TMDL Revision (dissolved oxygen)
LA030802_00	Hickory Branch	New TMDL (dissolved oxygen)
LA020101_00	Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou	TMDL Revision (dissolved oxygen)
LA040701_00 LA040702_00 LA040703_00 LA040704_00 LA040705_00	Tangipahoa River, Big Creek, Chappepeela Creek, and Bedico Creek	TMDL Alternative
LA020101_00	Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou	New TMDL (fecal coliform)
LA030505_00	Contraband Bayou	TMDL Revision (dissolved oxygen)
LA040102_00	Comite River	TMDL Alternative

LDEQ expects that alternative plans are the most appropriate means to achieve the water quality standards in many watersheds since the impairment issues are likely caused by conditions outside the regulatory impacts of traditional TMDLs. Such conditions may include nonpoint source loads (including individual treatment units in unsewered areas), unpermitted dischargers, or permitted dischargers that are not meeting the limits provided in the current permit limits.

LDEQ anticipates that, in general, the alternative plans may include the tasks listed below. The actual plans may vary on a case-by-case basis based on the conditions and characteristics of the individual water body.

General Alternative Plan Structure:

1. Investigative activities
    a. Water body monitoring
    b. Discharger inventory review
    c. Loading estimations (as needed based on the appropriate available data)
    d. Facility inspections
    e. Individual unit inspections
    f. Work with local stakeholders, governments, & organizations
        i. Education and outreach
    g. Pre-plan monitoring
2. Plan development
3. Implementation
    a. Assist local stakeholders, governments, & organizations
        i. Education and outreach
        ii. Development of ordinances as needed
        iii. Regionalization
    b. Implementation of BMPs
    c. Assist with required upgrades for
        i. Permitted
        ii. Unpermitted facilities (acquire permits)
        iii. Individual homes
    d. Compliance schedules/orders, penalties (as needed)
    e. Monitoring during implementation
4. Post-plan implementation monitoring.

LDEQ has identified several potential partners to assist in activities conducted in the priority watersheds, including but not limited to:

- United States Environmental Protection Agency (USEPA);
- United States Geological Survey (USGS);
- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS);
- Louisiana Department of Health (LDH);
- Louisiana Department of Agriculture and Forestry (LDAF);
- Louisiana Department of Wildlife and Fisheries (LDWF);
- Louisiana Department of Natural Resources (LDNR);
- Coastal Protection and Restoration Authority (CPRA);
- Pontchartrain Conservancy (PC);
- Universities;
- local governments;
- local watershed-based organizations; and
- local watershed coordinators currently under LDEQ contract.

Funding for TMDLs and alternatives is expected to be provided by various sources. The primary sources are expected to be performance partnership grants, §106 grants (pollution control), §319 grants (nonpoint source management), and the State Revolving Loan Fund. Additional funding or other assistance may be provided by partnering agencies and organizations. Monitoring will be conducted to evaluate the progress of each individual plan. Ambient monitoring may serve as the primary source of monitoring, with additional monitoring conducted as needed. Plans will be adaptively managed to allow for necessary updates or changes in conditions. Plans will also be reviewed periodically to determine if the activities are being effective or if changes are needed and ensure that activities are being conducted appropriately.

All water body impairment combinations in IRCs 5 or IRC 5RC and not previously identified under the §303(d) Vision protocols were prioritized as follows:

1. WICs listed in IRC 5 with drinking water source or oyster propagation designated uses with suspected impairments due to fecal coliforms or organic compounds were given medium priority.
2. WICs listed in IRC 5 with suspected impairments due to fecal coliforms or organic compounds in subsegments *without* drinking water source or oyster propagation designated uses were assigned low priority for TMDL development.
3. WICs listed in IRC 5RC were assigned low priority for TMDL development to allow LDEQ time to evaluate the need for updated criteria.
4. WICs listed in IRC 5 for enterococci bacteria impairments based on LDH beach monitoring data or LDEQ ambient water quality monitoring data were assigned low priority to allow LDEQ time to coordinate with USEPA on source and epidemiological studies.
5. WICs listed in IRC 5 for the following suspected impairments were assigned low priority due to the non-critical nature of the impairments or due to uncertainty regarding the validity of the suspected impairment (e.g., natural conditions, lack of apparent anthropogenic sources, sources outside the scope of TMDL development):
    - Low or high pH
    - Metals
    - Chlorides, sulfates, total dissolved solids
    - Temperature
    - Turbidity
    - Mercury in fish tissue (primary source is regional/global atmospheric deposition)
6. All other WICs not previously mentioned were assigned low priority.

Summary

The 2022 IR §303(d) list represents a compilation of primarily four different sources of information: (1) the 2020 IR; (2) new data assessments for all 12 Louisiana basins with monitoring data (internal and third-party) between October 2016 and September 2020; (3) all recent TMDL activities occurring during or after development of the 2020 §303(d) list; and (4) current fish consumption and swimming advisories in Louisiana. It is important to note that removal of a water body from the §303(d) list, for any reason, does not remove water quality protections from that water body. All water bodies in Louisiana, §303(d) listed or not, are subject to the same protections under federal and state laws and regulations, in particular the CWA and Louisiana's surface water quality standards (LAC 33:IX.Chapter 11). LDEQ will continue to monitor and assess the quality

of Louisiana's waters; permitted facilities are subject to conditions of their permits; unpermitted point source dischargers are required to obtain a permit or face enforcement actions; violators of permit conditions are subject to enforcement action; and contributors to nonpoint sources of pollution are encouraged to follow BMPs as developed by LDEQ's NPS Program and its many collaborators.

Chapter 3: Integrated Report Category 4b Documentation

Introduction

Integrated Report Category 4b (Table 3.2.1) was used for WICs where a TMDL is not required or appropriate as a corrective mechanism for improving water quality. USEPA requires well documented justification for placement of a WIC in IRC 4b. The following sections outline the water bodies and subsegments categorized as IRC 4b and information to address USEPA's six factors to provide sufficient documentation to place in 4b (USEPA 2002, USEPA 2005, USEPA 2006).

Bayou Olsen/Olsen Bayou, Subsegment LA030304_001

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Bayou Olsen/Olsen Bayou (subsegment LA030304_001, hydrologic unit code (HUC) 08080206), is located in southwestern Louisiana within the zone of tidal influence of the Gulf of Mexico. Bayou Olsen is approximately 0.5 mile long and lies within a larger water quality subsegment, Moss Lake (subsegment LA030304_00, HUC 08080206). Bayou Olsen is a tributary of Moss Lake.

Impairment and pollutant causing impairment

Bayou Olsen LA030304_001 is listed as impaired in Louisiana's 2022 Water Quality IR based on an LDEQ and LDH swimming advisory limiting primary contact recreation. Bayou Olsen is listed as not fully supporting the Primary Contact Recreation designated uses as a result of 1,1,2-trichloroethane, 1,2-dichloroethane, and chloroform. In 1989, LDEQ and LDH issued an advisory against swimming and sediment contact (reviewed 1994, see https://deq.louisiana.gov/assets/docs/Water/Fish_Swim_Advisories/Fish_Consumption_Advisory_Table-10-7-21_with_subsegments.docx and also http://ldh.la.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/20181221ADVI SORIESTABLEOtherChemicals.pdf).

Sources of pollutant causing impairment

Adjacent to Bayou Olsen is the Carlyss Pit Remediation Site. The site was owned and operated by an independent disposal company from the late 1950s to 1971. During that time, waste materials, primarily liquid chlorinated hydrocarbons (LCH), were taken to the site and burned. Burning operations were subsequently discontinued, and the site was used for disposal of liquid wastes in surface impoundments or "ponds." In the past, Bayou Olsen received overflow from the waste ponds, which are located east of Highway 27 and 8.5 miles south of Sulphur, Louisiana.

VOCs were detected in Bayou Olsen sediments adjacent to the Carlyss Pit site. However, 2006 baseline surface water monitoring of Bayou Olsen implemented according to the LDEQ-approved Remedial Project Plan (RPP) for this site failed to demonstrate detectable levels of VOCs in the water column. Sampling was repeated in 2013 as described in *Bayou Sediments Area of Interest (AOI) Monitoring Report for 2013 Carlyss Pit #1 Site, Carlyss, Louisiana AI #7836* (Geosyntec, January 15, 2014, available at: https://edms.deq.louisiana.gov/app/doc/view?doc=9161181&key=87ed5b12-9969-458d-a1d2-a3d60ed984dc). This data supports the continued absence of site-related surface water impacts to Bayou Olsen from cross-media transfer of VOCs from the sediments.

Groundwater monitoring was approved by LDEQ July 21, 2015, in which installation of monitoring wells were authorized as described in the *Work Plan for Phytoremediation Pilot Test and Installation of Off-Site Monitoring Wells for Milestone 1 Groundwater and Contributing Subsurface Soils AOI, Carlyss Pit #1, Site AI#7836* (Geosyntec, August 6, 2015 http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9894996&ob=yes&child=yes).

Although sediment deposition appears to be occurring adjacent to the berm and the top six inches of sediment in this area meet the Remedial Criterion, it was recommended in *Bayou Sediments AOI Monitoring Report for 2015* (Geosyntec, January 4, 2016, see https://edms.deq.louisiana.gov/app/doc/view?doc=10047586&key=ca1bcb62-eb8b-4b52-9499-38923b90f795) that potential alternatives be evaluated to increase the protectiveness of the remedy given the recent trend in sediment VOC concentrations at transect BL1. The Companies developed a plan for additional bayou-related activities to address this trend, including additional sampling as appropriate, and submitted the plan to LDEQ on April 4, 2016 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10152206&ob=yes&child=yes). Sediment characterization activities that were conducted to address these recommendations concluded that the increasing trend appeared to have reversed and declined since 2015 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10286481&ob=yes&child=yes).

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

For the primary contact recreation designated use, LAC 33:IX:1113.C Table 1 specifies a 1,1,2-trichloroethane criterion of 6.9 µg/L for non-drinking water supply and a 1,2-dichloroethane criterion of 6.8 µg/L for non-drinking water supply.

For chloroform, LAC 33:IX:1113.C Table 1 specifies a criterion of 70 µg/L for non-drinking water supply to protect for primary contact recreation.

For aquatic life protection, LAC 33:IX:1113.C Table 1 specifies 1,1,2-trichloroethane criteria of 1,800 µg/L (acute) and 900 µg/L (chronic) for freshwater and brackish water; LAC 33:IX:1113.C.Table 1 specifies 1,2-dichloroethane criteria of 11,800 µg/L (acute) and 5,900 µg/L (chronic) for freshwater and 11,300 µg/L (acute) and 5,650 µg/L (chronic) for marine and brackish water.

For chloroform, LAC 33:IX:1113.C Table 1 specifies criteria of 2,890 µg/L (acute) and 1,445 µg/L (chronic) for freshwater and brackish water and criteria of 8,150 µg/L (acute) and 4,075 µg/L (chronic) for marine water to protect aquatic life.

Water column results since at least 2006 have shown no detectable levels of VOCs in the Bayou Olsen water column; however, the advisory issued by LDH remains in place. Additional sediment sampling and communication between LDEQ and LDH will be required to lift the LDH advisory and remove these compounds as suspected causes of impairment.

Controls that will achieve Water Quality Standards

Work began in June 1990 and was substantially completed by February 1992; approximately 1.5 million gallons of LCH were removed from the waste ponds. A Pond Closure Work Plan submitted to close the Carlyss Pit waste ponds was approved in May 1994. Work began in 1994 with the treatment of 6.9 million gallons of water from the Carlyss Pit waste ponds. Following water treatment, the waste ponds were filled with 185,000 cubic yards of clay and very low permeability soil. Subsequently the ponds were covered with clean topsoil, and

vegetation was established. Natural attenuation of Bayou Olsen sediments was determined to be the best option for sequestration of remaining contaminants in the bayou. Reinforcement of the berm separating the former east pond from the bayou was completed in the fall of 2013.

Descriptions of requirements under which pollution controls will be implemented
An Interim Agreement was entered into by LDEQ on February 6, 1985 with Browning-Ferris Industries (BFI) and Conoco Inc. to perform work at the site. A preliminary Interim Remedial Action Plan was developed in August 1987 directing the companies to implement remedial activities, including removal of LCH from Bayou Olsen. In February 1990, BFI and Conoco, Inc. submitted the LCH Reclamation Work Plan, which was approved by LDEQ.

A Pond Closure Certification Report was submitted to LDEQ in October 1995. In February 1998, LDEQ indicated all companies had met all requirements for remediation of the site (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=77580&ob=yes&child=yes).

LDEQ has approved a Monitored Natural Recovery as the remedy for the Bayou Sediments AOI (LDEQ letter dated November 30, 2007, available at: https://edms.deq.louisiana.gov/app/doc/view?doc=5985059&key=0b58edcc-c966-479d-9284-4ea537026ed5).

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

The Monitored Natural Recovery Remedy reduced potential ecological risks by allowing natural sedimentation to occur, thereby isolating the deeper sediments with higher concentrations of VOCs. Until data is available to indicate otherwise, LDEQ will continue to report this water body as impaired due to 1,1,2-trichlorethane, 1,2-dichloroethane, and chloroform. Future sampling data will be used to determine when the water body is fully supporting primary contact recreation uses.

4) Schedule for Implementing Pollution Controls

Remediation activities at the site have been completed.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

Surface water monitoring is currently being implemented as described in the *Remedial Project Plan for Long-Term Monitoring of the Bayou Sediments AOI* (RPP, Geosyntec, March 11, 2008, see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3412809&ob=yes&child=yes) that was approved by LDEQ in a letter dated April 9, 2008 (available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3443861&ob=yes&child=yes).

In addition to annual site inspections, surface water sampling was initially planned biennially, subject to LDEQ-approved schedule modifications. Sediment and surface water sampling events were conducted six times between 2008 and 2016. The most recent surface water sampling event occurred October 24, 2018 (see https://edms.deq.louisiana.gov/app/doc/view.aspx?doc=11565731&ob=yes&child=yes). According to the RPP of March 11, 2008, monitoring will be conducted until the remedial objectives for sediments have been attained and compliance with surface water quality standards demonstrated. Monitored Natural Attenuation continues to achieve protection of surface water and the area downstream of the former ponds, as the higher concentrations of site-related VOCs are remaining at depth and are overlain by cleaner accumulating sediment.

As discussed in the *Annual Groundwater Monitoring Report for* 2016 (Geosyntec, March 17, 2017 http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10553014&ob=yes&child=yes), ground water sampling was extended in 2017 as described in the *Work Plan Addendum: Zone III/IV Engineered Phytoremediation Pilot Test, Carlyss Pit #1, Site AI #7836* (Geosyntec, https://edms.deq.louisiana.gov/app/doc/view?doc=10574851&key=1bfcee64-c3bb-457f-8942-77d60fabdf1e).

Until such time as the impairment can be removed, IRC 4b remains the most suitable classification for the water body due to the known nature of the impairment and the ongoing remediation inspection actions described above. The remediation site continues to be inspected on an annual basis, and an Annual Corrective Action Plan (CAP) System Report is submitted to LDEQ. The most recent 2020 CAP report is available at: https://edms.deq.louisiana.gov/app/doc/view?doc=12527770.

6) Commitment to Revise Pollution Controls, As Necessary

No further controls are expected to be needed. As stated in the March 11, 2008 RPP, if monitoring results indicate that the remedial objectives will not be met or that the site is causing adverse impacts to the designated water use, then the responsible parties will review the cause for this and the appropriateness of the Monitored Natural Recovery Remedy and may propose enhancements or changes to the remedy, if required. All modifications to the RPP will be subject to LDEQ approval before implementation.

Capitol Lake, Subsegment LA070503_00

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Capitol Lake (subsegment LA070503_00, HUC 08070201) is a small manmade lake formed between 1901 and 1908 when the lower reach of Grass Bayou was dammed approximately 0.25 mile east of the Mississippi River. The lake is located in downtown Baton Rouge adjacent to the State Capitol and the Governor's Mansion. It has a surface area of approximately 60 acres, and its depth varies from one foot in the northern arm to a maximum of eight feet in the southwestern arm. The average depth ranges between four and six feet. Capitol Lake drains an area of approximately 4.5 square miles, consisting primarily of residential, commercial and industrial land uses. The lake receives drainage from two unnamed canals, which are subsurface storm sewers in their upper reaches. At the southwest end of the lake, there is a pumping station, which is the only outlet for the lake. The East Baton Rouge City Parish government operates this pumping station. It is usually turned on only during storm events and discharges to the Mississippi River. Thus, Capitol Lake is a mostly stagnant system that is only flushed during storm events.

Impairment and pollutant causing impairment

Capitol Lake is listed in Louisiana's 2022 Water Quality IR as not fully supporting the fish and wildlife propagation use as a result of suspected impairment from PCBs. Capitol Lake is under a "no fish consumption" advisory issued by LDEQ and LDH (see https://deq.louisiana.gov/assets/docs/Water/Fish_Swim_Advisories/Fish_Consumption_Advisory_Table-10-7-21_with_subsegments.docx and http://ldh.la.gov/__assets/oph/Center-EH/envepi/fishadvisory/Documents/20181221ADVISORIESTABLE__OtherChemicals.pdf). The advisory was initiated in 1983 due to the presence of PCBs in fish tissue, surface water,

and sediments (see http://edms.deq.louisiana.gov/app/doc/ view.aspx?doc=7386802&ob=yes &child=yes). The advisory was reviewed in 1994 and again in 2018 and remains in effect. Additional information on Capitol Lake water quality can be found in LDEQ's EDMS at: http://edms.deq.louisiana.gov/app/doc/querydef.aspx, AI#5040 and AI#91420.

Sources of pollutant causing impairment

Pollutant sources to Capitol Lake include both point and nonpoint sources, specifically, discharges, spills and urban stormwater runoff. Investigations were conducted in Capitol Lake by LDEQ's predecessor agencies in 1972, 1973, and 1981 for oil contamination. In 1981, Kansas City Southern Railroad was found to be a significant source of pollution. Later, enforcement actions against responsible industries were issued and corrective measures taken. However, oil and other pollutants continued to accumulate in the lake system, running off from urban surfaces such as streets, parking lots, gasoline stations, industrial and commercial facilities, and residences. In 1983, LDEQ's predecessor agency investigated a complaint concerning the discharge of oily wastes into the northern tributary of the lake system. The investigation revealed that oily wastewater, primarily from oil spillage and an underground storage tank leak, was draining into the canal from a Westinghouse Electric Corporation facility. Analysis of water samples revealed that PCBs were present in runoff water, canal water, and water from the center of the lake. PCBs were also found in fish tissue samples.

Investigation of other sources of pollution resulted in the issuance of enforcement actions and compliance orders requiring the cessation of discharge of oily waste or contaminated wastewater and control of discharges in excess of permit limits against Furlow-Laughlin Equipment Company Inc.; American Asphalt Corporation; City of Baton Rouge and Parish of East Baton Rouge; Comet Distribution Services Inc.; Kansas City Southern Railroad; and Road Runner Motor Re-builder Inc. It was also determined that none of the facilities were contributing PCBs. Other facilities that were possible sources of nonpoint PCB contaminated stormwater runoff from the storage of transformers, electric motors, and heavy equipment included the Louisiana Division of Administration Surplus Property Yard, U.S. Government Surplus Property Yard, and the Louisiana National Guard Armory, all located east of the lake.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

For total PCBs, LAC 33:IX:1113.C.Table 1 specifies a freshwater chronic criterion of 0.0140 µg/L for aquatic life protection and a non-drinking water supply criterion of 5.61×10^{-5} µg/L to protect for primary and secondary contact recreation and fish consumption.

For PCBs in fish tissue, a final screening level of 270 µg/kg is suggested in Tissue Screening Level Guidelines for Issuance of Public Health Advisories for Selected Contaminants (March 2012, available at: http://deq.louisiana.gov/assets/docs/Water/Fish_Swim_Advisories/TSL_Documentation_March_2012.pdf).

Controls that will achieve Water Quality Standards

In 1985-86, Westinghouse complied with LDEQ's directive by removing PCB-contaminated soils from its property, installing a French drain system to contain groundwater contamination, and installing a stormwater culvert system through its property, allowing drainage canal stormwater to pass through without contacting PCB-contaminated soil.

Because concentrations of PCBs in the lake sediment are below the 50 ppm level required for designation as a hazardous waste site, Capitol Lake did not rank as a high priority for cleanup funding. Under the federal Superfund Program, this level of contamination is not considered an environmental emergency. Therefore, funding for cleanup has been from sources other than federal monies. Data indicate that the contaminated sediments do not pose a direct threat to the public or to area groundwater. However, the advisory on consumption of fish from the lake system remains in effect.

Descriptions of requirements under which pollution controls will be implemented

Analytical results confirmed that Westinghouse Electric Corporation was a major contributor of PCBs to the northern part of the lake. A compliance order was issued to Westinghouse Electric Corporation requiring the facility to stop all oil-contaminated discharges, to submit plans for evaluation of the extent of PCB contamination in surface and subsurface soils at and surrounding the property, and for the removal and/or containment of PCB contamination (https://edms.deq.louisiana.gov/app/doc/view?doc=4007642&key=efcbfeab-55b8-43ed-957e-db64fff2e991). Westinghouse Electric Corporation signed a settlement agreement with LDEQ establishing the framework and timetable for cleanup and containment of PCB contamination at the facility and establishing an automatic monetary penalty system if the company failed to fulfill any provision (additional documents are available in LDEQ's EDMS, under AI#2056, (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4007634&ob=yes&child=yes).

In 1988, the Louisiana Legislature created the Capitol Lake Task Force with the purpose of studying and making recommendations on how to preserve and enhance the qualities of Capitol Lake. This task force found that Capitol Lake was seriously contaminated and requested that the governor create a commission to begin implementing the long-term solutions proposed by the Task Force.

In February 1991, an additional report on the chemical contamination of Capitol Lake sediments was submitted to LDEQ, including the conclusion that there was no additional PCB contamination. Later in this same month LDEQ's Inactive and Abandoned Sites Division issued compliance orders against Kansas City Southern Railroad and Louisiana Oil and Re-refining Company, Inc. The compliance orders required these companies to submit to LDEQ a work plan for remedial investigation and feasibility studies and to begin execution of the work plans no later than 90 days after approval of the plans. In May 1991, the Kansas City Southern Railroad was also issued a compliance order by LDEQ for violating its water discharge permit. In June 1992, LDEQ issued a "cease and desist" order shutting down the Louisiana Oil and Re-refining Company; the owner pleaded guilty to federal charges of conspiracy to illegally discharge pollutants. The owner was sentenced to prison and fined.

In 1993, because of the presence of PCBs in the lake, LDEQ initiated an extensive survey of Capitol Lake with the objectives of: (1) determining whether any exposure risk existed for people consuming fish from the lake system, (2) determining the extent and levels of contamination in the lake system, (3) determining any impacts upon the lake system's biological community, (4) confirming the extent and levels of contamination at the Westinghouse Electric Corporation facility, and (5) determining whether other sources of oil contamination were contributing PCBs to the lake system.

In January 1993, the governor signed an executive order creating the Governor's Commission on the Capitol Lake Rehabilitation Project and designated the LDEQ Secretary as chairman. LDEQ Office of the Secretary designed and conducted an environmental assessment of the Capitol Lakes system in 1997-1998. LDEQ collected and examined representative water, sediment, and fish tissue samples in sufficient quantity and quality to answer questions about human health risk posed by long-term exposure to toxic substances present in the lake system. The agency released a draft Risk Evaluation/Corrective Action Program (RECAP) risk assessment document in November 1998 that calculated and reported health risk. The health risk assessments included all possible pathways of human exposure to the constituents of concern at the concentrations found in the lake system's fish tissues and sediments. The RECAP risk assessment was amended, once in May 1999, and again in February 2000 (see https://edms.deq.louisiana.gov/app/doc/view?doc=4985478&key=c4819e3f-3ed9-4c72-bafd-5b366c993549). Each revision responded to issues that were raised during the review of the draft RECAP risk assessment document. Through the risk assessment process for the lake system, LDEQ concluded that human health risks posed by exposure to the lake system, including consumption of edible fish, are within regulatory limits.

Composite fish samples were once again collected from Capitol Lake in July and September of 2017 for PCB congener and pesticide analysis. Sampling was conducted by staff from the Louisiana Department of Wildlife and Fisheries and the Louisiana Department of Environmental Quality. The Louisiana Department of Health conducted the risk assessment analysis of the data. As of this writing, the current no fish consumption advisory due to PCBs continues to be recommended. Pesticides were found to be below screening levels use by the responsible agencies.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

In May 2002, LDEQ issued a statement of No Further Action, concluding that the Capitol Lakes system does not require any further management for protection of human health and environment. The June 17, 2002 decision documents are available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=1224436&ob=yes&child=yes. Capitol Lake will continue to be reported as impaired on the IR until the "no fish consumption" advisory has been lifted.

4) Schedule for Implementing Pollution Controls

LDEQ has determined that no further pollution controls are needed.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

The most recent fish tissue analysis for PCBs occurred in July and September 2017 (see https://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10892034&ob=yes&child=yes). LDEQ will continue to monitor Capitol Lake as part of the routine AWQMN. PCB sampling as part of the routine monitoring may take place as resources allow.

6) Commitment to Revise Pollution Controls, As Necessary

Based on the known nature of the suspected contamination and the LDEQ remediation decision reached on June 17, 2002, IRC 4b remains the most suitable classification for the 2022 Integrated Report. LDEQ will continue routine water quality monitoring of Capitol Lake as

part of the AWQMN. LDEQ will continue to work with LDH to determine if and when the advisory can be removed.

Devil's Swamp Lake and Bayou Baton Rouge, Subsegment LA070203_00

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Devil's Swamp Lake (subsegment LA070203_00, HUC 08070201) is a manmade lake near Scotlandville in East Baton Rouge Parish, Louisiana. The lake was created in 1973 by excavation of borrow material for construction of levees at the Baton Rouge Barge Harbor. The oxbow-shaped lake, which has an approximate surface area of 24 acres, is in a large flood plain area north of the city of Baton Rouge. Devil's Swamp Lake is surrounded by low-lying bottomlands and receives drainage from the adjacent swamp, Devil's Swamp. The swamps to the north and south of the lake are characterized by numerous small open ponds and water tupelo trees; surface water flow in the swamp is generally from north to south. The 262-acre swamp to the north of the lake extends approximately one mile to Devil's Swamp Lake. The 684-acre swamp to the south of the lake extends approximately 2.2 miles to the east bank of the Mississippi River and is subject to frequent backwater encroachment from the river. The lake is approximately 0.75 mile in length, 400 feet wide, and 20 feet deep at its deepest parts. Devil's Swamp Lake also receives discharges and stormwater runoff from a hazardous waste facility northeast of the lake and from some industrial facilities, and it receives floodwater from the Mississippi River during high flow periods. During flood conditions, the western and northern boundaries of the lake are indistinct because it coalesces with water of the surrounding swamp. Bayou Baton Rouge drains through Devil's Swamp and flows south into the Mississippi River upstream from the Baton Rouge Harbor Canal (see USGS report at http://pubs.usgs.gov/sir/2006/5301/pdf/sir2006-5301.pdf).

Impairment and pollutant causing impairment

Devil's Swamp Lake is listed in Louisiana's 2022 Water Quality IR as not fully supporting the fish and wildlife propagation due to the presence of unacceptable levels of PCBs and mercury in crawfish and finfish. The designated use of primary contact recreation remains impaired due to the possible presence of arsenic, hexachlorobenzene (HCB), hexachlorobutadiene (HCBD), lead, and mercury in sediments.

Sources of pollutant causing impairment

Industrial facilities have discharged to the swamp surrounding Devil's Swamp Lake since the 1960s. 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), now known as Clean Harbors Environmental Services. Following these analyses, both LDEQ and LDH tested for toxic substance residues in edible tissues of fish samples collected from the lake. The tissue analyses revealed PCB concentrations below the Food and Drug Administration action level. However, concentrations of HCB and HCBD were found at levels above action levels protecting against long-term chronic exposure (see https://www.atsdr.cdc.gov/HAC/pha/DevilsSwampLake/DevilsSwampLakeHC082906.pdf). In addition, high levels of lead, mercury, and arsenic were present.

Following review of the analytical results, the state epidemiologist recommended issuance of an advisory against swimming in and consumption of fish from Devil's Swamp Lake. LDH, LDEQ, and LDWF issued a joint advisory in October 1987. The agencies issued a revised health advisory that included the remainder of Devil's Swamp and Bayou Baton Rouge in June 1993. On August 12, 2015 the three agencies issued the most recent revision to the Devil's Swamp advisory. The revised advisory recommends no swimming or other primary contact water sports and no consumption of fish or crawfish from the area. 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 the former 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 (see https://deq.louisiana.gov/assets/docs/Water/Fish_Swim_Advisories/Fish_Consumption_Advisory_Table-10-7-21_with_subsegments.docx and also http://ldh.la.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/20181221ADVISORIESTABLEOtherChemicals.pdf).

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

For arsenic, LAC 33:IX:1113.C.Table 1A specifies a criterion of 10.0 µg/L for both human health protection and drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There is no human health protection, non-drinking water criterion for arsenic. The human health protection and drinking water supply criterion for arsenic is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

For HCB, LAC 33:IX:1113.C Table 1 specifies a criterion of 2.5×10^{-4} µg/L for non-drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There are no freshwater acute and chronic aquatic life protection criteria for HCB.

For HCBD, LAC 33:IX:1113.C Table 1 specifies a criterion of 0.11 µg/L for non-drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. The non-drinking water supply criterion for HCBD is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

For lead, LAC 33:IX:1113.C Table 1A specifies a criterion of 50.0 µg/L for both human health protection and drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There is no human health protection, non-drinking water criterion for lead. The aquatic life freshwater acute and chronic criteria are hardness dependent. Based on the lowest acceptable hardness value of 25 mg/L used in calculating lead criteria values, the lowest possible chronic lead criterion for aquatic life protection is 0.54 µg/L.

For methylmercury in fish tissue, a final screening level of 230.0 µg/kg is suggested in *Tissue Screening Level Guidelines for Issuance of Public Health Advisories for Selected Contaminants* (March 2012. see http://deq.louisiana.gov/assets/docs/Water/Fish_Swim_Advisories/TSL_Documentation_March_2012.pdf).

For total PCBs, LAC 33:IX:1113.C Table 1 specifies a criterion of 5.61×10^{-5} µg/L for non-drinking water supply and to protect for primary and secondary contact recreation and fish consumption. The human health protection and non-drinking water supply criterion for PCBs

is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

Controls that will achieve Water Quality Standards

The land use and hydrology of the watershed is complex and is divided into five areas for investigational purposes:

- North and west of Petro-Processors (Petro-Processors is a National Priorities List (NPL) site located in the Devil's Lake watershed): This area has not been extensively studied; however, no contaminants associated with industrial activities have been detected at concentrations in excess of background levels in samples from this area. Based on hydrology and drainage patterns, it is unlikely that wastes from industrial activities affect the area.
- 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 NPL site extensively impacted the northeast corner of this area. This area has been extensively investigated and is being remediated under a 1984 Consent Decree. 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 dechlorinated. The groundwater is also undergoing remediation by natural attenuation. This area also has an oxygen-reducing environment that allows natural dechlorination of the contaminants.
- Area bounded by the southern boundary of the area described in the preceding bullet and the northern end of Devil's Swamp Lake: There are scattered detections of chlorinated organics at concentrations that are well below levels that pose threats to the environment or human health.
- 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 the second bullet, above, and by PCBs. The probable source of these contaminants is the former RES site. USEPA is in the process of listing this site on the NPL. The state of Louisiana has agreed with this action.
- South Swamp: This is the area to the south and west of Devil's Swamp Lake that has not been impacted by either the RES site or the Petro-Processors site.

Descriptions of requirements under which pollution controls will be implemented

The Devil's Swamp Lake site was proposed for addition to the NPL in the Federal Register on March 8, 2004. USEPA completed evaluation and negotiations with some Potentially Responsible Parties (PRPs) and issued a Unilateral Administrative Order to PRPs to conduct a Remedial Investigation/Feasibility Study on December 3, 2009. As of December 2015 PRPs completed a Final Tier 2 Remedial Investigation Report that was made available to the public at the Scotlandville Branch of the East Baton Rouge Parish Library. For a history of site enforcement and cleanup actions, see USEPA ID LAD981155872, Devil's Swamp Lake at: https://semspub.epa.gov/work/06/500014767.pdf.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

Devil's Swamp Lake is currently under USEPA lead for the NPL. The Feasibility Study Technical Memorandum was completed on December 2, 2016; and the Feasibility Study Report was completed on June 1, 2018. Site documents and data are available at: https://www.epa.gov/superfund/devils-swamp-lake.

Devil's Swamp Lake will continue to be reported as impaired for the various WICs until the conclusion of all remediation actions and determination of full support. A fish consumption and swimming advisory remain in place for the area until PCB and other contaminant levels in fish, water, and sediment decline to the point where such an advisory is no longer needed.

Based on the well-established nature of the contamination issues and the ongoing NPL actions, IRC 4b remains the most suitable classification for this water body. Sampling data will be used to determine when the water body is fully supporting fish and wildlife propagation and primary contact recreation uses.

4) Schedule for Implementing Pollution Controls

The February 10, 2012 Tier 1 Remedial Investigation Report contains the collection of sample data and summaries for the site (available on LDEQ's EDMS under AI#86800, http://edms.deq.louisiana.gov/app/doc/querydef.aspx). A Tier 2 Remedial investigation was conducted to collect additional data to support findings in the Tier 1 report and completed October 31, 2015 (available on LDEQ's EDMS under AI#86800, http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9998159&ob=yes&child=yes).

USEPA signed a Record of Decision (ROD) August, 2, 2020 (see https://semspub.epa.gov/work/06/100021716.pdf. The Selected Remedy for cleaning up the site is:

- Cap the drainage ditch to isolate underlying PCBs in sediments, providing a clean sediment surface for habitat restoration and providing protection against erosion from storm events.
- Enhanced Natural Recovery in specific areas to reduce surface sediment concentrations of PCBs–and consequently reduce exposures to fish and the people who consume them. This will provide a clean sediment surface for habitat recovery while minimizing impacts to the swamp.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

Monthly progress reports are submitted by Clean Harbors Environmental Services (formerly Rollins Environmental Services) in accordance with the Administrative Order issued by LDEQ in 2003. See https://edms.deq.louisiana.gov/app/doc/view?doc=12985779 for the latest monthly progress report of October, 2021. LDEQ will continue to monitor Devil's Swamp Lake and Bayou Baton Rouge as part of the routine AWQMN. USEPA will conduct periodic Five-Year Reviews to ensure protectiveness of the remedy.

6) Commitment to Revise Pollution Controls, As Necessary

LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations. LDEQ is also committed to working with responsible parties in determining appropriate remedial actions.

Statewide Louisiana Subsegments Impacted by Non-Native Aquatic Plants

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Subsegments classified as IRC 4b with impairment caused by non-native aquatic plants are located throughout the state of Louisiana. The subsegments encompass rivers, lakes, bayous, tidal channels, and canals and occur in nine of Louisiana's twelve major river basins. Serving as a corridor between the continental United States and the subtropical world beyond the Gulf of Mexico, Louisiana has a humid, subtropical climate with abundant rainfall enabling rapid growth of vegetation. Average annual precipitation varies from 48 inches in the northwestern part of the state near Shreveport to 64 inches in the southeastern coastal plains near Thibodaux. With over one million acres of freshwater lakes/reservoirs, over nine million acres of wetlands, and over 5,000 square miles of estuaries and bays at risk, a substantial portion of Louisiana is threatened by invasive aquatic plants (Table 3.3.1).

Table 3.3.1.

Subsegments not supporting the designated use of fish and wildlife propagation and classified as Integrated Report Category 4b for suspected cause of non-native aquatic plants.

Subsegment Number	Subsegment Description	Water Body Type	Size[1, 2]
LA010701_00	Bayou Teche-From Berwick to Wax Lake Outlet	River	13.9
LA020101_00	Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou	River	40.1
LA020102_00	Bayou Boeuf, Halpin Canal, and Theriot Canal	River	23.4
LA020103_00	Lake Boeuf	Lake	1,760.0
LA020201_00	Bayou Des Allemands-From Lac Des Allemands to old US-90 (Scenic)	River	7.1
LA020202_00	Lac Des Allemands	Lake	16,596.0
LA020301_00	Bayou Des Allemands-From US-90 to Lake Salvador (Scenic)	River	13.7
LA020302_00	Bayou Gauche	River	3.2
LA020304_00	Lake Salvador	Lake	49,477.0
LA020401_00	Bayou Lafourche-From Donaldsonville to ICWW at Larose	River	67.4
LA040401_00	Blind River-From Amite River Diversion Canal to mouth at Lake Maurepas (Scenic)	River	5.1
LA040403_00	Blind River-From headwaters to Amite River Diversion Canal (Scenic)	River	20.3
LA040404_00	New River-From headwaters to New River Canal	River	23.2
LA040602_00	Lake Maurepas	Estuary	90.5
LA060102_00	Cocodrie Lake	Lake	7,310.0
LA060203_00	Chicot Lake	Lake	1,157.2
LA070202_00	Raccourci Old River	Lake	4,592.0
LA080102_00	Bayou Chauvin-From headwaters to Ouachita River	River	6.6
LA100302_00	Black Bayou Lake-From LA-1 to spillway	Lake	4,382.4
LA100406_00	Flat River-From headwaters to Loggy Bayou	River	55.0

Table 3.3.1.

Subsegments not supporting the designated use of fish and wildlife propagation and classified as Integrated Report Category 4b for suspected cause of non-native aquatic plants.

Subsegment Number	Subsegment Description	Water Body Type	Size[1, 2]
LA100502_00	Lake Bistineau	Lake	14,447.0
LA100603_00	Wallace Lake	Lake	2,711.0
LA100605_00	Clear Lake and Smithport Lake; includes old Edwards Lake	Lake	7,252.0
LA100702_00	Black Lake Bayou-From one mile north of Leatherman Creek to Black Lake (Scenic)	River	47.6
LA101302_00	Iatt Lake	Lake	6,280.3
LA110101_00	Toledo Bend Reservoir-From Texas-Louisiana state line to Toledo Bend Dam	Lake	165,487.2
LA120108_00	False River	Lake	3,133.1
LA120110_00	Bayou Cholpe-From headwaters to Bayou Choctaw	River	8.2
LA120204_00	Lake Verret and Grassy Lake	Lake	16,311.3
LA120301_00	Bayou Terrebonne-From Thibodaux to ICWW in Houma	River	14.9
LA120404_00	Lake Penchant	Lake	882.5
LA120405_00	Lake Hache and Lake Theriot	Lake	1,685.4
LA120501_00	Bayou Grand Caillou-From Houma to Bayou Pelton	River	8.3
LA120503_00	Bayou Petit Caillou-From Bayou Terrebonne to LA-24 bridge	River	5.2
LA120504_00	Bayou Petit Caillou-From LA-24 bridge to Boudreaux Canal (Estuarine)	River	11.2
LA120505_00	Bayou Du Large-From Houma to Marmande Canal	River	6.7
LA120506_00	Bayou Du Large-From Marmande Canal to 1/2 mile north of St. Andrews Mission (Estuarine)	River	9.6
LA120507_00	Bayou Chauvin-From Ashland Canal to Lake Boudreaux (Estuarine)	River	12.7
LA120601_00	Bayou Terrebonne-From Houma to Company Canal (Estuarine)	River	7.4
LA120602_00	Bayou Terrebonne-From Company Canal to Humble Canal (Estuarine)	River	9.5
LA120604_00	Bayou Blue-From ICWW to Grand Bayou Canal	River	12.8
LA120605_00	Bayou Pointe Au Chien-From headwaters to St. Louis Canal	River	7.8
LA120606_00	Bayou Blue-From Grand Bayou Canal to Bully Camp Canal (Estuarine)	River	5.9
LA120703_00	Bayou Du Large-From 1/2 mile north of St. Andrews Mission to Caillou Bay (Estuarine)	River	21.5

1. Size Units: River = miles; Lake = acres; Estuary = square miles
2. Water body sizes may be different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

Impairment and pollutant causing impairment

Subsegments shown in Table 3.3.1 are listed in Louisiana's 2022 IR as not fully supporting the FWP designated use as a result of *non-native aquatic plants*. Non-native aquatic plants are included in the NPDES list of pollutants as "biological materials" (see https://www.epa.gov/sites/production/files/2015-09/documents/pwm_app-a.pdf). Invasive aquatic species are rapid colonizers and are competitively superior to most native plants, quickly dominating the aquatic plant community after introduction to a water body. Specific species of non-native aquatic plants were not reported by LDEQ staff making these impairment determinations. However, typical non-native aquatic plants of concern for the reported subsegments may include but are not limited to water hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), giant salvinia (*Salvinia molesta*), and common salvinia (*Salvinia minima*). Many of the following species may also be of concern in the subsegments reported as impaired. All species mentioned below will not be present in all subsegments. According to the *State Management Plan for Aquatic Invasive Species in Louisiana* (Tulane Univ. and Xavier Univ. 2005. http://is.cbr.tulane.edu/docs_IS/Louisiana-AIS-Mgt-Plan.pdf), the following aquatic plants are classified as "extensively established species" that occur in eight or more drainage basins in Louisiana:

- Water hyacinth – South American native; clogs waterways, impedes boat traffic, slows water currents and blocks light to submerged vegetation, thus lowering DO levels
- Chinese Tallow Tree (*Sapium sebiferum*) – introduced for their attractive foliage, these trees can reach thirty feet high and form dense monocultures in wooded areas that inhibit the growth of native trees and shrubs
- Parrot feather (*Myriophyllum aquaticum*) – South American native that can block waterways, preventing fishing and boat traffic and providing ideal mosquito breeding habitat
- Hydrilla – rooted aquatic weed from Asia forms thick mats which can impede boat traffic and swimming, and lower DO levels, killing fish
- Wild taro (*Colocasia esculenta*) – forms dense stands in riparian zones and displaces native vegetation
- Brazilian waterweed (*Egeria densa*) – forms thick mats at the water surface, impeding swimming, boating, and fishing; chokes out native vegetation and degrades water quality and fish habitat
- Eurasian watermilfoil (*Myriophyllum spicatum*) – forms thick mats at the water surface, impeding swimming, boating, and fishing; outcompetes native vegetation and degrades water quality for fish and birds
- Water lettuce (*Pistia stratiotes*) – believed to be native to Africa; impedes swimming, boating, and fishing; degrades water quality for native vegetation and adversely affects fish and bird populations
- Common salvinia – Central and South American native; forms thick mats on the water surface, in some instances up to almost 10 inches deep; shades and outcompetes native plants, diminishing habitat for fish and birds

The following aquatic plants are classified as "locally established species" that occur in three to seven Louisiana drainage basins:

- Giant salvinia – free-floating, rootless plant forms thick mats on the water surface, in some instances up to almost 10 inches deep; shades and outcompetes native plants, diminishing habitat for fish and birds; can double its biomass every seven to 10 days under ideal conditions; chokes waterways and has interfered with floodgate operation
- Cogon grass (*Imperata cylindrica*) (the Louisiana Aquatic Invasive Species (LAIS) taskforce classifies cogon grass as an aquatic invasive because it was introduced through an aquatic pathway and occurs in areas that experience some flooding; it spreads rapidly with a dense growth pattern that creates unsuitable habitat for native plants, insects, mammals, and birds.)

The following aquatic plants occur in fewer than three drainage basins in Louisiana and are classified as "potential arrivals":

- Purple loosestrife (*Lythrum salicaria*) – European native with prolific seed production; disrupts ecosystems by outcompeting native plants, diminishing habitat for fish and birds; clogs irrigation systems and destroys grazing pastures
- "Cylindro" (*Cylindrospermopsis raciborskii*) – an invasive, subtropical, microscopic species of blue-green algae; believed to have been introduced to Florida over 30 years ago and has spread rapidly across North America; highest concentrations below the water surface; produces neurotoxins and hepatotoxins; has caused deaths of humans and wildlife worldwide; outcompetes other algae and can cause public health impacts by its presence in drinking water reservoirs

The *State Management Plan for Aquatic Invasive Species in Louisiana* places Louisiana second only to Florida in number of introduced aquatic plant species, with 32 and 45, respectively.

Sources of pollutant causing impairment

The suspected source of impairment for these IRC 4b subsegments is *introduction of non-native organisms (accidental or intentional)*. Numerous sources state that the history of invasive aquatic plants in Louisiana started with the distribution of water hyacinth at the 1884 World's Industrial and Cotton Centennial Exposition in New Orleans (available at: http://www.lsuagcenter.com/en/communications/publications/agmag/Archive/2010/fall/Invasive-Aquatic-Weeds-in-Louisiana.htm). In this century, Louisiana is home to the busiest port system in the nation in terms of tonnage, offering ready access for invasive aquatic plants to enter state waters from bulk and containerized cargoes and through ballast discharge of ships. Other invasive plants were introduced to Louisiana through the aquarium trade, as a result of nursery sales, and, in the cases of Eurasian water milfoil and Brazilian water weed, possibly by federal authorities with beneficial intent. Many species are also transferred among water bodies on boats and boat trailers. Natural sources are also responsible for the spread of invasive aquatic plants, including wind, flooding, and animals, including birds.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

As stated in LAC 33:IX.1113.B.1, "The waters of the state shall be maintained in an aesthetically attractive condition and shall meet the generally accepted aesthetic qualifications." (see http://deq.louisiana.gov/resources/category/regulations-lac-title-33). As set forth in LAC 33:IX.1113.B.12, "The biological and community structure and function in state waters shall be maintained, protected, and restored except where not attainable and

feasible as defined in LAC 33:IX.1109. This is the ideal condition of the aquatic community inhabiting the unimpaired water bodies of a specified habitat and region as measured by community structure and function…Reference site conditions will represent naturally attainable conditions…this condition shall be determined by consistent sampling and reliable measures of selected, indicative communities of animals…and/or plants as established by the department…" The water quality target can be seen as the preservation and restoration of integrity to the native, balanced biological and aquatic community structure in Louisiana's aquatic ecosystems.

USEPA's NPDES vessels program regulates incidental discharges from the normal operation of vessels. The NPDES vessels program does not regulate discharges from military vessels or recreational vessels. Instead, those are regulated by other USEPA programs under §312 of the Clean Water Act. Incidental discharges from the normal operation of vessels include, but are not limited to, ballast water, bilgewater, graywater (e.g., water from sinks, showers), and anti-foulant paints (and their leachate). These discharges may result in negative environmental impacts via the addition of traditional pollutants or, in some cases, by contributing to the spread of aquatic invasive species (see https://www.epa.gov/sites/production/files/2015-09/documents/ballast14h.pdf).

The Vessel Incidental Discharge Act (VIDA) (Title IX of the Frank LoBiondo Coast Guard Authorization Act of 2018), signed by the President on December 4, 2018 (https://www.congress.gov/115/bills/s140/BILLS-115s140enr.pdf), establishes a framework for the regulation of discharges incidental to the normal operation of a vessel under a new CWA §312(p). Incidental vessel discharges of commerical vessels had previously been regulated under the 2013 Vessel General Permit (VGP), which was effective from April 13, 2013 until December 18, 2018. Under VIDA, USEPA is required to develop new national performance standards for commercial vessel incidental discharges and the U.S. Coast Guard is required to develop corresponding implementation regulations. These new standards and implementing regulations are expected in late 2022; existing requirements established under the 2013 VGP, U.S. Coast Guard ballast water regulations, and state and local requirements remain in effect as interim requirements until these new standards are published (see https://www.epa.gov/npdes/vessels-vgp). Information on stakeholder outreach and engagement in USEPA development of VIDA national standards of performance can be found at https://www.epa.gov/vessels-marinas-and-ports/vessel-incidental-discharge-act-vida-engagement-opportunities.

Management actions described by the LAIS Task Force (see below), should, when implemented, decrease the rate of introduction of invasive aquatic plant species into Louisiana water bodies. It is doubtful that full eradication of invasive aquatic plants will be achieved in light of the numerous natural mechanisms of spread, such as wind, flooding, and birds that cannot be legislated or controlled.

Controls that will achieve Water Quality Standards

The LAIS Task Force convened by order of Governor M. J. Foster determined that "invasive species pose a serious threat to the economic and ecological health of the State of Louisiana" and produced the *State Management Plan for Aquatic Invasive Species in Louisiana-July 2005* (see http://is.cbr.tulane.edu/docs_IS/Louisiana-AIS-Mgt-Plan.pdf). The plan describes the nature and extent of this environmental problem and proposes a coordinated suite of specific management actions to minimize negative impacts.

LAIS Task Force goal and objectives are as follows:

Goal: Prevent and control the introduction of new nonindigenous species into Louisiana, control the spread and impact of existing invasive species, and eradicate locally established invasive species wherever possible.

> Objective 1: Coordinate all aquatic invasive species management activities or programs within Louisiana and collaborate with regional, national, and international aquatic invasive species programs
>
> Objective 2: Prevent and control the introduction/reintroduction of nonindigenous invasive species through education about species and pathways, targeting the general public (including schools), industries, user groups, government agencies, and nongovernmental organizations
>
> Objective 3: Eliminate locally established invasive species through monitoring, early detection, rapid response, and early eradication
>
> Objective 4: Control the spread of established invasive species through cooperative management activities designed to minimize impacts when eradication is impossible
>
> Objective 5: Prevent the introduction of non-native species, or the spread of existing ones, through legislation and regulation

The LAIS Task Force recommended these management actions:

- Hire staff to administer the LAIS Council and Advisory Task Force
- Develop a rapid Response and Early Eradication Plan
- Assess Louisiana ports and waterways for invasive species

Descriptions of requirements under which pollution controls will be implemented

Congress has been concerned about economic and ecological risks from non-native plants since at least 1912, when it passed the Plant Quarantine Act. More recently, Congress passed the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA–see https://www.congress.gov/bill/101st-congress/house-bill/5390). NANPCA was amended and expanded by the National Invasive Species Act of 1996 (see https://www.govtrack.us/congress/bills/104/hr4283) in order to prevent the spread of invasive species and to fund, manage, and disseminate information that will help control the impacts of invasive species. The National Invasive Species Council was established by Executive Order 13112 to ensure that federal programs and activities to prevent and control invasive species are coordinated, effective, and efficient (see http://www.invasivespecies.gov/). Executive Order 13751 in 2016 amended and expanded Executive Order 13112, and directed actions to continue coordinated federal invasive species prevention and control measures (see https://www.doi.gov/sites/doi.gov/files/uploads/eo_13751.pdf).

Taking the mandates of the CWA into consideration, Congress passed the Clean Boating Act of 2008 (available at https://www.epa.gov/vessels-marinas-and-ports/about-clean-boating-act-cba) directing USEPA to develop and promulgate management practices for recreational vessels to mitigate adverse effects from recreational boat discharges such as bilge water, graywater, and deck runoff that may spread invasive species.

The federal government has attempted to control introduction of invasive plant and animal species by requiring commercial shipping interests to submit a ballast water management plan. In March 2012, the Department of Homeland Security/U.S. Coast Guard published the Ballast Water Discharge Standard Rule, adding performance standards for discharges of ballast water (see https://www.ballast-water-treatment.com/en/ballast-water-management-regulation/uscg-bwm-standards).

In Louisiana, LDWF has jurisdiction over listed noxious aquatic plants. La. R.S. 56:328(B) prohibits anyone at any time from knowingly importing or causing the import of listed aquatic plant species or causing them to be transported into Louisiana from any other state or country without first obtaining a written permit from the Wildlife and Fisheries Commission (see http://legis.la.gov/Legis/Law.aspx?d=105222).

The LAIS Task Force was formed by authority of Louisiana Executive Order MJF 02-11 on June 4, 2002. In 2004 a bill passed both the Louisiana House and Senate and was signed into law by Governor Kathleen Blanco calling for the creation of the LAIS Council and Advisory Task Force to implement the LAIS management plan.

As noted above, the LDWF currently leads Louisiana's aquatic invasive species efforts. Its work includes spraying of water bodies overtaken by invasive species and periodic drawdowns of reservoirs to try and limit the spread. In addition, the agency has a public education component. See https://www.wlf.louisiana.gov/page/controlling-aquatic-plants-and-enhancing-freshwater-habitat for more information on LDWF invasive species programs.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

IRC 4b remains the most suitable classification for the listed subsegments because of the known nature of the impairment in question and the ongoing activities described above. Because invasive aquatic plants are spread by numerous pathways to and among water bodies and because legislation is pending to address some of these pathways, it is not yet possible to estimate when non-native aquatic plants will no longer be a concern. However, full eradication or reasonable control of non-native aquatic plants is not expected in the foreseeable future.

4) Schedule for Implementing Pollution Controls

Non-native aquatic plant control activities are based on the LAIS Task Force management plan. Due to the nature of the impairment in question it is not possible to develop a reasonable schedule for implementation of pollution control activities.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

The LAIS Task Force, currently staffed only by LDWF personnel, is required to submit an annual status report on its aquatic invasive species management plan and its implementation every year to the state legislature. LDEQ will continue routine surface water quality monitoring of the listed subsegments as part of the AWQMN.

6) Commitment to Revise Pollution Controls, As Necessary

LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations, including evaluation of non-native aquatic plant observations. Revisions to controls for non-native aquatic plants through the LDWF management plan and its implementation are required every year to the state legislature.

Wetland Assimilation Areas for South Slough (LA040607_00)

1) Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

South Slough Wetland (LA040607_00) is a wetland assimilation area subsegment identified in LAC 33:IX.1123. Table 3. It is used by the City of Hammond as part of its wastewater treatment facility.

Impairment and pollutant causing impairment

The subsegment is reported in Louisiana's 2022 Water Quality IR as not fully supporting the fish and wildlife propagation use, due to assessment of primary productivity in the assimilation areas as compared to a reference site. Change in vegetative primary productivity in the assimilation areas was found to be more than 20 percentage points below the corresponding productivity in the reference area.

Sources of pollutant causing impairment

There are no explicit sources of pollutant causing the reduced vegetative productivity in the wetland assimilation areas, although permanent flooding of the wetland area(s) may be a contributing factor.

2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

Water quality target

The water quality target for the subsegment will be met when the percent change in vegetative productivity from year-to-year in the assimilation area achieves positive growth or is no more than 20 percentage points below the reference area productivity percent change.

Controls that will achieve Water Quality Standards

Volume 3 of the *Water Quality Management Plan, Permitting Guidance Document for Implementing Louisiana Surface Water Quality Standards* has been revised. The revisions include more specific permit language and requirements, which will ensure achievement of water quality standards. The specific requirements have already been included in all other wetland assimilation permits. The City of Hammond currently has a permit renewal in house that will include the revisions plus additional permitting measures specific to the City of Hammond.

Descriptions of requirements under which pollution controls will be implemented

Per the proposed revisions to Volume 3 of the Water Quality Management Plan, the permittee must develop and implement an Adaptive Management Plan. This plan shall include, but is not limited to the following:

1. *Historical and current conditions of the wetland assimilation areas* – The Adaptive Management Plan shall include the historical and current conditions of the wetland assimilation areas. This may include a record of plant species, current state of degradation, probable cause of the degradation, etc. The Plan shall include an overview on how the wetlands assimilation project and the specific adaptive management practices are benefiting the overall health to the wetland areas.
2. *Discharge distribution plan* – This shall be an established procedure describing how the effluent will be distributed into the wetland assimilation area, promoting restoration and sustainability of the wetland ecosystem while, at the same time, assimilating nutrients. Healthy wetlands typically experience a natural pulsing, or fluctuation, of

floodwaters. Therefore, the discharge distribution plan must establish a method to discharge effluent into the wetlands in a manner that ensures uniform coverage and to the maximum extent possible simulates natural healthy conditions, within the wetland assimilation area.

3. *Use of water control structures* – The use of water control structures shall be used in areas to avoid short-circuiting to maximize the assimilation potential of the wetland.
4. *Extension or modification of water distribution system* – The extension of the water distribution system may be necessary to ensure uniform coverage across the assimilation area.
5. *Control of invasive species, including plant and animal* – The introduction of nutrient enriched effluent may invite many invasive species into the wetland assimilation area, which may cause a negative impact to the area. Therefore, a program designed to control these invasive species shall be developed.
6. *Plantings of trees and other vegetation* – In some cases, the wetland assimilation areas are heavily degraded and are permanently flooded. In these areas, the planting of seedlings may be advantageous to ensure new growth, thus enhancing the longevity and sustainability of the wetland assimilation area.
7. *Dye studies* – As treated wastewater is discharged into the wetland assimilation area, changes within the area are expected. A negative impact could be channelization of the effluent, reducing the assimilation potential of the area. Therefore, in the fourth year of the permit cycle, dye studies shall be conducted to ensure that uniform coverage over the wetland assimilation area is being maintained.

3) Estimate or Projection of the Time When Water Quality Standards Will Be Met

The Louisiana Administrative Code calls for the assessment of biological integrity for wetlands approved for wastewater assimilation projects, with assessments occurring over a five-year period of record. Due to the unknown cause of the impairment and due to the long-term nature of monitoring and assessment, it is not possible to estimate a time when water quality standards will be met. Additionally, WPD staff will continue to analyze the Annual Reports for each permittee to ensure compliance with the permit(s).

4) Schedule for Implementing Pollution Controls

The respective sewage treatment facility is overseen by the WPD based on permit limitations and adaptive management practice plans for protection and improvement of the wetlands.

5) Monitoring Plan to Track Effectiveness of Pollution Controls

The sewage treatment facility is required to conduct vegetative sampling every year under terms of their NPDES permit. Results of this sampling were reviewed and reevaluated as part of the 2022 IR.

6) Commitment to Revise Pollution Controls, As Necessary

The respective sewage treatment facility is required to continue corrective activities until vegetative productivity in the wetland assimilation area has improved to the point of meeting the terms of their LPDES permit.

Chapter 4: River and Stream Water Quality Assessment

The information reported in Table 3.4.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The river miles and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.4.2. The miles and count impacted by various suspected sources of impairment are shown in Table 3.4.3. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping system. 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, and each subsegment may have multiple designated uses. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendix A.

Table 3.4.1

Summary of designated use support for Louisiana rivers and streams, *2022 Integrated Report* assessment (reported in miles (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Size Not Assessed	Total Size for Designated Use
Primary Contact Recreation	4,645 (153)	4,830 (198)	6 (1)	9,481 (352)
Secondary Contact Recreation	8,986 (340)	650 (23)	6 (1)	9,642 (364)
Fish and Wildlife Propagation	2,824 (96)	6721 (261)	6 (1)	9551 (358)
Drinking Water Supply	730 (12)	361 (11)	0	1,091 (23)
Limited Aquatic Life and Wildlife Use	21 (2)	70 (4)	0	91 (6)
Outstanding Natural Resource Waters	746 (33)	964 (31)	0	1,710 (64)
Oyster Propagation	179 (10)	419 (19)	0	598 (29)
Agriculture	2,089 (59)	0	0	2,089 (59)

Suspected Causes of Non-Support of Designated Uses

Table 3.4.2

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected causes of impairment, *2022 Integrated Report* assessment (reported in miles).

Suspected Cause of Impairment	Size	Count
1,2-Dichloroethane	84	1
2,3,7,8-Tetrachlorodibenzofuran	67	2
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	67	2
4,4'-DDT	468	5
Ammonia	23	4
Atrazine	83	1
Carbofuran	931	23

Table 3.4.2

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected causes of impairment, *2022 Integrated Report* assessment (reported in miles).

Suspected Cause of Impairment	Size	Count
Chloride	171	13
Color	276	10
Copper	7	2
Dioxin	12	1
Dioxin - Fish Consumption Advisory	68	3
Dissolved Oxygen	4,473	186
Enterococcus	1,047	81
Fecal Coliform	4,277	139
Fipronil	351	7
Furan Compounds	68	3
Lead	293	8
Mercury - Fish Consumption Advisory	2,587	81
Methoxychlor	4	1
Methyl Parathion	83	1
Nitrate/Nitrite (Nitrite + Nitrate as N)	879	39
Non-Native Aquatic Plants	469	27
PCBs - Fish Consumption Advisory	68	3
PCBs In Sediment	12	1
pH, High	41	3
pH, Low	455	18
Phenol	4	1
Phosphorus, Total	813	37
Polychlorinated Biphenyls (PCBs)	16	2
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	4	1
Sulfate	480	19
Temperature	78	6
Total Dissolved Solids (TDS)	1,062	37
Toxaphene	185	1
Turbidity	2,696	73

Suspected Sources of Non-Support of Designated Uses

Table 3.4.3

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2022 Integrated Report* assessment (reported in miles).

Suspected Sources of Impairment	Size	Count
Agriculture	2,633	74
Animal Feeding Operations (NPS)	40	1

Table 3.4.3

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2022 Integrated Report* assessment (reported in miles).

Suspected Sources of Impairment	Size	Count
Atmospheric Deposition - Toxics	2,633	81
Construction	85	3
Construction Stormwater Discharge (Permitted)	29	2
Crop Production (Irrigated)	132	4
Crop Production (Non-Irrigated)	132	4
Discharges from Municipal Separate Storm Sewer Systems (MS4)	104	5
Dredging (e.g., for Navigation Channels)	40	1
Drought-Related Impacts	141	5
Erosion and Sedimentation	83	2
Forced Drainage Pumping	46	5
Golf Courses	16	2
Highways, Roads, Bridges, Infrastructure (New Construction)	7	1
Impacts from Hydrostructure Flow Regulation/Modification	81	3
Industrial Point Source Discharge	187	9
Industrial/Commercial Site Stormwater Discharge (Permitted)	50	4
Introduction of Non-Native Organisms (Accidental or Intentional)	1,059	56
Landfills	8	1
Livestock (Grazing or Feeding Operations)	203	8
Low Water Crossing	32	1
Manure Runoff	105	2
Marina Boat Maintenance	6	1
Marina/Boating Sanitary On-Vessel Discharges	240	7
Municipal (Urbanized High Density Area)	87	4
Municipal Point Source Discharges	1,014	29
Natural Sources	3,398	138
Naturally Occurring Organic Acids	42	4
Non-Point Source	27	1
On-Site Treatment Systems (Septic Systems/Similar Decentralized Systems)	1,759	94
Package Plant or Other Permitted Small Flows Discharges	946	52
Petroleum/Natural Gas Activities	112	2
Petroleum/Natural Gas Production Activities (Permitted)	15	1
Point Source-Unspecified	281	6
Reduced Freshwater Flows	14	5
Residential Districts	28	3
Runoff from Forest/Grassland/Parkland	195	6
Rural (Residential Areas)	323	9
Sand/Gravel/Rock Mining or Quarries	29	1
Sanitary Sewer Overflows (Collection System Failures)	512	13

Table 3.4.3

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2022 Integrated Report* assessment (reported in miles).

Suspected Sources of Impairment	Size	Count
Seafood Processing Operations	4	1
Sediment Resuspension (Clean Sediment)	93	6
Sewage Discharges in Unsewered Areas	1217	36
Silviculture Activities	465	14
Silviculture Harvesting	573	24
Site Clearance (Land Development or Redevelopment)	145	6
Source Unknown	4,961	182
Sources Outside State Jurisdiction or Borders	97	4
Transfer of Water From an Outside Watershed	14	1
Unknown Point Source	46	3
Upstream Source	54	4
Urban Runoff/Storm Sewers	62	1
Water Diversions	144	4
Waterfowl	168	6
Wetland Drainage	11	1
Wildlife Other Than Waterfowl	298	18

Chapter 5: Lake Water Quality Assessment

The information reported in Table 3.5.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The lake acres and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.5.2. The acres and count impacted by various suspected sources of impairment are shown in Table 3.5.3. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping system. 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 LAC 33:IX.1123, Table 3, can be found in Appendix A.

Table 3.5.1

Summary of designated use support for Louisiana lakes, *2022 Integrated Report* assessment (reported in acres (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Size Not Assessed	Total Size for Designated Use
Primary Contact Recreation	539,391 (55)	30,144 (9)	2,711 (1)	572,246 (65)
Secondary Contact Recreation	571,953 (64)	293 (1)	0	572,246 (65)
Fish and Wildlife Propagation	38,361 (13)	533,885 (52)	0	572,246 (65)
Drinking Water Supply	214,512 (10)	29,278 (3)	0	243,790 (13)
Outstanding Natural Resource Waters	0	29 (1)	0	29 (1)
Agriculture	345,249 (16)	0	0	345,249 (16)

Suspected Causes of Non-Support of Designated Uses

Table 3.5.2

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2022 Integrated Report* assessment (reported in acres).

Suspected Cause of Impairment	Size	Count
Arsenic	64	1
Carbofuran	47,869	1
Chloride	56,487	1
Color	29,278	3
Dissolved Oxygen	132,522	28
Fecal Coliform	26,155	6
Hexachlorobenzene	64	1

Table 3.5.2

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2022 Integrated Report* assessment (reported in acres).

Suspected Cause of Impairment	Size	Count
Hexachlorobutadiene	64	1
Lead	64	1
Mercury	64	1
Mercury - Fish Consumption Advisory	268,248	20
Nitrate/Nitrite (Nitrite + Nitrate As N)	5,310	4
Non-Native Aquatic Plants	298,964	16
Oil And Grease	64	1
PCBs - Fish Consumption Advisory	120	2
pH, High	15,887	3
Phosphorus, Total	5,310	4
Temperature	6,344	4
Total Dissolved Solids (TDS)	62,693	3
Turbidity	230,730	21

Suspected Sources of Non-Support of Designated Uses

Table 3.5.3

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2022 Integrated Report* assessment (reported in acres).

Suspected Sources of Impairment	Size	Count
Agriculture	96,947	11
Atmospheric Deposition - Toxics	268,183	19
Construction Stormwater Discharge (Permitted)	4,022	1
Contaminated Sediments	64	1
Crop Production (Non-Irrigated)	10,770	1
Discharges from Municipal Separate Storm Sewer Systems (MS4)	55	1
Industrial Point Source Discharge	64	1
Industrial/Commercial Site Stormwater Discharge (Permitted)	120	2
Introduction of Non-Native Organisms (Accidental or Intentional)	331,889	22
Natural Sources	189,459	27
On-Site Treatment Systems (Septic Systems/Similar Decentralized Systems)	8,022	3
Package Plant or other Permitted Small Flows Discharges	204	1
Pesticide Application	1,685	1
Runoff from Forest/Grassland/Parkland	6,280	1
Sanitary Sewer Overflows (Collection System Failures)	3,004	2
Sediment Resuspension (Clean Sediment)	11,986	2
Sewage Discharges in Unsewered Areas	12,029	6
Shallow Lake/Reservoir	3,133	1

Table 3.5.3

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2022 Integrated Report* assessment (reported in acres).

Suspected Sources of Impairment	Size	Count
Silviculture Harvesting	54,896	10
Site Clearance (Land Development or Redevelopment)	4,022	1
Source Unknown	347,010	31
Unknown Point Soure	1385	1
Unspecified Land Disturbance	2,184	1
Upstream Source	64	1
Waterfowl	1,684	1

Chapter 6: Estuary and Coastal Water Quality Assessment

The information reported in Table 3.6.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The estuary square miles and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.6.2. The square miles and count impacted by various suspected sources of impairment are shown in Table 3.6.3. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping system. Tables 3.6.2 and 3.6.3 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 LAC 33:IX.1123, Table 3, can be found in Appendix A.

Table 3.6.1

Summary of designated use support for Louisiana estuaries, *2022 Integrated Report* assessment (reported in square miles (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Total Size for Designated Use
Primary Contact Recreation	1,231 (14)	4,812 (38)	6,043 (52)
Secondary Contact Recreation	6,043 (52)	0	6,043 (52)
Fish and Wildlife Propagation	2,151 (28)	3,892 (24)	6,043 (52)
Oyster Propagation	3,084 (23)	2,234 (17)	5,317 (40)

Suspected Causes of Non-Support of Designated Uses

Table 3.6.2

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected causes of impairment, *2022 Integrated Report* assessment (reported in square miles (water body count)).

Suspected Cause of Impairment	Size	Count
Carbofuran	208	1
Dioxin - Fish Consumption Advisory	72	4
Dissolved Oxygen	3,473	16
Enterococcus	4,812	38
Fecal Coliform	2,234	17
Furan Compounds	72	4
Mercury - Fish Consumption Advisory	2,093	9
Non-Native Aquatic Plants	91	1
PCBs - Fish Consumption Advisory	72	4
Turbidity	54	3

Suspected Sources of Non-Support of Designated Uses

Table 3.6.3

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected sources of impairment, *2022 Integrated Report* assessment (reported in square miles (water body count)).

Suspected Sources of Impairment	Size	Count
Agriculture	208	1
Atmospheric Deposition - Toxics	2,093	9
Discharges from Municipal Separate Storm Sewer Systems (MS4)	2	1
Industrial Point Source Discharge	72	4
Industrial/Commercial Site Stormwater Discharge (Permitted)	69	2
Introduction of Non-Native Organisms (Accidental or Intentional)	180	2
Marina/Boating Pumpout Releases	156	1
Natural Sources	963	13
Non-Point Source	9	1
On-Site Treatment Systems (Septic Systems/Similar Decentralized Systems)	209	7
Package Plant or Other Permitted Small Flows Discharges	462	2
Sanitary Sewer Overflows (Collection System Failures)	2	1
Sediment Resuspension (Clean Sediment)	1	1
Sewage Discharges in Unsewered Areas	188	3
Silviculture Harvesting	84	1
Source Unknown	5,494	40
Unknown Point Source	31	1
Waterfowl	142	3
Wet Weather Discharges (Non-Point Source)	208	1
Wildlife Other Than Waterfowl	150	3

Chapter 7: Wetland Water Quality Assessment

The information reported in Table 3.7.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The wetland acres and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.7.2. The acres impacted by various suspected sources of impairment are shown in Table 3.7.3. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping system. Tables 3.7.2 and 3.7.3 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 LAC 33:IX.1123, Table 3, can be found in Appendix A.

Table 3.7.1

Summary of designated use support for Louisiana wetlands, *2022 Integrated Report* assessment (reported in acres (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Size Not Assessed	Total Size for Designated Use
Primary Contact Recreation	566,298 (2)	375,091 (4)	0	941,389 (6)
Secondary Contact Recreation	941,389 (6)	0	36,310 (10)	977,700 (16)
Fish and Wildlife Propagation	293,130 (10)	681,822 (5)	2748 (1)	977,700 (16)
Drinking Water Supply	356,046 (1)	0	0	356,046 (1)
Oyster Propagation	0	72,519 (1)	0	72,519 (1)

Suspected Causes of Non-Support of Designated Uses

Table 3.7.2

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected causes of impairment, *2022 Integrated Report* assessment (reported in acres (water body count)).

Suspected Cause of Impairment	Size	Count
Cause Unknown	25,904	1
Chloride	7,077	1
Dissolved Oxygen	583,399	3
Enterococcus	72,519	1
Fecal Coliform	368,014	3
Mercury - Fish Consumption Advisory	220,276	1
Temperature	7,077	1
Total Dissolved Solids (TDS)	7,077	1
Turbidity	72,519	1

Suspected Sources of Non-Support of Designated Uses

Table 3.7.3

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected sources of impairment, *2022 Integrated Report* assessment (reported in acres).

Suspected Sources of Impairment	Size	Count
Atmospheric Deposition - Toxics	220,276	1
Natural Sources	655,918	4
Source Unknown	328,476	4
Waterfowl	72,519	1
Wildlife Other Than Waterfowl	72,519	1

Chapter 8: Public Health/Aquatic Life Concerns

Fishing and Swimming Advisories Currently in Effect

LDEQ currently issues fish consumption and swimming advisories in conjunction with the LDH Health/Fish Consumption Advisories Program (LDH 2022). 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, women of childbearing age, 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 or enterococci contamination of a water body. However, a limited number of swimming advisories have been based on chemical contamination of water or sediments. Fecal coliform or enterococci 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 website at: http://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories.

PART IV: GROUNDWATER ASSESSMENT

Introduction

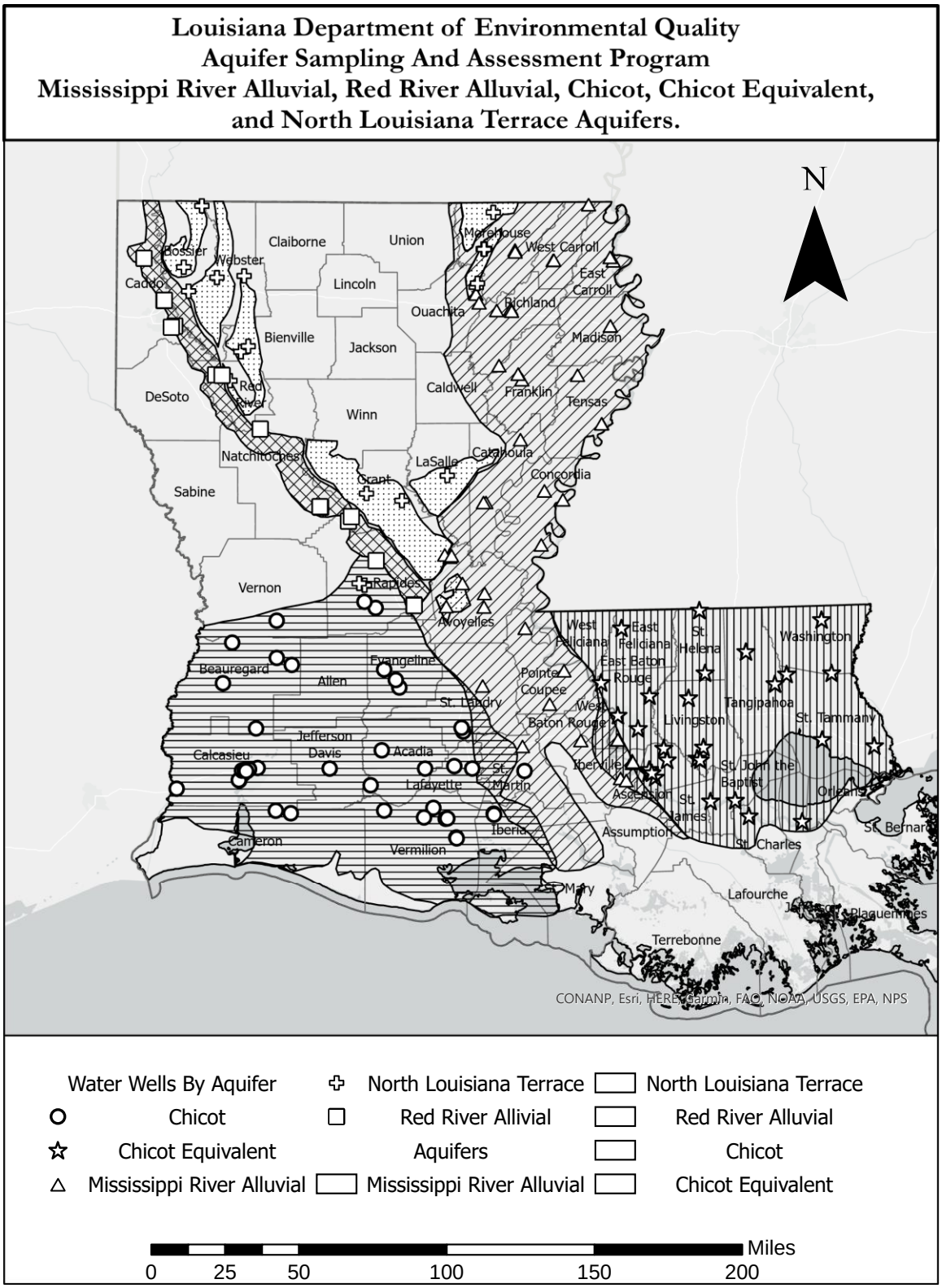
The LDEQ, WPAD, Aquifer Sampling and Assessment Program (ASSET) provides water quality data from freshwater aquifers around the state. The ASSET Program is an ambient groundwater monitoring program designed to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers. The ASSET Program samples approximately 200 water wells located in 14 aquifers across the state. The sampling process is designed so that all 14 aquifers are monitored on a rotating basis, within a three year period so that each well is monitored every three years.

The USEPA has encouraged states to select an aquifer or hydrogeologic setting and discuss available data that best reflects the quality of the resource. Data presented for this report is from ASSET Program monitoring data collected in calendar years 2019 through 2021 from the Chicot, Chicot Equivalent, Mississippi River Alluvial, North Louisiana Terrace, and Red River Alluvial aquifers (Figure 4.1.1). These aquifers were chosen because they occur within the common hydrogeologic setting of the Pleistocene geologic series. The Chicot Aquifer is located in the southwest portion of the state while the Chicot Equivalent is in the southeast. The North Louisiana Terrace and Red River Alluvial aquifers occur in the northern half of the state, while the Mississippi River Alluvial aquifer can be found along the Mississippi River on the eastern border of the state. Table 4.1.1 shows the hydrogeologic column of aquifers in Louisiana and the occurrence of these aquifers in relation to each other and in regard to the other freshwater aquifers in the state.

Table 4.1.2 provides an indication of the most critical contaminant sources and contaminants impacting groundwater resources in Louisiana. Table 4.1.3 provides a summary of Louisiana groundwater protection programs and activities with listing of legislation, statutes, rules, and/or regulations that are in place. Table 4.1.4 lists the wells sampled, their total depths, date sampled, and how produced water was used. For quality control, ASSET staff took duplicate samples for each parameter at wells MO-124 (North Louisiana Terrace), RR-254 (North Louisiana Terrace), AV-462 (Mississippi River Alluvial), SMN-33 (Mississippi River Alluvial), AV-5495Z (Mississippi River Alluvial), LF-572 (Chicot), BE-488 (Chicot), VE-882 (Chicot), AN-266 (Chicot), and AN-321 (Chicot).

Table 4.1.5 lists the field and conventional analytical results by well, and Table 4.1.6 lists the inorganic (total metals) analytical results for each well. Table 4.1.7 lists the field and conventional parameters' statistical values for minimum, maximum, and average concentrations, while Table 4.1.8 provides a listing of inorganic statistics of minimum, maximum, and average concentrations. Statistical values of parameters were determined by Regression on Order Statistics (ROS). Currently this is the most commonly accepted statistical method for small data sets with non-detect values. ROS is used throughout the groundwater portion (Part IV) of this report where statistical values are listed or discussed. Also note that the terms Laboratory Detection Limit, Detection Limit (DL), and Reporting Detection Limit (RDL) are used interchangeably in Part IV of this report.

Figure 4.1.1


Louisiana Department of Environmental Quality
Aquifer Sampling And Assessment Program
Mississippi River Alluvial, Red River Alluvial, Chicot, Chicot Equivalent,
and North Louisiana Terrace Aquifers.
N
Claiborne
Union
Morehouse
West Carroll
Bossier
Webster
Caddo
Lincoln
East Carroll
Richland
Ouachita
Bienville
Jackson
Madison
DeSoto
Red River
Caldwell
Franklin
Tensas
Winn
Natchitoches
LaSalle
Catahoula
Concordia
Grant
Sabine
Vernon
Rapides
Avoyelles
West Feliciana
East Feliciana
St. Helena
Washington
Beauregard
Evangeline
East Baton Rouge
Pointe Coupee
Allen
St. Landry
West Baton Rouge
Livingston
Tangipahoa
St. Tammany
Jefferson Davis
Calcasieu
Acadia
Iberville
St. John the Baptist
St. Martin
Lafayette
Ascension
St. James
Orleans
Assumption
St. Bernard
Iberia
St. Charles
Cameron
Vermilion
St. Mary
Lafourche
Jefferson
Plaquemines
Terrebonne
CONANP, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS
Water Wells By Aquifer
Chicot
Chicot Equivalent
Mississippi River Alluvial
North Louisiana Terrace
Red River Allivial
Aquifers
Mississippi River Alluvial
North Louisiana Terrace
Red River Alluvial
Chicot
Chicot Equivalent
Miles
0 25 50 100 150 200

The data that follow were derived from the ASSET Program, which is conducted as a Clean Water Act activity. The objectives of the program are to determine and monitor the quality of groundwater produced from the freshwater aquifers across Louisiana, and to provide water quality data to the department, other state and federal agencies, and the corporate and private citizens of Louisiana.

Data contained in Table 4.1.4 show that from July 2019 through June 2021, 73 wells were sampled which produce from the Chicot, Chicot Equivalent, Mississippi River Alluvial, North Louisiana Terrace, and Red River Alluvial aquifers. Twenty-six of the wells are classified as public supply, twenty-three are classified as domestic, fourteen industrial, and ten are classified as irrigation.

Non-analytical well information for registered water wells, such as depth, use categorization, and aquifer assignment were obtained from the LDNR Strategic Online Natural Resources Information System (SONRIS).

Chicot Aquifer (16 Wells)

Geology

The Chicot aquifer consists of fining upward sequences of gravels, sands, silts, and clays of the Pleistocene prairie, intermediate, and high terrace deposits of southwestern Louisiana. The medium to coarse-grained sand and gravel aquifer units dip and thicken toward the Gulf, thin slightly toward the west into Texas, and thicken toward the east where they are overlain by alluvium of the Atchafalaya and Mississippi rivers. The aquifers are confined, have a finer texture, and are increasingly subdivided by silts and clays southward from the northern limit of the outcrop area in southern Vernon and Rapides parishes.

In the Lake Charles area, the Chicot is divided into the shallow alluvial sands, the “200-foot” sand, the “500-foot” sand, and the “700-foot” sand. East of Calcasieu parish the Chicot is divided into the “upper sand” (in hydraulic connection to the Atchafalaya sand, Abbeville sand, and “200-foot” sand) and the “lower sand” (“700-foot” sand). The “500-foot” sand is largely isolated except where it merges with the “700-foot” sand north of Calcasieu Parish. Fresh water in the Chicot and other southwestern Louisiana aquifers is separated from fresh water in southeast Louisiana by a saltwater ridge along the western edge of the Mississippi River valley. Salt water occurs within the Chicot along the coast and in isolated bodies north of the coast.

Hydrogeology

Recharge to the Chicot occurs primarily through the direct infiltration of rainfall in the inter-stream, upland outcrop-subcrop areas. Recharge also occurs by water movement from the Atchafalaya alluvium, downward infiltration through the clays south of the primary recharge outcrop area, upward movement from the underlying Evangeline aquifer, and inflow from the Vermilion and Calcasieu rivers. Water movement is generally toward the pumping centers at Lake Charles and Eunice. However, there is little movement of water from the west because of pumping in the Orange, Texas area. The hydraulic conductivity varies between 40-220 feet/day.

The maximum depths of occurrence of freshwater in the Chicot range from 100 feet above sea level, to 1,000 feet below sea level. The range of thickness of the fresh water interval in the Chicot is 50 to 1,050 feet. The depths of the Chicot wells that were monitored in conjunction with the ASSET Program range from 66 to 697 feet.

Chicot Equivalent Aquifer (26 Wells)

Geology

The Chicot Equivalent aquifer is composed of the Pleistocene aged aquifers of the New Orleans area, the Baton Rouge area, and St. Tammany, Tangipahoa, and Washington parishes. The aquifers are in Pleistocene aged alluvial and terrace deposits. The sedimentary sequences that make up the aquifer can be subdivided into several aquifer units separated by confining beds. Northward within southeast Louisiana, fewer units are recognized because some younger units pinch out updip and some clay layers present to the south disappear. Where clay layers are discontinuous or disappear, aquifer units coalesce. The aquifers are moderately well, to well sorted, and consist of fine sand near the top, grading to coarse sand and gravel in lower parts and are generally confined by silt and clay layers.

Hydrogeology

The deposits that constitute the individual aquifers are not readily differentiated at the surface and act as one hydraulic system that can be subdivided into several hydrologic zones in the subsurface. The Mississippi River Valley is entrenched into the Pleistocene strata in the western part of the system, resulting in water movement between the river, the shallow sands, and the Pleistocene aquifers. Recharge occurs primarily by the direct infiltration of rainfall in inter-stream, upland outcrop areas, by the movement of water between aquifers, and between the aquifers and the Mississippi River. The hydraulic conductivity varies between 10-200 feet/day.

The maximum depths of occurrence of freshwater in the Chicot Equivalent range from 350 feet above sea level, to 1,100 feet below sea level. The range of thickness of the fresh water interval in the Chicot Equivalent is 50 to 1,100 feet. The depths of the Chicot Equivalent wells that were monitored in conjunction with ASSET range from 90 to 775 feet.

Mississippi River Alluvial Aquifer (19 Wells)

Geology

Mississippi River alluvium consists of fining upward sequences of gravel, sand, silt, and clay. The aquifer is poorly to moderately well sorted, with fine-grained to medium-grained sand near the top, grading to coarse sand and gravel in the lower portions. Layers of silt and clay of varying thicknesses and extent confine it. The Mississippi River Alluvial aquifer consists of two distinct components; valley trains and meander-belt deposits, which are closely related hydrologically.

Hydrogeology

The Mississippi River Alluvial aquifer is hydraulically connected with the Mississippi River and its major streams. Direct infiltration of rainfall in the river valley, lateral and upward movement of water from adjacent and underlying aquifers, and overbank stream flooding accomplish recharge. The amount of recharge from rainfall depends on the thickness and permeability of the silt and clay layers overlying it. Water levels fluctuate seasonally in response to precipitation trends and river stages. Water levels are generally within 30 to 40 feet of the land surface, and movement is down gradient and toward rivers and streams. Natural discharge occurs by seepage of water into the Mississippi River and its streams, but some water moves into the aquifer when stream stages are above aquifer water levels. The hydraulic conductivity varies between 10 and 530 feet/day.

The maximum depths of occurrence of freshwater in the Mississippi River Alluvial range from 20 feet below sea level to 500 feet below sea level. The range of thickness of the fresh water interval in the Mississippi River Alluvial is 50 to 500 feet. The depths of the Mississippi River Alluvial aquifer wells monitored in conjunction with ASSET program range from 30 feet to 352 feet below land surface, with an average depth of 133 feet.

North Louisiana Terrace Aquifer (NLT) (8 Wells)

Geology

The NLT consists of Pleistocene Terrace deposits are unconsolidated, fining upward sequences of gravel, sand, silt, and clay. The formation ages up dip, so that the sequences are coarser grained with fine-grained top stratum not present due to erosion. Down dip the sequences exhibit gravel layers grading upward into fine sand. Holocene alluvium occurs on top of the sand in the larger stream valleys. The aquifer deposits as a whole can be classified as poorly to well-sorted coarse-grained sands. Most of the aquifer is unconfined, but can be confined locally by silt and clay layers.

Hydrogeology

Recharge occurs up dip, where the overlying silts and clays have eroded. Direct infiltration of rainfall in upland outcrop areas moves down gradient and laterally, having a portion of the discharge flow into streams with valleys through the aquifer units. Due to the influence of rainfall on recharge in the aquifer, water level typically reflect variations in precipitation patterns and seasonal withdrawal fluctuations. The NLT thickens downward and can occur in intervals consisting of 50 to 150 feet, with depths reaching 100 feet below and above sea level.

Red River Alluvial Aquifer (4 Wells)

Geology

The Red River Alluvium units consists of fining upward sequences of poor to moderately sorted grains. These sequences exhibit sand and gravel units grading into fine to medium-grained sand upwards. Layers of silt and clay, varying aerially in thickness and extent, confine the aquifer.

Hydrogeology

The Red River Alluvial aquifer is dominated by surface to groundwater interactions with the Red River. Although recharge can be aided by rainfall in areas where confining units are small or nonexistent, lateral and upward movement of water from adjacent aquifers and streams are the main force. The exchange between the aquifer and the Red River can variate hydraulic conductivity between 10 to 530 feet per day. Water is confined within 30-40 feet of the land surface and moves down gradient towards rivers and streams. Thickness intervals can range between 50 and 200 feet, at 20 feet above sea level to 160 feet below.

Program Parameters

The field parameters checked at each sampling site and the list of conventional parameters analyzed in the laboratory are shown in Table 4.1.5 The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 4.1.6 These tables also show the field and analytical results determined for those analytes. Tables 4.1.7 and 4.1.8 provide a statistical overview of conventional and inorganic data for these aquifers, listing the minimum, maximum, and average

results for these parameters. Table 4.1.9 lists the Federal Maximum Contaminant Level (primary and secondary) and Action Level (AL) for applicable parameters.

In addition to the conventional and inorganic analytical parameters, the target analyte list includes three other categories of compounds: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and pesticides/PCBs. Due to the large number of analytes in these categories, tables were not prepared showing the analytical results for these compounds. A discussion of detections from any of these three categories, if necessary, can be found in their respective sections. Tables 4.1.10, 4.1.11, and 4.1.12 list the target analytes and detection limits for volatiles, semi-volatiles and pesticides/PCBs, respectively.

Figure 4.1.1 shows the geographic locations of the Cockfield, Sparta, and Carrizo-Wilcox aquifers and their associated wells.

Interpretation of Data

Under the Federal Safe Drinking Water Act, USEPA has established maximum contaminant levels (MCLs) for pollutants that may pose a health risk in public drinking water. An MCL is the highest level of a contaminant that USEPA allows in public drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. While not all wells sampled were public supply wells, the ASSET Program does use MCLs as a benchmark for further evaluation.

USEPA has also set secondary standards, which are defined as non-enforceable taste, odor, or appearance guidelines. Field and laboratory data contained in Tables 4.1.5 and 4.1.6 show that one or more Secondary MCLs (SMCLs) were exceeded in 48 of the 73 wells sampled in these five aquifers, with a total of 77 SMCLs being exceeded.

In addition to primary and secondary MCLs, USEPA has established action levels for particular compounds. If the action levels are exceeded, then a treatment technique is required by public water supply systems to control the corrosiveness of the distributed water.

The ASSET Program also considers hardness values (reported as mg/L of $CaCO_3$) along with drinking water standards in assessing quality of groundwater produced from an aquifer. The hardness classification ranges are based on the hardness scale from Peavy et al. (1985) found in Environmental Engineering, which are:

Soft ≤ 50 mg/L
Moderately Hard >50 mg/L –150 mg/L
Hard >150 mg/L– 300 mg/L
Very Hard >300 mg/L

Collectively, the aquifers sampled during 2019-2021 show an average hardness of 198 mg/L, which is considered hard. Separately, the Terrace and Chicot aquifers fall within the hard range. The alluvial aquifers are classified as very hard. The only aquifer classified as moderately hard is the Chicot Equivalent, with an average hardness of 62.33 mg/L.

Field and Conventional Parameters

Table 4.1.5 shows the field and conventional parameters for which samples are collected at each well and the analytical results for field and laboratory parameters. Table 4.1.7 provides an overview of these parameters, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards

A review of the analysis listed in Table 4.1.5 shows that no primary MCL was exceeded for field and conventional parameters. Those ASSET wells reporting turbidity levels greater than 1.0 Nephelometric Turbidity Unit (NTU) do not exceed the Primary MCL of 1.0, as this standard applies to surface water systems and groundwater systems under the direct influence of surface water. The Louisiana Department of Health has determined that no public supply well in Louisiana is in this category.

Federal Secondary Drinking Water Standards

A review of the analysis listed in Table 4.1.5 shows that ten wells exceeded the SMCL for pH, six wells exceeded the SMCL for chloride, two wells exceeded the SMCL for color, and twenty-one wells exceeded the SMCL for TDS. Laboratory results override field results in exceedance determinations, thus only lab results will be counted in determining SMCL exceedance numbers for TDS. Following is a list of SMCL parameter exceedances with well number and results:

pH (SMCL = 6.5 – 8.5 Standard Units):

AN-6297Z – 8.51 SU
BE-488 – 5.99 SU (Normal and Duplicate)
EF- 5329Z – 5.64 SU
LI-7965Z – 6.46 SU
MO-124 – 6.08 SU
RR-254 – 6.30 SU (Normal and Duplicate)
SH-5333Z – 6.15 SU
TA-7627Z – 5.76 SU
WA-5295Z – 5.90 SU
WA-5311Z – 5.23 SU

Chloride (SMCL = 250 mg/L)

AN-321 – 342 mg/L
AN-6297Z – 632 mg/L
FR-1358 – 270 mg/L
MO-364 – 335 mg/L
SC-179 – 347 mg/L
SJB-173 – 297 mg/L

Color (SMCL = 15 PCU)

AN-6297Z – 25 PCU
JF-244 – 30 PCU

Total Dissolved Solids (SMCL = 500 mg/L)

AC-8316Z – 540 mg/L
AN-316 – 525 mg/L (571 mg/L Lab)
AN-321 – 749.31 (Lab: 595 mg/L, Normal and Duplicate)
AN- 6297Z – 1612.54 mg/L (1260 mg/L Lab)
AV-462 – 900 mg/L (825 mg/L Field)
AV-5495Z – 555 mg/L (Duplicate: 513.5 mg/L Field)
CD-11849Z – 942 mg/L (725 mg/L Field)
CO-433 – 865 mg/L (841 mg/L Field)
EV-673 – 501 mg/L
IB-COM – 913 mg/L (775 mg/L Lab)
JF-224 – 1695 mg/L (808 mg/L Field)
MA-248 – 880 mg/L
MO-364 – 1065 mg/L
NA-5404Z – 624 mg/L
RR-345 – 790 mg/L (680 g/L Lab)
SJB-173 – 1175 mg/L
TS-61 – 580 mg/L (520 mg/L Lab)
VE-882 – 730 mg/L (605 mg/L Field)
VE-862 – 730 mg/L
WC-91 – 671 mg/L (575 mg/L Lab)
WC-527 – 858 mg/L (535 mg/L Lab)

Inorganic Parameters

Table 4.1.6 shows the inorganic (total metals) parameters for which samples are collected at each well and the analytical results for those parameters. Table 4.1.8 provides an overview of inorganic data, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards

Table 4.1.6 shows that two wells exceeded the primary MCL for arsenic. The occurrence of arsenic in these two wells has been established and fits closely to historical data for them. IB-363, an irrigation well, has shown arsenic values in each sampling event since 2004, with the highest concentration occurring in 2010 at 35.2 µg/L. TS-FORTENBERRY is a domestic use well that has reported arsenic since 1996, with the most current sampling reporting the highest occurrence of arsenic at 28.5 µg/L.

Even though neither of these wells are a primary source of drinking water, the ASSET program has notified the well owners of the arsenic exceedances, and as a precaution, have been provided information on the effect of arsenic in drinking water. In addition, the well owners have been provided information on various treatment techniques to reduce the amount of arsenic in drinking water. The following is a list of those exceedances:

Arsenic (MCL = 10 µg/L)

IB-363 – 28.5 µg/L

TS-FORTENBERRY – 19.7 µg/L

No other inorganic (total metal) parameter exceeded a primary MCL. Refer to Table 4.1.9 for a listing of all primary MCLs for inorganics.

Federal Secondary Drinking Water Standards

Laboratory data contained in Table 4.1.6 show that six wells exceeded the secondary MCL for iron.

Iron (SMCL = 300 µg/L):

AV-462 – 5,270 µg/L (Duplicate: 5,260 µg/L)
AV-126 – 12,000 µg/L
BE-378 – 2,370 µg/L
BO-578 – 738 µg/L
BO-7869Z – 1,430 µg/L
CD-1184Z – 4,030 µg/L
CD-859 – 5,510 µg/L
CO-433 – 14,100 µg/L
EB-34 – 434 µg/L
EB-1231 – 1,490 µg/L
FR-1358 – 2,760 µg/L
I-7312z – 972 µg/L
IB-363 – 1,910 µg/L
IB-COM – 2,410 µg/L
JD-862 – 2,270 µg/L
MA-248 – 10,600 µg/L
NA-5404Z – 10,800 µg/L
OU-5524Z – 355 µg/L
PC-5515Z – 5,590 µg/ L
RI-RAYVILLE – 7,480 µg/L
RR-345 – 13,000 µg/L
SC-179 – 388 µg/L
SH-77 – 331 µg/L
SJ-226 – 786 µg/L
SJB-173 – 527 µg/L
SJB-7152Z – 759 µg/L
SMN-33 – 1,630 µg/L (Duplicate: 1,660 µg/L)
TS-61 – 9,860 µg/L
TS-FORTENB – 11,000 µg/L
VE-151 – 3,400 µg/L
VE-862 – 968 µg/L
VE-882 – 1,390 µg/L (Duplicate: 1420 µg/L)

MO-124 – 8,520 µg/L
MO-364 – 567 µg/L
MO-871 – 534 µg/L
WC-527 – 4,300 µg/L
WC-91 – 705 µg/L

Volatile Organic Compounds

Table 4.1.10 shows the VOC parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any confirmed detection of a VOC would be discussed in this section.

There were no confirmed detections of VOCs at or above their laboratory reporting detection limit during the sampling of these wells.

Semi-Volatile Organic Compounds

Table 4.1.11 shows the SVOC parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any confirmed detection of a SVOC would be discussed in this section.

There were no confirmed detections of any SVOC at or above its laboratory reporting detection limit during the sampling of these wells.

Pesticides and PCBs

Table 4.1.12 shows the pesticide and PCB parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a pesticide or PCB would be discussed in this section.

There were no confirmed detections of any pesticide or PCB at or above its laboratory reporting detection limit during the sampling of these wells.

Summary

In summary, the combined aquifer data show that the groundwater produced from these aquifers is hard. Taken individually, data show that groundwater produced from the Chicot and North Louisiana Terrace aquifers is hard, the groundwater produced from the Red River and Mississippi River alluvial aquifers is very hard, and the groundwater produced from the Chicot Equivalent aquifer is moderately hard. The only primary MCL exceedances were from two wells in the Mississippi River Alluvial aquifer. Arsenic, which can occur in aquifers from either natural or anthropogenic sources, was reported in two wells with values above 10 µg/L. Both of these wells have a history of arsenic contamination dating back to their entrance into the ASSET sampling rotation. ASSET program standard procedure is to notify well owners of MCL exceedances, and provide them with additional information relating to treatment and health effects. Combined aquifer data also show the groundwater is of good quality when considering short term or long term health based risk exposure limits in that no primary MCL was exceeded. Combined aquifer data show that the groundwater produced from these aquifers is of fair quality based on taste, odor or appearance guidelines. The Mississippi River Alluvial aquifer is the only Pleistocene aquifer that is considered to be of poor to fair quality due to the occurrence of arsenic and iron. High iron levels also occurred in the same events as the arsenic, however, a finding for this relationship is beyond the scope of the ASSET Program and this report.

Table 4.1.1

Hydrogeologic column of aquifers in Louisiana (Highlighted aquifers sampled for this reporting period).

SYSTEM	SERIES	Stratigraphic Unit		Hydrogeologic Unit: Northern Louisiana — Aquifer or confining unit	Central and southwestern Louisiana — Aquifer system or confining unit	Central and southwestern Louisiana — Aquifer or confining unit: Lake Charles area	Central and southwestern Louisiana — Aquifer or confining unit: Rice growing area	Southeastern Louisiana — Aquifer system or confining unit	Southeastern Louisiana — Aquifer[1] or confining unit: Baton Rouge area	Southeastern Louisiana — Aquifer[1] or confining unit: St. Tammany, Tangipahoa, and Washington Parishes	Southeastern Louisiana — Aquifer[1] or confining unit: New Orleans area and lower Mississippi River parishes
Quaternary	Pleistocene	Red River alluvial deposits Miss. River alluvial deposits Northern La. Terrace deposits Unnamed Pleistocene deposits		Red River alluvial aquifer or surficial confining unit Mississippi River alluvial aquifer or surficial confining unit Upland terrace aquifer or surficial confining unit	Chicot aquifer system or surficial confining unit	"200-foot" sand "500-foot" sand "700-foot" sand	Upper sand unit Lower sand unit	Chicot Equivalent aquifer system[2] or surficial confining unit	Mississippi River alluvial aquifer or surficial confining unit Shallow sand "400-foot" sand "600-foot" sand	Upland terrace aquifer Upper Ponchatoula aquifer	Gramercy aquifer[3] Norco aquifer[3] Gonzales-New Orleans Aquifer[3] "1,200-foot" sand[3]
Tertiary	Pliocene -----?----- Miocene	Fleming Formation	Blounts Creek Member	Pliocene-Miocene aquifers are absent in this area	Evangeline aquifer or surficial confining unit			Evangeline equivalent aquifer system[2] or surficial confining unit	"800-foot" sand "1,000-foot" sand "1,200-foot" sand "1,500-foot" sand "1,700-foot" sand	Lower Ponchatoula Aquifer Big Branch aquifer Kentwood aquifer Abita aquifer Covington aquifer Slidell aquifer	
			Castor Creek Member		Castor Creek confining unit			Unnamed confining unit	"2,000-foot" sand "2,400-foot" sand "2,800-foot" sand	Tchefuncte aquifer Hammond aquifer Amite aquifer Ramsay aquifer Franklinton aquifer	
			Williamson Creek Member Dough Hills Member Carnahan Bayou Member		Jasper aquifer system or surficial confining unit	Williamson Creek aquifer Dough Hills confining unit Carnahan Bayou aquifer		Jasper equivalent aquifer system[2] or surficial confining unit			
			Lena Member		Lena confining unit			Unnamed confining unit			
	-----?----- Oligocene	Catahoula Formation			Catahoula aquifer			*Catahoula equivalent aquifer system[2] or surficial confining unit			
		Vicksburg Group, undifferentiated		Vicksburg-Jackson confining unit							
	Eocene	Jackson Group, undifferentiated									
		Claiborne Group	Cockfield Formation	Cockfield aquifer or surficial confining unit							
			Cook Mountain Formation	Cook Mountain aquifer or confining unit							
			Sparta Sand	Sparta aquifer or surficial confining unit							
			Cane River Formation	Cane River aquifer or confining unit							
			Carrizo Sand	Carrizo-Wilcox aquifer or surficial confining unit							
	Paleocene	Wilcox Group, undifferentiated									
		Midway Group, undifferentiated		Midway confining unit							

No fresh water occurs in older aquifers

[1]Clay units separating aquifers in southeastern Louisiana are discontinuous and unnamed.
[2]Four aquifer systems as a group are called the Southern Hills aquifer system (*Catahoula equivalent aquifer system is not monitored by the ASSET Program).
[3]Four aquifers as a group are called the New Orleans aquifer system.

Source: DOTD/USGS Water Resources Special Report No. 9, 1995

Index to Table 4.1.2

Factors in selecting a contaminant source

A. Human health and/or environmental risk (toxicity)
B. Size of the population at risk
C. Location of the sources relative to drinking water sources
D. Number and/or size of contaminant sources
E. Hydrogeologic sensitivity
F. State findings, other findings
G. Documented from mandatory reporting
H. Geographic distribution/occurrence
I. Other criteria - high to very high priority in localized areas of the state

Contaminants

A. Inorganic pesticides
B. Organic pesticides
C. Halogenated solvents
D. Petroleum compounds
E. Nitrate
F. Fluoride
G. Salinity/brine
H. Metals
I. Radionuclides
J. Bacteria
K. Protozoa
L. Viruses
M. Other - sulfates from gypsum stacks

Table 4.1.2

Major sources of groundwater contamination in the freshwater aquifers of Louisiana.

Contaminant Source	Ten Highest-Priority Sources(√)	Factors in Selecting a Contaminant Source	Contaminants
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications			
On-farm agricultural mixing and loading procedures			
Land application of manure (unregulated)			
Storage and Treatment			
Land Application			
Material stockpiles			
Storage tanks (above ground)	√	A,B,C,D,E,F,G	B,C,D
Storage tanks (underground)	√	A,B,C,D,E,F,	B,C,D
Surface impoundments	√	A,B,C,D,E,F,G	C,D,G,H,J,L
Waste piles	√	D,G	I,M
Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills	√	A,B,C,D,E,F,G	A,B,C,D,E,H
Septic systems	√	C,D,G	A,B,C,D,E,H,J,L
Shallow injection wells			
Other			
Hazardous waste generators[1]			
Hazardous waste sites[1]			
Industrial facilities[1]			
Material transfer operations[1]			
Mining and mine drainage			
Pipelines and sewer lines	√	A,B,C,D,E,F,G	C,D,G
Salt storage and road salting			
Salt water intrusion	√	B,C,E,G	G
Spills	√	B,D,G	C,D
Transportation of materials			
Urban runoff	√	A,B,D,G	A,B,C,D,E,H,J,L
Small-scale manufacturing and repair shops			
Other sources (please specify)			

1. Represents facilities with multiple sources of groundwater contamination rather than unit sources.

Table 4.1.3

State groundwater protection programs for Louisiana with their implementation status.

Programs or Activities	Check	Implementation Status	Responsible State Agency
Active SARA[1] Title III Program	√	Fully established	LDEQ
Ambient groundwater monitoring system	√	Fully established	LDEQ
Aquifer vulnerability assessment	√	Fully established	LDEQ
Aquifer mapping	√	Fully established	LDEQ
Aquifer characterization	√	Continuing efforts	LDOTD
Comprehensive data management system	√	Continuing efforts	LDEQ
USEPA-endorsed Core Comprehensive State Ground Water Protection Program (CSGWPP)	√	Pending	LDEQ
Groundwater discharge permits	√	Fully established	LDNR(UIC)
Groundwater Best Management Practices	√	Continuing efforts	LDEQ
Groundwater legislation	√	Continuing efforts	LDNR
Groundwater classification	√	Continuing efforts	LDNR
Groundwater quality standards	√	Continuing efforts	LDEQ
Interagency coordination for groundwater protection initiatives	√	Continuing efforts	LDNR
Nonpoint source controls	√	Continuing efforts	LDEQ
Pesticide State Management Plan	√	Fully Established	LDAF
Pollution Prevention Program	√	Continuing efforts	LDEQ
Resource Conservation and Recovery Act (RCRA) Primacy	√	Fully established	LDEQ
Source Water Assessment Program	√	Fully established	LDEQ
State Superfund	√	Fully established	LDEQ
State RCRA Program incorporating more stringent requirements than RCRA Primacy	√	Continuing efforts	LDEQ
State septic system regulations	√	Fully established	LDH
Underground storage tank installation requirements	√	Fully established	LDEQ
Underground Storage Tank Remediation Fund	√	Fully established	LDEQ
Underground Storage Tank Permit Program	√	Fully established	LDEQ
Underground Injection Control Program	√	Fully established	LDNR
Vulnerability assessment for drinking water/wellhead protection	√	Fully established	LDEQ
Well abandonment regulations	√	Fully established	LDNR
Wellhead Protection Program (USEPA-approved)	√	Fully established	LDEQ
Well installation regulations	√	Fully established	LDNR

1. Superfund Amendments and Reauthorization Act

Table 4.1.4

List of ASSET wells sampled.

Registered Well Number	Parish	Date Sampled	Owner	Aquifer Member	Depth (Feet)	Well Use
AC-539	Acadia	2/19/20	City of Rayne	Chicot	251	Public Supply
AC-8316Z	Acadia	2/19/20	Private Owner	Chicot	165	Domestic
AN-266	Ascension	4/14/21	City of Gonzales	Chicot Equivalent	548	Public Supply
AN-316	Ascension	6/21/21	Westlake Vinyls	Chicot Equivalent	478	Industrial
AN-321	Ascension	5/4/21	Rubicon	Chicot Equivalent	523	Industrial
AN-337	Ascension	5/5/21	BASF	Chicot Equivalent	459	Industrial
AN-500	Ascension	5/4/21	Lion Copolymer	Chicot Equivalent	480	Industrial
AN-6297Z	Ascension	5/5/21	Oxy Chemical	Chicot Equivalent	294	Industrial
AN-9183Z	Ascension	4/14/21	Private Owner	Chicot Equivalent	630	Domestic
AV-126	Avoyelles	9/25/19	Hamburg Mills	Mississippi River Alluvial	155	Domestic
AV-462	Avoyelles	9/25/19	Farm, LLC	Mississippi River Alluvial	110	Irrigation
AV-5495Z	Avoyelles	7/9/20	Private Owner	Mississippi River Alluvial	90	Domestic
BE-378	Beauregard	5/13/20	Transcontinental Gas Pipeline	Chicot	172	Industrial
BE-412	Beauregard	5/13/20	PCA	Chicot	202	Industrial
BE-488	Beauregard	5/14/20	Singer Water District	Chicot	262	Public Supply
BO-434	Bossier	3/20/19	Consolidated WW District #1 of Bossier	North Louisiana Terrace	94	Public Supply
BO-578	Bossier	3/20/19	Village Water System	North Louisiana Terrace	85	Public Supply
BO-7896Z	Bossier	3/21/19	Private Owner	North Louisiana Terrace	96	Domestic
CD-11849Z	Caddo	3/21/19	Private Owner	Red River Alluvial	47	Domestic
CD-859	Caddo	3/20/19	East Ridge Country Club	Red River Alluvial	58	Irrigation
CO-433	Concordia	7/30/20	Whitehall Plantation	Mississippi River Alluvial	149	Irrigation
CT-DENNIS	Catahoula	6/24/20	Private Owner	Mississippi River Alluvial	30	Domestic
EB-1231	East Baton Rouge	9/10/20	Georgia Pacific	Chicot Equivalent	280	Industrial
EB-34	East Baton Rouge	11/17/20	Exxon Mobil USA	Chicot Equivalent	453	Industrial
EB-8599Z	East Baton Rouge	9/10/20	Private Owner	Chicot Equivalent	180	Domestic

Table 4.1.4

List of ASSET wells sampled.

Registered Well Number	Parish	Date Sampled	Owner	Aquifer Member	Depth (Feet)	Well Use
EB-991B	East Baton Rouge	11/17/20	Baton Rouge Water Works	Chicot Equivalent	565	Public Supply
EF-5329Z	East Feliciana	9/9/20	Private Owner	Chicot Equivalent	97	Domestic
EV-673	Evangeline	2/19/20	City of Mamou	Chicot	247	Public Supply
FR-1358	Franklin	6/16/20	Macon Ridge Research Station	Mississippi River Alluvial	60	Irrigation
I-7312Z	Iberia	3/5/20	Breaux Electric	Chicot	180	Public Supply
IB-363	Iberville	1/29/20	Syngenta Crop Protection	Mississippi River Alluvial	225	Irrigation
IB-COM	Iberville	1/29/20	Private Owner	Mississippi River Alluvial	185	Domestic
JD-862	Jefferson Davis	5/13/20	City of Welsh	Chicot	697	Public Supply
JF-224	Jefferson	3/30/21	Entergy	Chicot Equivalent	775	Industrial
LF-572	Lafayette	2/19/20	LUS	Chicot	570	Public Supply
LI-5477Z	Livingston	4/14/21	Private Owner	Chicot Equivalent	106	Domestic
LI-7945Z	Livingston	6/25/21	French Settlement Water System	Chicot Equivalent	455	Public Supply
LI-7965Z	Livingston	6/25/21	LIGO	Chicot Equivalent	205	Industrial
LS-264	La Salle	1/24/19	City of Jena	North Louisiana Terrace	105	Public Supply
MA-248	Madison	6/30/20	Tallulah Water Service	Mississippi River Alluvial	153	Public Supply
MO-124	Morehouse	10/31/19	Texas Gas	North Louisiana Terrace	133	Public Supply
MO-364	Morehouse	10/31/19	Peoples Water Service	North Louisiana Terrace	154	Public Supply
MO-871	Morehouse	6/30/20	Private Owner	Mississippi River Alluvial	80	Irrigation
NA-5404Z	Natchitoches	10/24/19	Seven C’s Ranch	Red River Alluvial	76	Domestic
OU-5524Z	Ouachita	10/31/19	Private Owner	North Louisiana Terrace	95	Domestic
PC-5515Z	Pointe Coupee	1/29/20	Private Owner	Mississippi River Alluvial	156	Domestic
R-6947Z	Rapides	5/14/20	Private Owner	Chicot	110	Domestic
RI-469	Richland	6/16/20	Liddieville Water System	Mississippi River Alluvial	90	Public Supply
RI-730	Richland	6/18/20	Start Water System	Mississippi River Alluvial	101	Public Supply
RI-RAYVIL	Richland	6/18/20	Rayville Water Department	Mississippi River Alluvial	230	Public Supply
RR-254	Red River	5/9/19	East Cross	North Louisiana Terrace	93	Public Supply

Table 4.1.4

List of ASSET wells sampled.

Registered Well Number	Parish	Date Sampled	Owner	Aquifer Member	Depth (Feet)	Well Use
RR-345	Red River	7/2/19	Bundrick Farms	Red River Alluvial	89	Irrigation
SC-179	St. Charles	4/15/21	Union Carbide	Chicot Equivalent	460	Industrial
SH-5333Z	St. Helena	10/21/20	Private Owner	Chicot Equivalent	230	Domestic
SH-77	St. Helena	10/21/20	Transco	Chicot Equivalent	170	Public Supply
SJ-226	St. James	4/15/21	Noranda Alumina, LLC	Chicot Equivalent	248	Industrial
SJB-173	St. John	6/23/21	E.I. DuPont	Chicot Equivalent	425	Industrial
SL-7152Z	St. Landry	2/19/20	Private Owner	Chicot	180	Domestic
SMN-33	St. Martin	1/29/20	LDOTD/Lafayette District	Mississippi River Alluvial	125	Public Supply
ST-11516Z	St. Tammany	3/22/21	Louisiana State Parks	Chicot Equivalent	340	Domestic
TA-520	Tangipahoa	10/27/20	Private Owner	Chicot Equivalent	135	Irrigation
TA-7627Z	Tangipahoa	3/8/21	Global Wildlife	Chicot Equivalent	120	Domestic
TS-61	Tensas	6/4/20	Town of St. Joseph	Mississippi River Alluvial	140	Public Supply
TS-FORTENB	Tensas	6/16/20	Private Owner	Mississippi River Alluvial	33	Domestic
V-535	Vernon	5/14/20	Marlow Fire Station	Chicot	66	Public Supply
VE-151	Vermilion	3/5/20	Southern Oaks Country Club	Chicot	250	Irrigation
VE-862	Vermilion	3/5/20	Town of Gueydan	Chicot	249	Public Supply
VE-882	Vermilion	3/5/20	City of Kaplan	Chicot	279	Public Supply
VE-VIATOR	Vermilion	3/5/20	Private Owner	Chicot	200	Domestic
WA-5295Z	Washington	3/9/21	Private Owner	Chicot Equivalent	100	Domestic
WA-5311Z	Washington	3/10/21	Private Owner	Chicot Equivalent	90	Domestic
WC-527	West Carroll	6/30/20	Private Owner	Mississippi River Alluvial	85	Irrigation
WC-91	West Carroll	7/9/20	New Carroll Water Association	Mississippi River Alluvial	115	Public Supply

Table 4.1.5

Field measurements and conventional laboratory analytical results for parameters sampled.

Field, Analytical Parameters, and Units	Field Measures					Conventional Laboratory Parameters											
	pH SU	Sal. ppth	Sp. Cond. mmhos/cm	TDS mg/L	Temp Deg. C	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. mmhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
Drinking Water Limit and Type	**≥6.5, ≤8.5**	**N/A**	**N/A**	**500**	**N/A**	**N/A**	**250 (S)**	**15 (S)**	**N/A**	**10 (P)**	**N/A**	**N/A**	**N/A**	**250 (S)**	**500 (S)**	**N/A**	**(TT)**
Well Number↓	**Laboratory Detection Limits →**					**5**	**0.25**	**5**	**5**	**0.01**	**0.10**	**0.05**	**0.10**	**1.0**	**10**	**4.0**	**0.3**
AC-539	7.54	0.33	0.66	370.00	17.44	274.00	25.80	< DL	204.00	< DL	1.60	0.38	0.64	< DL	435.00	4.00	10.30
AC-8316Z	7.57	0.41	0.78	405.00	16.03	269.00	70.00	< DL	246.00	< DL	2.00	0.32	0.83	7.90	540.0§	< DL	19.00
AN-266	8.02	0.18	0.36	238.45	22.72	118.00	20.90	< DL	44.00	< DL	0.43	0.22	0.37	3.50	180.00	< DL	0.53
AN-266*	7.48	0.21	0.42	277.00	16.14	170.00	7.50	<DL	182.00	0.05	0.53	0.42	0.39	4.7	240.00	4.00	4.60
AN-316	7.58	0.43	0.88	525.0§	20.75	142.00	181.00	10.00	70.00	< DL	0.52	0.20	0.80	< DL	571.0§	5.00	0.61
AN-321	8.07	0.57	1.15	749.3§	25.09	152.00§	342.0§	< DL	62.00	< DL	0.67	0.62	1.41	< DL	765.0§	< DL	0.35
AN-321*	8.07	0.57	1.15	749.3§	25.10	141.00	221.00	5.00	42.00	0.05	0.65	0.58	1.10	<DL	595.0§	4.00	0.94
AN-337	8.19	0.23	0.49	320.89	23.54	155.00	52.90	4.10	40.00	< DL	0.85	0.48	0.46	< DL	275.00	5.00	1.00
AN-500	8.34	0.19	0.39	254.39	23.93	141.00	26.50	< DL	30.00	< DL	0.77	0.53	4.04	2.70	170.00	< DL	1.20
AN-6297Z	8.51§	1.28	2.48	1612.5	21.48	183.00§	632.0§	25.0§	166.00	< DL	1.10	0.24	2.32	< DL	1260.0§	< DL	3.00
AN-9183Z	8.01	0.17	0.36	238.12	22.78	145.00	39.20	< DL	8.00	< DL	0.42	0.20	5.53	3.20	270.00	< DL	< DL
AV-126	6.92	0.37	0.74	260.00	17.45	349.00	14.20	< DL	400.00	0.05	0.47	< DL	4.94	10.10	494.00	32.00	190.00
AV-462	6.94	0.71	1.40	825.0§	16.86	379.00	97.90	< DL	540.00	0.05	0.34	< DL	1.40	151.00	911.0§	20.00	70.50
AV-462*	6.94	0.71	1.40	911.0§	16.86	379.00	97.90	<DL	540.00	<DL	0.34	0.35	1.40	151.00	825.0§	20.00	70.50
AV-5495Z	6.50	0.38	0.79	513.6§	25.76	119.00	107.00	10.00	280.00	7.40	< DL	0.15	1.80	< DL	555.0§	< DL	3.20
AV-5495Z*	6.52	0.38	0.79	513.6§	25.71	119.00	107.00	10.00	280.00	7.40	0.10	0.15	1.80	63.20	555.0§	4.00	3.20
BE-378	7.06	0.02	0.45	10.00	22.47	93.10	44.20	10.00	74.00	0.05	0.26	0.41	< DL	4.60	10.00	< DL	4.30
BE-412	6.02§	0.03	0.56	47.74	21.31	11.90	5.90	< DL	38.00	0.09	< DL	< DL	0.76	2.50	10.00	< DL	0.95
BE-488	5.99§	0.33	0.07	47.74	21.30	21.80	6.10	10.00	28.00	0.05	0.36	< DL	0.10	1.00	125.00	< DL	1.60
BE-488*	6.01	0.03	0.07	47.75	21.32	23..80	6.10	5.00	50.00	0.05	0.09	0.05	1.02	9.30	30.00	4.00	0.75
BO-434	6.67	0.11	0.23	105.00	15.55	95.10	14.50	7.00	78.00	0.55	0.54	0.44	0.23	4.60	150.00	< DL	0.11
BO-578	7.57	0.20	0.42	185.00	16.38	211.00	28.60	13.00	116.00	0.05	0.76	0.31	0.41	1.00	267.00	< DL	2.30
BO-7896Z	7.48	0.32	0.71	285.00	15.97	285.00	40.70	< DL	280.00	0.05	0.50	0.29	0.65	11.80	425.00	< DL	11.60
CD-11849Z	7.23	0.73	1.63	725.0§	15.69	444.00	115.00	14.00	560.00	0.05	1.50	0.59	1.45	198.00	942.0§	7.00	45.80
CD-859	7.17	0.33	5.92	305.00	17.12	465.00	12.00	10.00	360.00	0.05	1.00	0.43	6.76	11.50	439.00	14.00	60.50

Table 4.1.5

Field measurements and conventional laboratory analytical results for parameters sampled.

Field, Analytical Parameters, and Units	Field Measures					Conventional Laboratory Parameters											
	pH SU	Sal. ppth	Sp. Cond. mmhos/cm	TDS mg/L	Temp Deg. C	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. mmhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
Drinking Water Limit and Type	**≥6.5, ≤8.5**	**N/A**	**N/A**	**500**	**N/A**	**N/A**	**250 (S)**	**15 (S)**	**N/A**	**10 (P)**	**N/A**	**N/A**	**N/A**	**250 (S)**	**500 (S)**	**N/A**	**(TT)**
Well Number↓	**Laboratory Detection Limits →**					**5**	**0.25**	**5**	**5**	**0.01**	**0.10**	**0.05**	**0.10**	**1.0**	**10**	**4.0**	**0.3**
CO-433	7.03	0.64	1.29	841.1§	27.06	575.00	21.10	10.00	780.00	0.05	2.00	0.95	< DL	38.50	865.0§	35.00	194.00
CT-DENNIS	7.06	0.11	0.22	145.83	21.99	79.20	16.60	< DL	90.00	0.08	0.11	< DL	0.48	5.00	195.00	< DL	2.40
EB-1231	6.62	0.13	0.27	180.84	23.28	80.40	25.30	< DL	76.00	0.05	< DL	< DL	0.48	10.40	150.00	< DL	12.50
EB-34	6.84	0.18	0.37	244.40	20.57	166.00	14.40	10.00	156.00	0.05	0.55	0.11	0.48	2.80	265.00	< DL	0.79
EB-8599Z	6.51	0.09	0.20	133.50	23.78	71.60	16.50	< DL	56.00	< DL	0.50	0.08	0.27	4.10	130.00	6.00	2.30
EB-991B	7.54	0.13	0.26	174.83	22.15	122.00	3.50	< DL	70.00	< DL	0.43	0.13	0.31	8.00	240.00	< DL	< DL
EF-5329Z	5.64§	0.02	0.06	41.04	23.79	22.70	4.60	< DL	14.00	0.17	< DL	< DL	< DL	2.10	10.00	< DL	1.70
EV-673	7.36	0.38	0.75	425.00	16.89	231.00	77.70	< DL	198.00	< DL	0.29	0.43	0.77	1.50	501.00§	< DL	10.10
FR-1358	6.82	0.79	1.56	1017.3	20.90	358.00	270.0§	< DL	360.00	0.39	0.34	0.40	1.44	20.20	430.00	11.00	68.50
I-7312Z	7.44	0.22	0.45	230.00	18.21	206.00	4.50	10.00	190.00	< DL	0.64	< DL	0.46	1.00	301.00	< DL	7.00
IB-363	7.92	0.29	0.59	384.00	13.53	189.00	35.90	< DL	222.00	< DL	0.53	0.36	0.56	18.30	270.00	6.00	11.20
IB-COM	7.66	0.71	1.40	913.0§	12.38	292.00	237.00	< DL	680.00	< DL	1.10	< DL	1.21	1.00	775.00§	7.00	22.10
JD-862	6.53	0.47	0.95	808.7§	24.49	118.00	196.00	10.00	164.00	< DL	0.53	0.36	1.23	1.00	435.00	7.00	16.20
JF-224	8.35	0.61	1.24	808.7§	24.76	281.00	217.00	30.0§	24.00	< DL	1.30	0.73	1.73	1.00	695.00§	< DL	0.46
LF-572	7.48	0.21	0.40	185.00	16.14	175.00	7.00	< DL	186.00	< DL	0.51	0.32	0.43	4.90	277.00	< DL	5.20
LF-572*	7.48	0.21	0.42	277.00	16.14	170.00	7.50	<DL	182.00	0.05	0.53	0.42	0.39	4.70	240.00	4.00	4.60
LI-5477Z	7.96	0.20	0.43	282.70	20.90	181.00	8.30	10.00	54.00	< DL	0.81	0.25	0.49	< DL	230.00	< DL	< DL
LI-7945Z	8.22	0.33	0.69	450.90	23.40	131.00	114.00	< DL	54.00	< DL	1.10	0.50	7.45	2.10	360.00	< DL	< DL
LI-7965Z	6.46§	0.07	1.55	101.00	22.02	41.60	10.10	< DL	46.00	< DL	0.52	0.07	1.48	3.20	90.00	< DL	< DL
LS-264	NR					72.10	10.50	< DL	26.00	0.64	< DL	0.71	0.21	6.60	185.00	< DL	0.32
MA-248	6.77	0.37	0.76	498.70	21.80	377.00	9.50	10.00	360.00	< DL	0.99	0.75	0.76	1.00	880.00§	14.00	130.00
MO-124	6.08	0.16	0.30	300.00	18.33	105.00	38.50	< DL	146.00	0.98	0.20	0.46	0.33	1.00	213.00	20.00	29.20
MO-124*	6.08	0.16	0.32	213.00	18.33	105.00	38.50	<DL	146.00	0.98	0.20	0.46	0.30	<DL	300.00	20.00	29.20
MO-364	7.19	0.83	1.55	R	17.85	270.00	335.0§	< DL	220.00	< DL	0.11	0.70	1.63	38.90	1065.0§	< DL	4.60
MO-871	6.90	0.36	0.74	484.00	21.03	245.00	53.50	10.00	220.00	0.25	0.33	0.26	0.72	37.00	420.00	11.00	21.70

Table 4.1.5

Field measurements and conventional laboratory analytical results for parameters sampled.

Field, Analytical Parameters, and Units	Field Measures					Conventional Laboratory Parameters											
	pH SU	Sal. ppth	Sp. Cond. mmhos/cm	TDS mg/L	Temp Deg. C	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. mmhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
Drinking Water Limit and Type	**≥6.5, ≤8.5**	**N/A**	**N/A**	**500**	**N/A**	**N/A**	**250 (S)**	**15 (S)**	**N/A**	**10 (P)**	**N/A**	**N/A**	**N/A**	**250 (S)**	**500 (S)**	**N/A**	**(TT)**
Well Number↓	**Laboratory Detection Limits →**					**5**	**0.25**	**5**	**5**	**0.01**	**0.10**	**0.05**	**0.10**	**1.0**	**10**	**4.0**	**0.3**
NA-5404Z	6.87	0.48	0.82	435.00	16.88	364.00	69.40	< DL	324.00	< DL	1.50	< DL	0.96	1.00	624.00§	21.00	44.30
OU-5524Z	6.78	0.06	0.13	105.00	16.18	30.20	19.30	< DL	26.00	0.12	< DL	0.12	0.14	2.60	89.00	< DL	1.50
PC-5515Z	6.57	0.44	0.90	582.0§	14.31	377.00	41.20	< DL	620.00	< DL	1.80	< DL	0.88	1.00	420.00	15.00	48.00
R-6947Z	6.39§	0.02	0.05	348.90	20.70	12.90	3.80	< DL	34.00	0.56	0.17	< DL	0.07	1.10	< DL	< DL	1.10
RI-469	7.56	0.13	0.29	NR	NR	55.50	31.50	< DL	80.00	7.20	< DL	0.14	0.29	7.40	250.00	< DL	0.82
RI-730	7.54	0.20	0.43	278.66	21.62	165.00	34.40	< DL	166.00	1.80	0.76	0.84	0.43	21.20	345.00	< DL	1.70
RI-RAYVIL	7.52	0.25	0.53	278.66	21.60	264.00	17.40	10.00	280.00	< DL	0.71	0.69	0.50	1.00	435.00	14.00	70.00
RR-254	6.30§	0.10	0.21	140.00	17.06	69.00	59.40	< DL	30.00	0.52	0.17	0.07	0.31	11.50	150.00	< DL	< DL
RR-254*	6.30§	0.10	0.21	138.00	17.06	74.80	71.60	6.00	32.00	0.48	0.10	0.11	0.34	5.10	220.00	4.00	0.20
RR-345	7.14	0.61	0.21	790.0§	17.03	377.00	63.30	< DL	480.00	< DL	1.40	< DL	1.06	62.60	680.00§	86.00	189.00
SC-179	8.12	1.04	2.04	1326.4	21.90	363.00	347.0§	10.00	82.00	< DL	2.60	0.49	2.49	< DL	1060.0§	< DL	0.56
SH-5333Z	6.15§	0.04	NR	NR	23.12	18.00	9.10	< DL	26.00	0.61	0.35	< DL	< DL	< DL	< DL	6.00	1.20
SH-77	7.08	0.05	0.12	NR	23.12	28.00	2.90	< DL	40.00	< DL	1.00	< DL	< DL	< DL	35.00	< DL	5.70
SJ-226	7.73	0.43	8.85	575.4§	19.84	181.00	124.00	< DL	178.00	< DL	1.40	0.65	10.60	14.50	460.00	< DL	3.90
SJB-173	7.76	0.91	1.81	1175.0	26.32	339.00	297.0§	< DL	174.00	< DL	1.70	0.30	1.86	< DL	1176.0§	< DL	0.90
SL-7152Z	7.42	0.20	0.39	235.00	15.68	179.00	4.60	< DL	172.00	< DL	1.50	0.49	0.41	< DL	265.00	< DL	5.70
SMN-33	7.88	0.23	0.47	306.00	13.75	170.00	22.00	< DL	192.00	< DL	2.20	< DL	0.46	< DL	215.00	< DL	2.80
SMN-33*	7.88	0.23	0.47	306.00	13.75	170.00	21.90	<DL	204.00	0.05	1.00	0.27	0.44	1.00	190.00	4.00	3.10
ST-11516Z	8.09	0.13	0.28	184.50	23.00	146.00	9.60	10.00	34.00	< DL	0.43	0.36	0.33	3.00	160.00	< DL	0.30
TA-7627Z	5.76§	0.01	3.68	23.90	20.68	8.10	3.80	< DL	14.00	< DL	0.17	< DL	< DL	< DL	3.14	< DL	0.35
TS-61	7.16	N/A	1.75	579.9§	NR	434.00	22.10	55.0§	440.00	< DL	1.20	0.65	1.75	< DL	520.00§	24.00	130.00
TS-FORTENB	6.96	0.39	0.81	525.0§	22.98	349.00	16.60	10.00	380.00	< DL	1.50	1.10	0.70	< DL	235.00	28.00	168.00
V-535	5.24§	0.01	0.03	166.00	20.28	< DL	2.70	10.00	50.00	< DL	0.27	< DL	< DL	< DL	35.00	9.00	17.90
VE-151	7.41	0.49	0.93	505.0§	17.82	314.00	113.00	10.00	720.00	< DL	0.91	< DL	0.99	< DL	644.00§	8.00	32.90
VE-862	7.40	0.56	1.16	605.0§	18.14	329.00	125.00	10.00	252.00	< DL	2.30	1.00	1.12	< DL	730.00§	< DL	3.10

Table 4.1.5

Field measurements and conventional laboratory analytical results for parameters sampled.

Field, Analytical Parameters, and Units	Field Measures					Conventional Laboratory Parameters											
	pH SU	Sal. ppth	Sp. Cond. mmhos/cm	TDS mg/L	Temp Deg. C	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. mmhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
Drinking Water Limit and Type	**≥6.5, ≤8.5**	**N/A**	**N/A**	**500**	**N/A**	**N/A**	**250 (S)**	**15 (S)**	**N/A**	**10 (P)**	**N/A**	**N/A**	**N/A**	**250 (S)**	**500 (S)**	**N/A**	**(TT)**
Well Number↓	**Laboratory Detection Limits →**					**5**	**0.25**	**5**	**5**	**0.01**	**0.10**	**0.05**	**0.10**	**1.0**	**10**	**4.0**	**0.3**
VE-882	7.61	0.42	0.86	465.00	17.17	295.00	56.80	10.00	236.00	< DL	1.20	< DL	0.85	< DL	730.00§	< DL	3.10
VE-882*	7.61	0.42	0.83	430.00	17.14	319.00	56.60	10.00	240.00	0.05	1.60	0.28	0.85	1.00	551.0§	5.00	6.60
VE-VIATOR	7.47	0.24	0.49	185.00	16.38	206.00	9.70	10.00	214.00	< DL	1.60	< DL	0.50	< DL	323.00	10.00	25.50
WA-5295Z	5.90§	0.02	0.35	22.99	20.83	10.10	2.60	10.00	14.00	0.35	0.18	< DL	0.35	< DL	40.00	< DL	0.45
WA-5311Z	5.23§	0.01	2.73	17.79	21.38	5.80	3.30	10.00	10.00	0.26	0.13	< DL	2.72	< DL	10.00	< DL	< DL
WC-527	7.09	0.65	1.31	853.7§	21.30	406.00	107.00	10.00	600.00	0.09	0.43	0.22	1.35	57.40	535.0§	9.00	38.70
WC-91	7.12	0.51	1.03	671.5§	21.00	283.00	135.00	< DL	380.00	< DL	0.37	0.10	1.34	10.30	575.0§	< DL	6.00

(P) – Primary, (S) – Secondary, (AL) – Action Level

*Denotes Duplicate Sample; § – Exceeds USEPA Secondary Standard; ‡ – Exceeds USEPA Action Level

Table 4.1.6

Laboratory analytical results for the inorganic (Total Metals) parameters sampled.

Analytical Parameters and Units	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	**1.0**	**1.0**	**1.0**	**0.5**	**1.0**	**1.0**	**3.0**	**50**	**1**	**0.20**	**1.0**	**1.0**	**0.50**	**0.50**	**5.0**
Drinking Water Limit and Type	**6 (P)**	**10 (P)**	**2,000 (P)**	**4 (P)**	**5 (P)**	**100 (P)**	**1,300 (AL)**	**300 (S)**	**15 (AL)**	**2 (P)**	**N/A**	**50 (P)**	**N/A**	**2 (P)**	**5,000 (S)**
Well Number↓															
AC-539	< DL	< DL	539.00	< DL	< DL	< DL	< DL	158	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AC-8316Z	< DL	< DL	499.00	< DL	< DL	< DL	< DL	94	< DL	< DL	< DL	< DL	< DL	< DL	8.60
AN-266	< DL	< DL	117.00	< DL	< DL	< DL	< DL	158	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AN-266*	<DL	<DL	114.00	<DL	<DL	<DL	<DL	168	<DL	<DL	<DL	<DL	<DL	<DL	<DL
AN-321	< DL	< DL	202.00	< DL	< DL	< DL	< DL	100	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AN-321*	<DL	<DL	200.00	<DL	<DL	<DL	<DL	118	<DL	<DL	<DL	<DL	<DL	<DL	<DL
AN-337	< DL	< DL	80.20	< DL	< DL	< DL	< DL	70.70	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AN-500	< DL	< DL	207.00	< DL	< DL	< DL	< DL	31.10	1.90	< DL	< DL	< DL	< DL	< DL	< DL
AN-6297Z	< DL	< DL	543.00	< DL	< DL	< DL	7.20	78.70	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AN-9183Z	< DL	< DL	36.00	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AV-126	< DL	< DL	420.00	< DL	< DL	< DL	< DL	12000§	< DL	< DL	< DL	< DL	< DL	< DL	27.60
AV-462	< DL	3.00	52.80	< DL	< DL	< DL	< DL	5270§	< DL	< DL	< DL	< DL	< DL	< DL	6.10
AV-462*	<DL	3.00	52.80	<DL	<DL	<DL	<DL	5270§	<DL	<DL	<DL	<DL	<DL	<DL	6.10
AV-5495Z	< DL	< DL	115.00	< DL	< DL	< DL	3.70	< DL	< DL	< DL	5.40	1.90	< DL	< DL	11.70
AV-5495Z*	<DL	<DL	116.00	<DL	<DL	<DL	<DL	<DL	<DL	<DL	4.80	1.90	<DL	<DL	5.50
BE-378	< DL	1.4	190.00	< DL	< DL	< DL	< DL	2370§	< DL	< DL	< DL	< DL	< DL	< DL	10.00
BE-412	< DL	< DL	102.00	< DL	< DL	1.30	< DL	< DL	< DL	< DL	1.30	< DL	< DL	< DL	17.40
BE-488	< DL	< DL	78.30	< DL	< DL	1.10	< DL	51	< DL	< DL	1.70	< DL	< DL	< DL	6.10
BE-488*	<DL	<DL	75.10	<DL	<DL	<DL	2.10	50	<DL	<DL	1.60	<DL	<DL	<DL	<DL
BO-434	< DL	1.30	75.50	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
BO-578	< DL	< DL	261.00	< DL	< DL	< DL	< DL	738§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
BO-7896Z	< DL	2.50	451.00	< DL	< DL	< DL	< DL	1430§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CD-11849Z	< DL	8.70	162.00	< DL	< DL	< DL	< DL	4030§	< DL	< DL	< DL	< DL	< DL	< DL	< DL

Table 4.1.6

Laboratory analytical results for the inorganic (Total Metals) parameters sampled.

Analytical Parameters and Units	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	**1.0**	**1.0**	**1.0**	**0.5**	**1.0**	**1.0**	**3.0**	**50**	**1**	**0.20**	**1.0**	**1.0**	**0.50**	**0.50**	**5.0**
Drinking Water Limit and Type	**6 (P)**	**10 (P)**	**2,000 (P)**	**4 (P)**	**5 (P)**	**100 (P)**	**1,300 (AL)**	**300 (S)**	**15 (AL)**	**2 (P)**	**N/A**	**50 (P)**	**N/A**	**2 (P)**	**5,000 (S)**
Well Number↓															
CD-859	< DL	2.70	561.00	< DL	< DL	< DL	< DL	5510§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CO-433	< DL	3.80	842.00	< DL	< DL	< DL	< DL	14100§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CT-DENNIS	< DL	< DL	6.10	< DL	< DL	< DL	15.90	92	1.60	< DL	1.10	< DL	< DL	< DL	244.00
EB-1231	< DL	< DL	203.00	< DL	< DL	3.50	9.60	1490§	< DL	< DL	2.30	1.80	< DL	< DL	< DL
EB-34	< DL	< DL	198.00	< DL	< DL	< DL	9.70	434§	< DL	< DL	< DL	< DL	< DL	< DL	11.60
EB-8599Z	< DL	< DL	225	< DL	< DL	< DL	< DL	168	< DL	< DL	< DL	< DL	< DL	< DL	10.80
EB-991B	< DL	< DL	29.20	< DL	< DL	< DL	< DL	84	< DL	< DL	< DL	< DL	< DL	< DL	< DL
EF-5329Z	< DL	<DL	26.90	< DL	< DL	< DL	167.00	73	8.70	< DL	1.20	< DL	< DL	< DL	46.30
EV-673	< DL	2.80	245.00	< DL	< DL	< DL	4.40	88	< DL	< DL	< DL	< DL	< DL	< DL	15.00
FR-1358	< DL	3.90	193.00	< DL	< DL	< DL	< DL	2760§	< DL	< DL	1.80	< DL	< DL	< DL	< DL
I-7312Z	< DL	1.40	168.00	< DL	< DL	< DL	< DL	972§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
IB-363	< DL	28.50‡	417.00	< DL	< DL	< DL	< DL	1910§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
IB-COM	< DL	6.90	717.00	< DL	< DL	< DL	< DL	2410§	< DL	< DL	< DL	< DL	< DL	< DL	119.00
JD-862	< DL	< DL	770.00	< DL	< DL	< DL	< DL	2270§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
JF-224	< DL	< DL	123.00	0.57	< DL	< DL	< DL	96	2.00	< DL	< DL	< DL	< DL	< DL	< DL
LF-572	< DL	< DL	204.00	< DL	< DL	< DL	< DL	64	< DL	< DL	< DL	< DL	< DL	< DL	< DL
LF-572*	<DL	<DL	200.00	<DL	<DL	<DL	<DL	712§	<DL	<DL	<DL	<DL	<DL	<DL	<DL
LI-5477Z	< DL	< DL	89.80	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
LI-7945Z	< DL	< DL	177.00	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	70.20
LI-7965Z	< DL	< DL	144.00	< DL	< DL	< DL	< DL	< DL	1.30	< DL	< DL	< DL	< DL	< DL	7.30
LS-264	< DL	1.80	26.30	< DL	< DL	1.30	3.90	< DL	< DL	< DL	1.10	< DL	< DL	< DL	9.10
MA-248	< DL	9.00	533.00	< DL	< DL	< DL	< DL	10600§	< DL	< DL	< DL	< DL	< DL	< DL	9.70
MO-124	< DL	2.10	197.00	< DL	< DL	2.20	57.20	8520§	4.00	< DL	< DL	< DL	< DL	< DL	11.70

Table 4.1.6

Laboratory analytical results for the inorganic (Total Metals) parameters sampled.

Analytical Parameters and Units	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	**1.0**	**1.0**	**1.0**	**0.5**	**1.0**	**1.0**	**3.0**	**50**	**1**	**0.20**	**1.0**	**1.0**	**0.50**	**0.50**	**5.0**
Drinking Water Limit and Type	**6 (P)**	**10 (P)**	**2,000 (P)**	**4 (P)**	**5 (P)**	**100 (P)**	**1,300 (AL)**	**300 (S)**	**15 (AL)**	**2 (P)**	**N/A**	**50 (P)**	**N/A**	**2 (P)**	**5,000 (S)**
Well Number↓															
MO-124*	<DL	2.10	197.00	<DL	<DL	<DL	57.20	8520§	4.00	<DL	<DL	<DL	<DL	<DL	11.70
MO-364	< DL	< DL	625.00	< DL	< DL	< DL	5.50	567§	< DL	< DL	7.00	< DL	< DL	< DL	17.80
MO-871	< DL	5.80	285.00	< DL	< DL	< DL	< DL	534§	< DL	< DL	1.20	< DL	< DL	< DL	13.60
NA-5404Z	< DL	< DL	590.00	< DL	< DL	< DL	< DL	10800§	< DL	< DL	< DL	< DL	< DL	< DL	5.10
OU-5524Z	< DL	< DL	52.40	< DL	< DL	1.30	36.30	355§	< DL	< DL	1.10	< DL	< DL	< DL	10.80
PC-5515Z	< DL	5.30	1260.00	< DL	< DL	< DL	< DL	5590§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
R-6947Z	< DL	< DL	39.80	< DL	< DL	< DL	< DL	< DL	< DL	< DL	1.30	< DL	< DL	< DL	11.00
RI-469	< DL	< DL	32.90	< DL	< DL	5.00	< DL	< DL	< DL	< DL	2.20	< DL	< DL	< DL	18.70
RI-730	< DL	1.70	103.00	< DL	< DL	1.20	< DL	242	< DL	< DL	1.20	< DL	< DL	< DL	5.30
RI-RAYVIL	< DL	< DL	255.00	< DL	< DL	< DL	4.10	7480§	1.40	< DL	< DL	< DL	< DL	< DL	7.30
RR-254	< DL	< DL	46.20	< DL	< DL	< DL	16.60	154	< DL	< DL	1.40	< DL	< DL	< DL	18.60
RR-254*	<DL	<DL	45.40	<DL	<DL	<DL	14.90	154	<DL	<DL	1.40	<DL	<DL	<DL	15.30
RR-345	< DL	1.50	470.00	< DL	< DL	< DL	< DL	13000§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SC-179	< DL	< DL	74.30	< DL	< DL	< DL	< DL	388§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SH-5333Z	< DL	< DL	11.80	< DL	< DL	< DL	< DL	< DL	8.50	< DL	1.30	< DL	< DL	< DL	28.80
SH-77	< DL	< DL	132.00	< DL	< DL	< DL	< DL	331§	< DL	< DL	< DL	< DL	< DL	< DL	24100
SJ-226	< DL	< DL	305.00	< DL	< DL	< DL	< DL	786§	< DL	< DL	< DL	< DL	< DL	< DL	18.80
SJB-173	< DL	< DL	409.00	< DL	< DL	< DL	< DL	527§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SL-7152Z	< DL	< DL	132.00	< DL	< DL	< DL	< DL	759§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SMN-33	< DL	3.40	550.00	< DL	< DL	< DL	< DL	1630§	< DL	< DL	< DL	< DL	< DL	< DL	6.30
SMN-33*	<DL	3.50	539.00	<DL	<DL	<DL	<DL	1660§	<DL	<DL	<DL	<DL	<DL	<DL	5.30
ST-11516Z	< DL	< DL	16.90	< DL	< DL	< DL	3.80	90	< DL	< DL	< DL	< DL	< DL	< DL	< DL
TA-7627Z	< DL	< DL	13.60	< DL	< DL	< DL	5.10	< DL	< DL	< DL	1.20	< DL	< DL	< DL	< DL

Table 4.1.6

Laboratory analytical results for the inorganic (Total Metals) parameters sampled.

Analytical Parameters and Units	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	**1.0**	**1.0**	**1.0**	**0.5**	**1.0**	**1.0**	**3.0**	**50**	**1**	**0.20**	**1.0**	**1.0**	**0.50**	**0.50**	**5.0**
Drinking Water Limit and Type	**6 (P)**	**10 (P)**	**2,000 (P)**	**4 (P)**	**5 (P)**	**100 (P)**	**1,300 (AL)**	**300 (S)**	**15 (AL)**	**2 (P)**	**N/A**	**50 (P)**	**N/A**	**2 (P)**	**5,000 (S)**
Well Number↓															
TS-61	< DL	< DL	712.00	< DL	< DL	< DL	< DL	9860§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
TS-FORTENB	< DL	19.70‡	490.00	< DL	< DL	< DL	9.80	11000§	< DL	< DL	< DL	< DL	< DL	< DL	13.20
V-535	< DL	< DL	30.00	< DL	< DL	< DL	390.00	155	1.10	< DL	< DL	< DL	< DL	< DL	99.40
VE-151	< DL	1.80	347.00	< DL	< DL	< DL	< DL	3400§	< DL	< DL	< DL	< DL	< DL	< DL	5.10
VE-862	< DL	< DL	955.00	< DL	< DL	< DL	< DL	968§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
VE-882	< DL	< DL	1878.00	< DL	< DL	< DL	< DL	1390§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
VE-882*	<DL	<DL	584.00	<DL	<DL	<DL	<DL	1420§	<DL	<DL	<DL	<DL	<DL	<DL	<DL
VE-VIATOR	< DL	7.70	138.00	< DL	< DL	< DL	< DL	2780§	< DL	< DL	< DL	< DL	< DL	< DL	< DL
WA-5295Z	< DL	< DL	63.00	< DL	< DL	1.30	5.00	< DL	< DL	< DL	< DL	< DL	< DL	< DL	6.50
WA-5311Z	< DL	< DL	15.80	< DL	< DL	< DL	3.90	< DL	< DL	< DL	< DL	< DL	< DL	< DL	9.40
WC-527	< DL	1.60	458.00	< DL	< DL	< DL	< DL	4300§	< DL	< DL	< DL	< DL	< DL	< DL	7.90
WC-91	< DL	7.50	175.00	< DL	< DL	< DL	1.80	705§	< DL	< DL	< DL	< DL	< DL	< DL	< DL

Analytical results for wells RI-450 and UN-5332Z are not listed as metals data for these 2 wells was rejected due to container contamination.
(P) – Primary, (S) – Secondary, (AL) – Action Level
*Denotes Duplicate Sample; § – Exceeds USEPA Secondary Standard; ‡ – Exceeds USEPA Action Level

Table 4.1.7

Field and conventional statistics for ASSET wells sampled.

Parameter		Minimum	Maximum	Average
Field	Temperature (^{O}C)	12.38	27.06	20.07
	pH (SU)	5.23	8.51	7.14
	Specific Conductance (mmhos/cm)	0.03	8.85	0.94
	Salinity (ppt)	0.01	1.28	0.33
	TDS (g/L)	10.00	1612.54	396.41
Conventional	Alkalinity (mg/L)	< DL	575.00	197.58
	Chloride (mg/L)	2.60	632.00	74.39
	Color (PCU)	< DL	55.00	7.98
	Specific Conductance (umhos/cm)	0.07	1.31	10.60
	Sulfate (mg/L)	< DL	198.00	11.43
	TDS (mg/L)	< DL	1260.00	396.76
	Total Suspended Solids (TSS) (mg/L)	< DL	86.00	7.13
	Turbidity (NTU)	< DL	194.00	24.61
	Hardness (mg/L)	8.00	780.00	198.11
	Nitrite - Nitrate, as N (mg/L)	< DL	7.40	0.31
	Total Kjeldahl Nitrogen (TKN) (mg/L)	< DL	2.60	0.77
	Total Phosphorus (mg/L)	< DL	1.10	0.31

Table 4.1.8

Inorganic (Total Metals) statistics for ASSET wells sampled.

Parameter	Minimum	Maximum	Average
Antimony (µg/L)	12.38	27.06	20.07
Arsenic (µg/L)	5.23	8.51	7.14
Barium (µg/L)	0.03	8.85	0.94
Beryllium (µg/L)	0.01	1.28	0.33
Cadmium (µg/L)	10.00	1612.54	396.41
Chromium (µg/L)	< DL	575.00	197.58
Copper (µg/L)	2.60	632.00	74.39
Iron (µg/L)	< DL	55.00	7.98
Lead (µg/L)	0.07	1.31	10.60
Mercury (µg/L)	< DL	198.00	11.43
Nickel (µg/L)	< DL	1260.00	396.76
Selenium (µg/L)	< DL	86.00	7.13
Silver (µg/L)	< DL	194.00	24.61
Thallium (µg/L)	8.00	780.00	198.11
Zinc (µg/L)	< DL	7.40	0.31

Table 4.1.9

LDEQ ASSET Program field parameters, conventional, and inorganic analytes with applicable USEPA National Primary (MCL) and Secondary (SMCL) Drinking Water Standards and Action Levels (AL).

Parameter/Analyte		MCL Type / Limit	Unit
Field	Temperature (Temp)	-	Degrees C.
	pH	SMCL / ≥ 6.5, ≤ 8.5	SU
	Specific Conductance (Sp. Cond.)	-	mmhos/cm
	Salinity (Sal.)	-	ppth
	Total Dissolved Solids (TDS)	SMCL / 0.5	g/L
Conventional	Alkalinity (Alk)	-	mg/L
	Chloride (Cl)	SMCL / 250	mg/L
	Color	SMCL / 15	PCU
	Specific Conductance (Sp. Cond.)	-	umhos/cm
	Sulfate (SO4)	SMCL / 250	mg/L
	Total Dissolved Solids (TDS)	SMCL / 500	mg/L
	Total Suspended Solids (TSS)	-	mg/L
	Turbidity (Turb)	*MCL / 1	NTU
	Ammonia (NH3)	-	mg/L
	Hardness (Hard)	-	mg/L
	Nitrite-Nitrate (NO2NO3)	MCL / 10	mg/L
	Total Kjeldahl Nitrogen (TKN)	-	mg/L
	Total Phosphorus (Tot. P)	-	mg/L
Inorganics (Total Metals)	Antimony	MCL / 6	µg/L
	Arsenic	MCL / 10	µg/L
	Barium	MCL / 2,000	µg/L
	Beryllium	MCL / 4	µg/L
	Cadmium	MCL / 5	µg/L
	Chromium	MCL / 100	µg/L
	Copper	AL / 1,300	µg/L
	Iron	SMCL / 300	µg/L
	Lead	AL / 15	µg/L
	Mercury	MCL / 2	µg/L
	Nickel	-	µg/L
	Selenium	MCL / 50	µg/L
	Silver	SMCL / 100	µg/L
	Thallium	MCL / 2	µg/L
	Zinc	SMCL / 5,000	µg/L

MCL = Primary Maximum Contaminant Level; SMCL = Secondary Maximum Contaminant Level; AL = Action Level

* Only applies to public water supply systems with surface water source, or groundwater source under the direct influence of surface water. Louisiana Department of Health has determined that no public water supply well falls in this category.

Table 4.1.10

ASSET Program Volatile Organic Compounds analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
1,1,1-Trichloroethane	624	0.5
1,1,2,2-Tetrachloroethane	624	0.5
1,1,2- Trichloroethane	624	0.5
1,1-Dichloroethane	624	0.5
1,1- Dichloroethene	624	0.5
1,2,3-Trichlorobenzene	624	1.0
1,2-Dichlorobenzene	624	0.5
1,2-Dichloroethane	624	0.5
1,2-Dichloropropane	624	0.5
1,3- Dichlorobenzene	624	0.5
1,4-Dichlorobenzene	624	0.5
Benzene	624	0.5
Bromodichloromethane	624	0.5
Bromoform	624	0.5
Bromomethane	624	0.5
Carbon Tetrachloride	624	0.5
Chlorobenzene	624	0.5
Chloroethane	624	0.5
Chloroform	624	0.5
Chloromethane	624	0.5
cis-1,3-Dichloropropene	624	0.5
Dibromochloromethane	624	0.5
Ethyl Benzene	624	0.5
Methylene Chloride	624	0.5
o-Xylene	624	1.0
Styrene	624	1.0
Methyl-t-Butyl Ether	624	0.5
Tetrachloroethene	624	0.5
Toluene	624	0.5
trans-1,2-Dichloroethene	624	0.5
trans-1,3-Dichloropropene	624	0.5
Trichloroethene	624	0.5
Trichlorofluoromethane	624	0.5
Vinyl Chloride	624	0.5
m & p-Xylenes	624	2.0

Table 4.1.11

ASSET Program Semi-Volatile Organic Compounds analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
1,2,4-Trichlorobenzene	625	10
2,4,6-Trichlorophenol	625	10
2,4-Dichlorophenol	625	10
2,4-Dimethylphenol	625	10
2,4-Dinitrophenol	625	10
2,4-Dinitrotoluene	625	10
2,6-Dinitrotoluene	625	10
2-Chloronaphthalene	625	10
2-Chlorophenol	625	10
2-Nitrophenol	625	10
3,3'-Dichlorobenzidine	625	5
4,6-Dinitro-2-Methylphenol	625	10
4-Bromophenyl Phenyl Ether	625	10
4-Chloro-3-Methylphenol	625	10
4-Chlorophenyl Phenyl Ether	625	10
4-Nitrophenol	625	10
Acenaphthene	625	10
Acenaphthylene	625	10
Anthracene	625	10
Benzidine	625	30
Benzo(a)Anthracene	625	5
Benzo(a)Pyrene	625	5
Benzo(b)Fluoranthene	625	10
Benzo(g,h,i)Perylene	625	10
Benzo(k)Fluoranthene	625	5
Benzyl Butyl Phthalate	625	10
Bis(2-Chloroethoxy) Methane	625	10
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	625	10
Bis(2-Chloroisopropyl) Ether	625	10
Bis(2-Ethylhexyl) Phthalate	625	10
Chrysene	625	5
Dibenz(a,h)Anthracene	625	5
Diethyl Phthalate	625	10
Dimethyl Phthalate	625	10
Di-n-Butyl Phthalate	625	10
Di-n-Octylphthalate	625	10
Fluoranthene	625	10
Fluorene	625	10

Table 4.1.11

ASSET Program Semi-Volatile Organic Compounds analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
Hexachlorobenzene	625	5
Hexachlorobutadiene	625	10
Hexachlorocyclopentadiene	625	10
Hexachloroethane	625	10
Indeno(1,2,3-c,d)Pyrene	625	5
Isophorone	625	10
Naphthalene	625	10
Nitrobenzene	625	10
n-Nitrosodimethylamine	625	10
n-Nitrosodi-n-Propylamine	625	10
n-Nitrosodiphenylamine	625	10
Pentachlorophenol	625	5
Phenanthrene	625	10
Phenol	625	10
Pyrene	625	10

Table 4.1.12

ASSET Program Pesticide and PCB analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
Aldrin	608	0.01
alpha BHC (Alpha Hexachlorocyclohexane)	608	0.05
alpha Endosulfan	608	0.01
alpha-Chlordane	608	0.05
beta BHC (beta Hexachlorocyclohexane)	608	0.05
beta Endosulfan	608	0.02
Chlordane	608	0.20
delta BHC (delta Hexachlorocyclohexane)	608	0.05
Dieldrin	608	0.02
Endosulfan Sulfate	608	0.10
Endrin	608	0.02
Endrin Aldehyde	608	0.10
Endrin Ketone	608	0.10
gamma BHC (Lindane)	608	0.05
gamma-Chlordane	608	0.05
Heptachlor	608	0.01
Heptachlor Epoxide	608	0.01
Methoxychlor	608	0.50
p,p'-DDD	608	0.10

Table 4.1.12

ASSET Program Pesticide and PCB analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
p,p'-DDE	608	0.10
p,p'-DDT	608	0.02
PCB-1016 (Arochlor 1016)	608	0.20
PCB -1221 (Arochlor 1221)	608	0.20
PCB -1232 (Arochlor 1232)	608	0.20
PCB -1242 (Arochlor 1242)	608	0.20
PCB -1248 (Arochlor 1248)	608	0.20
PCB -1254 (Arochlor 1254)	608	0.20
PCB -1260 (Arochlor 1260)	608	0.20
Toxaphene	608	0.30

GLOSSARY

Agriculture – Agriculture involves the use of water for crop spraying, irrigation, livestock watering, poultry operations and other farm purposes not related to human consumption.

Designated water use – A use of the waters of the state as established by the Louisiana Water Quality Standards. These uses include primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP), drinking water supply (DWS), outstanding natural resource waters (ONR), oyster propagation (OYS), agricultural activities (AGR), and limited aquatic life and wildlife (LAL). (See also Use Support.)

Dissolved oxygen – The amount of oxygen dissolved in water, commonly expressed as a concentration in terms of milligrams per liter, mg/L.

Drinking water supply – A surface or underground raw water source which, after conventional treatment, will provide safe, clear, potable, and aesthetically pleasing water for uses which include but are not limited to, human consumption, food processing and cooking, and as a liquid ingredient in foods and beverages.

Effluent – Wastewater discharged to waters of the state.

Effluent limitation – Any applicable state or federal quality or quantity limitation which imposes any restriction or prohibition on quantities, discharge rates, and concentrations of pollutants which are discharged into waters of the state.

Existing use – Those uses actually attained in the water body on or after November 28, 1975. They may or may not be designated uses.

Fecal coliform – Gram negative, non-spore forming, rod-shaped bacteria found in the intestinal tracts of warm-blooded animals.

Fish and wildlife propagation – Fish and wildlife propagation includes the use of water for preservation and reproduction of aquatic biota such as indigenous species of fish and invertebrates, as well as reptiles, amphibians, and other wildlife associated with the aquatic environment. This use also includes the maintenance of water quality at a level that prevents contamination of aquatic biota consumed by humans.

Limited aquatic life and wildlife – A subcategory of fish and wildlife propagation that recognizes not all water bodies are capable of supporting the same level of species diversity and richness. Examples of water bodies to which this may be applied include intermittent streams and manmade water bodies that lack suitable riparian structure and habitat.

Monitored waters – Water bodies for which assessment is based on current site-specific ambient data.

Nonpoint source – A diffuse source of water pollution that does not discharge through a point source or pipe, but instead flows freely across exposed natural or manmade surfaces, such as plowed fields, pasture land, construction sites, and parking lots.

Outstanding natural resource waters – Outstanding and natural resource waters include water bodies designated for preservation, protection, reclamation, or enhancement of wilderness and aesthetic qualities and ecological regimes, such as those designated under the

Louisiana Natural and Scenic Rivers System or those designated by the Office of Environmental Compliance as waters of ecological significance. This use designation applies only to the water bodies specifically identified in Louisiana's numerical criteria, LAC 33:IX.1123, Table 3, and not to their tributaries or distributaries, unless so specified.

Oxygen-demanding substances – Organic matter or materials in water or wastewater which utilize oxygen during the decomposition process, and inorganic material, such as sulfides, which utilize oxygen during the oxidation process.

Oyster propagation – The use of water to maintain biological systems that support economically important species of oysters, clams, mussels, or other mollusks so that their productivity is preserved and the health of human consumers of these species is protected. This use shall apply only to those water bodies named in the numerical criteria tables and not to their tributaries or distributaries unless so specified.

Point source – A discernible, confined and discrete conveyance including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

Primary contact recreation – Any recreational activity which involves or requires prolonged body contact with the water, such as swimming, water skiing, tubing, snorkeling, and skin-diving.

Riparian – Area of land along the banks of a stream which often exhibits slightly different vegetation and habitats than the surrounding landscape. Because of this variation, riparian areas are considered valuable wildlife habitat and important for the protection of water quality.

Secondary contact recreation – Any recreational activity which may involve incidental or accidental body contact with the water and during which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading, and recreational boating.

Subsegment – A named regulatory water body as defined by LAC 33:IX.1123. They are considered representative of the watershed through which they flow and, therefore, have numerical criteria assigned to them. This is the level of watersheds at which §305(b) assessments are applied. Each subsegment has a six-digit number assigned in the following manner, 03=basin, 01=segment, 01=subsegment. This would be read as LA030101_00, which represents Calcasieu River-headwaters to Highway 8. For mapping purposes, the subsegment is defined as a polygonal geographical area using GIS (Geographic Information System).

Toxic substances – Any element, compound, or mixture which at sufficient exposure levels induces deleterious acute or chronic physiological effects on an organism.

Use support – A determination made by LDEQ as part of the Integrated Report process of whether or not a designated water use is being supported or met based on an analysis of water

quality data or other information. Support statements include “Fully Supported,” “Not Supported,” and “Not Assessed” (See also Designated Water Use).

Wastewater – Liquid waste resulting from commercial, municipal, private, or industrial processes. This includes but is not limited to, cooling and condensing waters, sanitary sewage, industrial waste, and contaminated rainwater runoff.

Water body – Any contiguous body of water identified by the state. A water body can be a stream, a river, a segment of a stream or river, a lake, a bay, or a series of bays.

Water quality-limited segment – Any stream segment where the stream does not meet applicable water quality standards or will not meet applicable water quality standards even after application of the effluent limitations required by the Clean Water Act, as amended.

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APPENDIX A: 2022 Integrated Report of Water Quality in Louisiana

Appendix A is taken from the 2022 ATTAINS (Assessment, Total Maximum Daily Load, Tracking and Implementation System), which contains all water quality assessments for the state. ATTAINS is an online database created by USEPA and maintained by the states for Integrated Reporting and TMDL tracking.

All suspected causes of impairment and suspected sources of impairment in the spreadsheet are linked in a one to one fashion, meaning, a reported suspected cause of impairment is believed to be affected by the suspected source of impairment provided on the same line of the table. However, as a result of this linking, some suspected causes and/or sources may be listed more than once for a given water body subsegment. This results in cases where a suspected cause of impairment has two or more suspected sources of impairment. Likewise, if a suspected source of impairment affects two or more suspected causes of impairment, the suspected source will be listed more than once. This is important to note in order to prevent double counting when attempting to develop subtotals for the size or number of water bodies affected by a given suspected cause or suspected source of impairment.

The full text of Appendix A, including a link to an online interactive subsegment assessment map, can be found in the document 22_IR1_App_A_Text_and_Maps.

The full water quality assessment spreadsheet is contained in Appendix A in the document 22_IR1_App_A_Assessments_FINAL_3-18-22.

APPENDIX B: 2022 Integrated Report of Water Quality in Louisiana – Category 1 Addendum

Appendix B, of the 2022 Integrated Report, Category 1 Addendum, contains those water body impairment combinations (WICs) that were removed from LDEQ's 2020 Integrated Report during development of the 2022 edition. The WICs were removed because the suspected cause is no longer considered to be impairing water quality of the water body subsegment or as a clarification of prior impairment causes. Removal may be based on more recent water quality data collected after development of the 2020 Integrated Report, or due to advances in water quality assessment that permit more accurate determinations of water quality. This information does not constitute a formal §303(d) or §305(b) submittal, nor is this Category 1 listing a requirement of the Clean Water Act.

The full Category 1 table is contained in Appendix B in the document, 22_IR1_App_B_Cause_Removals_FINAL_3_10_22.

APPENDIX C: Complete list of suspected causes of impairment and cause descriptions used in USEPA's ATTAINS Assessment Database

The full list of suspected causes of impairment is contained in Appendix C in the document 22_IR1_App_C_Causes_FINAL_3-10-22.

APPENDIX D: Complete list of suspected sources of impairment used in USEPA's ATTAINS Assessment Database

The full list of suspected sources of impairment table is contained in Appendix D in the document 22_IR1_App_D_Sources_FINAL_3-10-22.

APPENDIX E: Complete Listing of Louisiana's Ambient Surface Water Quality Network Sites

The full list of ambient surface water quality network sites is contained in Appendix E in the document 22_IR1_App_E_Ambient_Station_List_FINAL_3_10_22. Not all sites contained in this list are currently sampled as part of LDEQ's rotating monitoring sites program.

APPENDIX F: Public Comments on the 2022 Integrated Report and LDEQ's Response to Comments

Appendix F is a compilation of all comments received regarding the 2022 Integrated Report, along with LDEQ's response to those comments. Any changes made to the public noticed 2022 Integrated Report which are based on public comments are noted in the column titled, "Summary of LDEQ Responses." Also included in this response are changes made to the 2022 Integrated Report during the review period following public notice. Such changes are typically done to correct technical mistakes encountered during initial development of the 2022 IR.

The full summary of public comments and LDEQ's responses is contained in Appendix F in the document 22_IR1_App_F_Response_Comments_FINAL_3-10-22.

APPENDIX G: Louisiana's 2022 Section 303(d) List

Appendix G represents a subset of Louisiana's 2022 Integrated Report (IR) and includes only those water body impairment combinations (WICs) reported as Categories 5, 5RC, or 5-Alt. As has been noted in the body of the IR text, WICs in Categories 5, 5RC, and 5-Alt of the IR assessments are the only WICs on Louisiana's 2022 §303(d) List. This table was developed only as an aid to the public and does not constitute Louisiana's "official" §303(d) List. Every effort was made to maintain consistency between Appendix A Categories 5, 5RC, and 5-Alt WICs and Appendix F. ***However, in order to ensure the accuracy of the overall Integrated Report, only those WICs in Appendix A, Categories 5, 5RC, and 5-Alt constitute the "official" §303(d) List.***

The full table of §303(d) Listed WICs, with the caveat noted above, is contained in Appendix G in the document 22_IR1_App_G_Louisiana_303d_List_FINAL_3_10_22.

APPENDIX H: USEPA's National Aquatic Resource Surveys (NARS)

Beginning in the early 2000s, USEPA began development of what came to be known as the National Aquatic Resource Surveys (NARS). NARS was designed to answer national-scale questions regarding water quality; questions which could not be easily answered by aggregating the individual state's water quality reports required under CWA sections 305(b) and 303(d). Each year one of four primary water body types is evaluated under the NARS program. Water body types include rivers and streams, lakes and reservoirs, wetlands, and coastal waters. Reports for each water body type are broken down into large regions in order to standardize water quality benchmarks and reporting as much as possible within the regions. This allows NARS to provide a statistically-valid snapshot or "report card" of water quality across large regions and water body types within the United States.

In August 2021, USEPA published the final report for the 2015 National Coastal Condition Assessment (NCCA). To characterize coastal conditions, EPA interpreted the data using applicable and available benchmarks for each ecological indicator to calculate an index score to rate a site good, fair, or poor. When possible, USEPA asks states to include NARS reporting in their IRs. For the 2022 IR, LDEQ chose to include a Louisiana specific summary of USEPA's NARS report from its 2015 NCCA. The full summary is contained in Appendix H in the document 22_IR1_App_H_USEPA_NARS_FINAL_3_10_22.