2024
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
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
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
LDENR	Louisiana Department of Energy and Natural Resources
LDEQ	Louisiana Department of Environmental Quality
LDH	Louisiana Department of Health
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
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
OEA	Office of Environmental 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
RECAP	Risk Evaluation/Corrective Action Program
RES	Rollins Environmental Services
RDL	Reporting Detection Limit
ROD	Record of Decision
RPP	Remedial Project Plan
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

PART I: EXECUTIVE SUMMARY/OVERVIEW

Summary of Louisiana's Water Quality Assessment Reporting

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 2024 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 2024 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 2024 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 Integrated Report Categories (IRC) used by LDEQ can be found in Table 1.

Table 1

2024 IR Categories[1].

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; LDEQ will implement alternative strategies under the §303(d)/New Vision protocol that are expected to achieve water quality goals. **IRC 5-Alt WICs are on Louisiana's §303(d) list.**

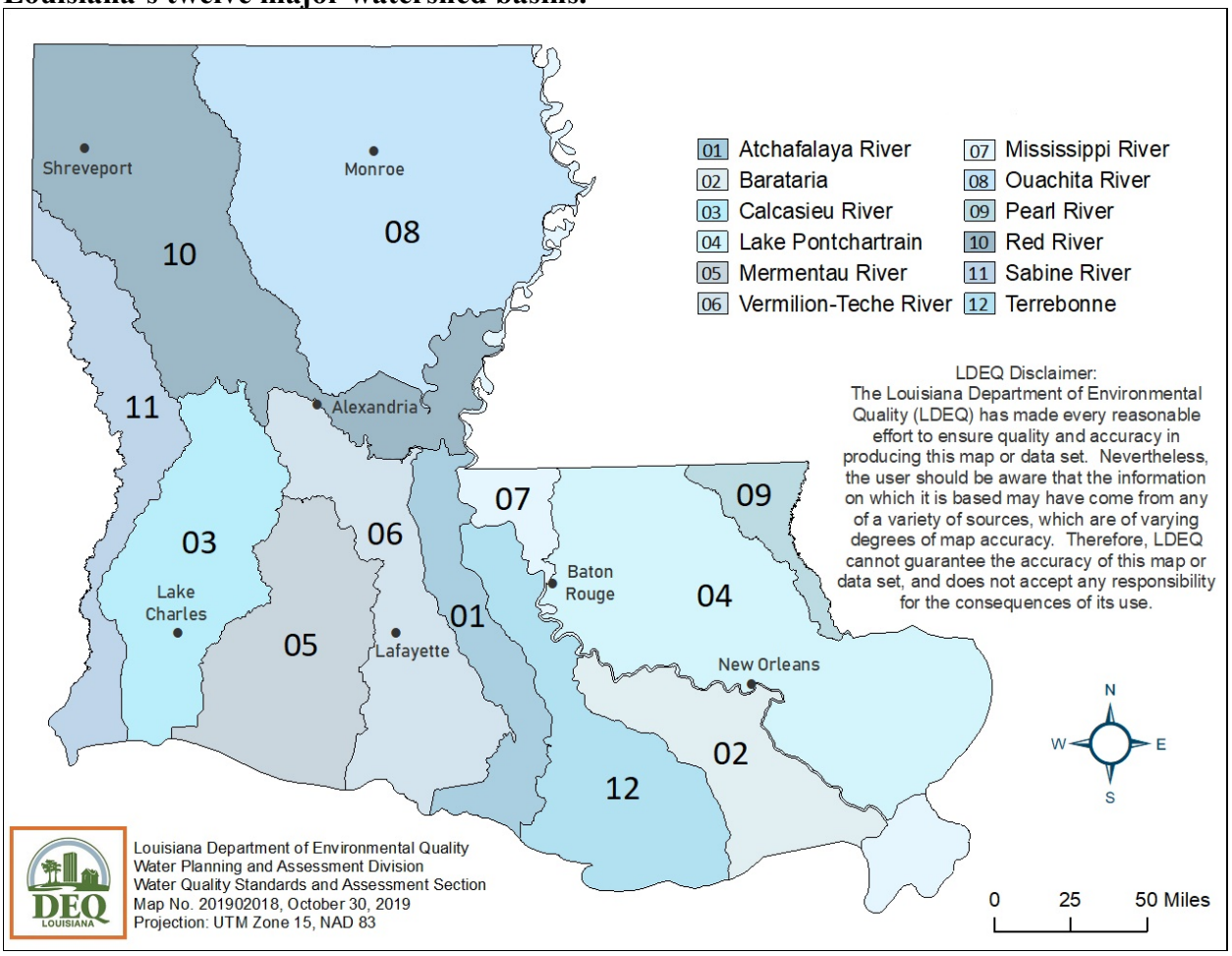
[1] USEPA IR Methodology guidance categories used to categorize water body/impairment combinations for the Louisiana 2024 IR; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by USEPA.

Summary of Overall Water Quality in Louisiana

The 2024 IR contains new assessments for subsegments in all 12 Louisiana basins (Figure 1). Due to the four-year cyclical nature of LDEQ's ambient water quality montoring network (AWQMN), typically approximately half of the assessments for the 2024 IR will be new, while the remaining half will be carried forward from the previous IR cycle (LDEQ 2022h). Data collected between October 1, 2018 and September 30, 2022 was used for the 2024 IR assessment.

Figure 1

Louisiana's twelve major watershed basins.

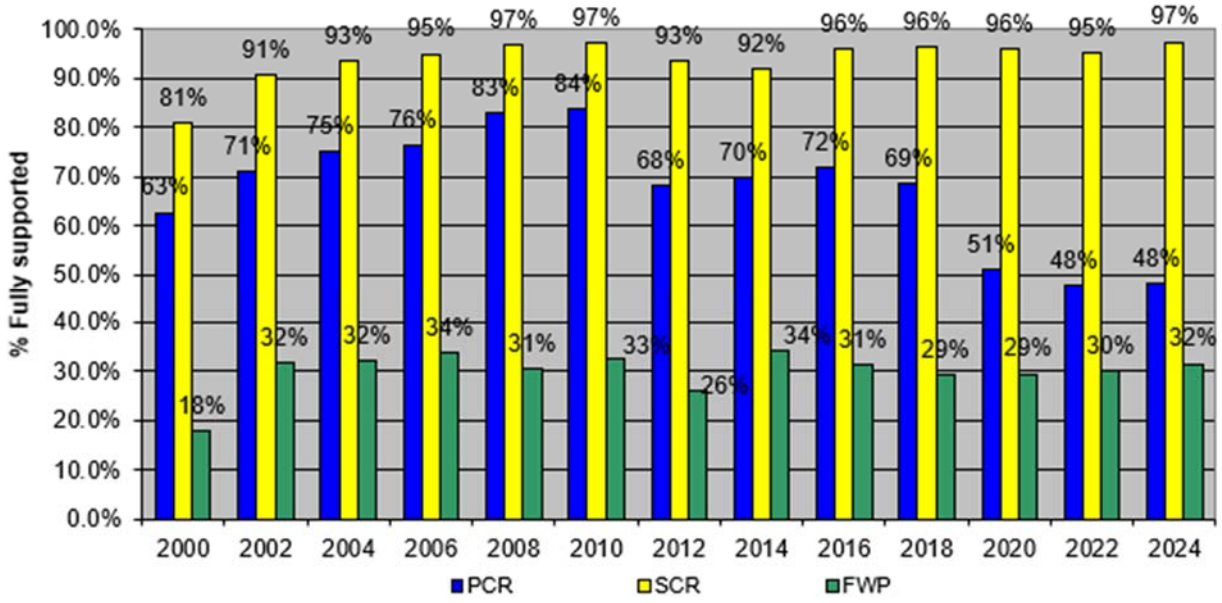


Values reported in summary tables are based on the 487 subsegments in Louisiana regulations (LAC 33:IX.1123.Table 3), as well as the 30 "advisory only" units (Appendix A) that account for fish consumption/swimming advisories on small portions of a regulatory subsegment. In these cases, the water body defined in the regulation is not impaired; however, a limited portion or tributary may be impaired due to the advisory.

Full support of the designated use of primary contact recreation (PCR or "swimming") use remained the same at 48% (Figure 2). This was down from 69% of assessed water body subsegments in the 2018 IR due to the implementation of enterococci criterion for the PCR use. Of the 233 subsegments impaired for PCR use, 50% are due to elevated enterococcus densities,

while 45% are due to elevated fecal coliform densities. The remaining PCR impairments are due to elevated water temperature or chemical contamination. Full support of secondary contact recreation (SCR or "boating") increased slightly to 97%. Of the 15 subsegments impaired for SCR use, 80% of the impairments are due to fecal coliforms and 20% due to toxin advisories. Full support of fish and wildlife propagation (FWP) use also increased slightly to 32%. 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: DO, chlorides, sulfates, total dissolved solids (TDS), turbidity, pH, metals, and organic compounds (includes pesticides). In addition to these monitored parameters, there are 122 subsegments that have FWP use impairments due to mercury or organic chemicals.

Figure 2
PCR, SCR, and FWP designated use percent Fully Supporting from 2000 to 2024 IR cycles.



Summary of Suspected Causes of Impairment to Water Quality

Table 2 lists all suspected causes of impairment for all designated uses in the 2024 IR and Table 3 provides a comparison of suspected causes between the previous 2022 and the current 2024 IR. Low DO, which is one of the parameters used to determine support of the FWP use, continues to be the most frequently cited suspected cause of impairment with 219 subsegments affected, fifteen less than was reported in 2022. Fecal coliform ranks second in terms of the number of subsegments impacted (142). 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 remain the third most frequently cited cause of impairment (117 subsegments), turbidity is the forth (92 subsegments).

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 detected infrequently. These include polychlorinated biphenyls (PCBs); furan compounds; lead; 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. For the 2024 IR, 63,300 organic chemical analyses were recorded by LDEQ. Of these, only 237 resulted in detectable concentrations of the chemical analyzed: twelve human health drinking water supply criteria exceedances, one human health non-drinking water supply, and four aquatic life criteria exceedances. The criterion exceedances included seven compounds in five subsegments, and resulted in one overall designated use impairment based on organic compounds. More information on procedures for assessing toxic substances can be found in Part III of this report.

Table 2
Number of suspected causes of designated use impairment for each water body type in the 2024 IR.

Suspected Cause of Impairment	River	Lake	Estuary	Wetland	Totals
1,1,2-Trichloroethane - Swimming Advisory	1				1
1,2-Dichloroethane	2				1
4,4'-DDT	5				5
Arsenic - Swimming Advisory		1			1
Atrazine	1				1
Carbofuran	23	1	1		25
Chloride	14	1		1	16
Chloroform - Swimming Advisory	1				1
Color	10	3			13
Copper	2				2
Dioxins - Swimming Advisory	1				1
Dioxins - Fish Consumption Advisory	5		4		9
Dissolved Oxygen	183	26	7	3	219
Enterococcus	77		39	1	117
Fecal Coliform	131	6	14	3	154
Fipronil	7				7
Furans - Fish Consumption Advisory	3		4		7
Furans - Swimming Advisory	2				2
Hexachlorobenzene - Swimming Advisory		1			1
Hexachlorobutadiene - Swimming Advisory		1			1
Lead	8				8
Lead - Swimming Advisory		1			1
Mercury - Swimming Advisory		1			1
Mercury - Fish Consumption Advisory	99	31	9	1	140
Methoxychlor	1				1

Table 2
Number of suspected causes of designated use impairment for each water body type in the 2024 IR.

Suspected Cause of Impairment	River	Lake	Estuary	Wetland	Totals
Methyl Parathion	1				1
Nitrate/Nitrite (Nitrite + Nitrate as N)	35	4			39
Non-Native Aquatic Plants	1	1			2
Oil and Grease		1			1
PCBs - Fish Consumption Advisory	3	2	4		9
PCBs - Swimming Advisory	2				2
pH, High	1	6			7
pH, Low	13	1			14
Phenol	1				1
Phosphorus, Total	33	4			37
Polycyclic Aromatic Hydrocarbons (PAHs)	1				1
Sulfate	15				15
Temperature	4	7			11
Total Dissolved Solids (TDS)	43	1		1	45
Toxaphene	1				1
Turbidity	87	18	3	1	109
Totals	824	118	85	11	1029

Table 3
Comparison of the number of suspected causes between the 2022 IR and the 2024 IR.

2022 and 2024 Suspected Causes of Impairment	2022 Total	2024 Total
1,1,2-Trichloroethane - Swimming Advisory	1	1
1,2-Dichloroethane	1	2
4,4'-DDT	5	5
Arsenic - Swimming Advisory	1	1
Atrazine	1	1
Carbofuran	25	25
Chloride	15	16
Chloroform - Swimming Advisory	1	1
Color	13	13
Copper	2	2
Dioxins - Swimming Advisory	1	1
Dioxins - Fish Consumption Advisory	7	9
Dissolved Oxygen	234	219
Enterococcus	121	117
Fecal Coliform	170	142
Fipronil	7	7
Furans - Fish Consumption Advisory	7	7
Furans - Swimming Advisory	2	2

Table 3
Comparison of the number of suspected causes between the 2022 IR and the 2024 IR.

2022 and 2024 Suspected Causes of Impairment	2022 Total	2024 Total
Hexachlorobenzene - Swimming Advisory	1	1
Hexachlorobutadiene - Swimming Advisory	1	1
Lead	8	8
Lead - Swimming Advisory	1	1
Mercury - Swimming Advisory	1	1
Mercury - Fish Consumption Advisory	139	140
Methoxychlor	1	1
Methyl Parathion	1	1
Nitrate/Nitrite (Nitrite + Nitrate As N)	43	39
Non-Native Aquatic Plants	44	2
Oil And Grease	1	1
PCBs - Fish Consumption Advisory	9	9
PCBs - Swimming Advisory	2	2
pH, High	6	7
pH, Low	18	14
Phenol	1	1
Phosphorus, Total	41	37
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	1	1
Sulfate	19	15
Temperature	11	11
Total Dissolved Solids (TDS)	41	45
Toxaphene	1	1
Turbidity	98	92
Total Number of Reported Suspected Causes	1,103	**1,029**

Summary of Suspected Sources of Impairment to Water Quality

Table 4 provides a list of all suspected sources of subsegment impairment across all designated uses. *Natural Sources* were reported the most (183 subsegments). This single suspected source was primarily related to low dissolved oxygen.

Table 4
Number of suspected sources of subsegment impairment for each water body type in the 2024 IR.

Suspected Source of Impairment	River	Lake	Estuary	Wetland	Total
Agriculture	77	9	1		87
Animal Feeding Operations (NPS)	1				1
Atmospheric Deposition - Toxics	99	30	9	1	139
Changes in Tidal Circulation/Flushing	1				1
Construction	1				1
Contaminated Sediments	1	1			2

Table 4
Number of suspected sources of subsegment impairment for each water body type in the 2024 IR.

Suspected Source of Impairment	River	Lake	Estuary	Wetland	Total
Crop Production (Irrigated)	4				4
Crop Production (Non-Irrigated)	4	2			6
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	1				1
Forced Drainage Pumping	5				5
Golf Courses	2				2
Highways, Roads, Bridges, Infrastructure (New Construction)	1				1
Impacts From Hydrostructure Flow Regulation/Modification	4				4
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)	1	1			2
Landfills	3				3
Livestock (Grazing or Feeding Operations)	8				8
Low Water Crossing	1				1
Managed Pasture Grazing	1				1
Manure Runoff	1				1
Marina Boat Maintenance	1				1
Marina/Boating Pumpout Releases			1		1
Marina/Boating Sanitary On-Vessel Discharges	11		4		15
Municipal (Urbanized High Density Area)	4				4
Municipal Point Source Discharges	24				24
Natural Sources	141	28	13	4	183
Naturally Occurring Organic Acids	4				4
Non-Point Source	1		1		2
On-Site Treatment Systems (Septic Systems And Similar Decentralized Systems)	94	2	7		101
Package Plant Or Other Permitted Small Flows Discharges	49		6		55
Pesticide Application		1			1
Petroleum/Natural Gas Activities	2				2

Table 4
Number of suspected sources of subsegment impairment for each water body type in the 2024 IR.

Suspected Source of Impairment	River	Lake	Estuary	Wetland	Total
Petroleum/Natural Gas Production Activities (Permitted)	1				1
Point Source(s) – Unspecified	5				5
Reduced Freshwater Flows	5				5
Residential Districts	3				3
Runoff From Forest/Grassland/Parkland	6				6
Rural (Residential Areas)	9				9
Sand/Gravel/Rock Mining or Quarries	1				1
Sanitary Sewer Overflows (Collection System Failures)	13	2	2		15
Sediment Resuspension (Clean Sediment)	6	2	1		9
Sewage Discharges in Unsewered Areas	26	3	3		32
Shallow Lake/Reservoir		2			2
Silviculture Activities	14				14
Silviculture Harvesting	22	8	1		31
Site Clearance (Land Development or Redevelopment)	5				5
Source Unknown	192	42	38	2	274
Sources Outside State Jurisdiction or Borders	4				4
Unknown Point Source	1	1			2
Unspecified Land Disturbance		1			1
Upstream Source	4	1			5
Water Diversions	4				4
Waterfowl	3	1	3	1	8
Wet Weather Discharges (Non-Point Source)			1		1
Wetland Drainage	4				4
Wildlife Other Than Waterfowl	15		4	1	20

The large number of subsegment listings for *Atmospheric Deposition-Toxics* and *Source Unknown* is largely due to the high number of mercury-related fish consumption advisories in Louisiana. 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 monitoring can be found in Part III of this report.

Twenty-four different categories were reported as suspected sources of subsegment impairment by fecal coliform and enterococcus. In rank order they include: source unknown (86); on-site treatment systems (septic systems) (54); natural sources (32); package plant or other permitted small flows discharges (27); sewage discharges in unsewered areas (23); wildlife other than waterfowl (17); marina/boating sanitary on-vessel discharges (13); municipal point source discharges (10); sanitary sewage overflows (8); rural (residential areas) (6); waterfowl (6); livestock (grazing or feeding operations) (5); runoff from forest/grassland/parkland (5); silviculture harvesting (4); drought-related impacts (3); landfills (2); municipal (urbanized high density area) (2); upstream source (2); agriculture (1); animal feeding operations (NPS) (1); managed pasture grazing (1); manure runoff (1); marina/boating pump out releases (1); and point source(s)-unspecified (1).

High turbidity, the forth most frequently cited cause of impairment was mostly contributed to *Agriculture* and *Silviculture* practices, as well as *Natural Sources*. Total dissolved solids (TDS) were also frequently cited as suspected causes of FWP impairment and predominantly reported suspected sources were *Natural Sources* and *Agriculture*.

Considering all suspected sources, each subsegment may be impaired by one or more suspected source(s) including nonpoint source (NPS), point source (PS), atmospheric, natural, and/or a variety of other types of sources: 194 (37.5%) subsegments were impacted by suspected NPS sources; 165 (31.9%) subsegments were impacted by suspected PS discharges; atmoshpheric deposition of toxics impacted 139 (26.8%) subsegments; a variety of naturally occurring conditions accounted for 204 (39.4%) suspected subsegment impairments; and 274 (52.9%) subsegments were impaired by unknown sources or suspected sources other than those classified previously. More information on NPS & PS pollution can be found in Part II.

Although Louisiana has a large industrial sector, only 22 subsegments out of the 487 regulated subsegments 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, 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. More information on water quality permitting and enforcement in Louisiana can be found in Part II.

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.

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 Evangeline aquifer and Evangeline Equivalent aquifer, which are within the common hydrogeologic setting of the Pliocene 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

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). There are numerous oil and gas fields, as well as salt domes, across the state, especially in the north and the southern coast (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 North American 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; LOSC n.d.-a). 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 2022).

Water

LDEQ's 12 major watershed basins are named for the major water bodies inside each basin. 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 5. 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. The Louisiana coastal zone boundary is an area defined using several parameters (e.g., tidal influence, salinity, vegetation) and extends 3 miles offshore (LDENR 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 Dataset (NHD) (USGS n.d. (a)) and USEPA Water Data and Tools (USEPA n.d. (b)).

Table 5

Geophysical data summaries for Louisiana[1].

State Geophysical Component	Reported or Estimated Value	Unit
General Information (U.S. Census Bureau (USCB) 2010; USGS n.d. (b))		
2022 Louisiana Population Estimate (USCB-PD 2022)	4,590,241	persons
Land Surface Area (includes intermittent water and marsh)	43,204	sq. miles
Percent Land	82.5	%
Water Surface Area (perennial only)	9,174	sq. miles
Percent Water	17.5	%
Major River Basins	12	total
Rivers[2] (USGS-NGP 2019b)		
Total NHD Flowline Miles	126,000	miles
Perennial Stream/River	49,357	miles
Intermittent Stream/River	59,774	miles

Table 5

Geophysical data summaries for Louisiana[1].

State Geophysical Component	Reported or Estimated Value	Unit
Undesignated Stream/River	162	miles
Canal/Ditch	16,707	miles
Border Rivers[3] (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 Reservoir)	266	miles
Lakes and Reservoirs[4] **(≥ 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
Wetlands[5] (USGS-National Land Cover Database (NLCD) 2023d)		
Total Area of Wetlands (Woody and Emergent/Herbaceous)	9,874,320	acres
Woody	6,550,552	acres
Emergent/Herbaceous	3,323,768	acres
Total Area of Inland Wetlands	5,686,834	acres
Woody	5,354,750	acres
Emergent/Herbaceous	332,084	acres
Total Area of Coastal Zone Wetlands	4,187,486	acres
Woody	1,195,803	acres
Emergent Herbaceous	2,991,684	acres
Total Area of Coastal Wetland (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[6] n.d.)	7,721	sq. miles

Table 5

Geophysical data summaries for Louisiana[1].

State Geophysical Component	Reported or Estimated Value	Unit

[1] Estimated values were derived from the high resolution (1:24k) USGS NHD (USGS-NGP 2019b). 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 (LDENR n.d.).

[2] 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. 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 of the Artificial Paths; 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. 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. Edits were performed in North American Datum 1983 (NAD 83) and projected in Universal Transverse Mercator (UTM) Zone 15.

[3] 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, the northern split was placed at 33.0043, -91.1714 and the southern split at 31.0008, -91.6361. For the Sabine River, the northern split was placed 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.

[4] 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 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.

[5] Wetland area was calculated from the 2021 National Land Cover Database (NLCD) raster dataset and includes the Woody Wetland (value 90) and Emergent/Herbaceous Wetland (value 95) classes (USGS 2023, 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.

[6] National Oceanographic and Atmospheric Administration-Office of Coastal Management.

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 2022 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 6
The percent[1] for each category of Louisiana land cover classes.

Category	Percent
Woody Wetlands	24
Evergreen Forest	22
Herbaceous Wetlands	10
Open Water	9
Grass/Pasture	8
Developed	7
Soybeans	5
Shrubland	3
Sugarcane	2
Corn	2
Aquaculture	2
Rice	2
Fallow/Idle Cropland	1
Mixed Forest	1
Cotton	1
Deciduous Forest	<1
Other Hay/Non Alfalfa	<1
Other Crops[1]	<1

[1] 2022 Cropland Data Layer summarized from CropScape (USDA NASS n.d. (a)).
[2] 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 Programs

Introduction

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

Water Quality Monitoring and Assessment

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 *2024 Water Quality Inventory: Integrated Report*, in order to inform the public, state agencies, and federal agencies about the quality of Louisiana water. Subsequent to water quality data assessment and reporting, if the water body is impaired, a TMDL or alternative plan can be developed and implemented. More information on the AWQMN program, as well as the TMDL program, can be found in Part III of this report; and groundwater information is found in part IV of this report.

Watershed Approach

USEPA and LDEQ developed a watershed approach as a geographically-based, systematic process to reduce water pollution and improve water quality. Watershed planning can be an effective management strategy to protect healthy waters and/or restore impaired waters. 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, was completed June 13, 2023 (LDEQ 2023f). 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

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 7, and total water body sizes may be different from prior IRs 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 7 are not reflective of the total size for water bodies listed in the Table 5, 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 7
Total sizes[1] of Louisiana water bodies classified for various designated uses.

	Water Body Type			
Classified Uses	**Rivers (miles)**	**Lakes (acres)**	**Estuaries (sq. miles)**	**Wetlands (acres)**
Primary Contact Recreation	9,482	572,246	6,043	941,389
Secondary Contact Recreation	9,643	572,246	6,043	941,389
Fish and Wildlife Propagation	9,721	581,445	6,043	941,389
Drinking Water Supply	1,091	243,790	-0-	356,046
Outstanding Natural Resource Waters	1,710	-0-	-0-	-0-
Oyster Propagation	598	-0-	5,317	72,519
Agriculture	2,089	345,249	-0-	-0-
Limited Aquatic Life and Wildlife Use	91	-0-	-0-	-0-

[1]Total water body sizes may be 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." (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 (LAC 33.IX.1123.Table 3.Endnotes).

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.

Triennial Review

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.

The CWA Section 303(c)(1) 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.

Part of the triennial review process includes an analysis 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 most recent triennial review began on March 20, 2021 with a potpourri notice in the *Louisiana Register* announcing the review and soliciting comments on the WQS. A public hearing was held on April 28, 2021 to solicit oral comments. Written comments were received from the public and within LDEQ. After the comment period closed on May 5, 2021, 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 2021 Triennial Review was submitted to the USEPA-Region 6 on August 1, 2022 (LDEQ 2022a).

Results of these triennial review efforts were developed into a rule (WQ111). Proposed rule WQ111 was published in the January 2023 edition of the Louisiana Register. A public hearing was held via Zoom on February 28, 2023 at 1:30 p.m. and the public comment period ended on March 8, 2023 at 4:30 p.m. LDEQ received multiple comments and drafted a response to comment summary. One comment offered by USEPA was deteremined to be substantial and necessitated a revised proposed rule. LDEQ published revised proposed rule (WQ111S) in the June 2023 edition of the Louisiana Register. A public hearing was held on July 27, 2023 at 1:30 p.m., with the public comment period ending the same day at 4:30 p.m. No comments were received concerning the revised proposed rule. The final rule for WQ111 was published in the September 2023 edition of the Louisiana Register and approved by USEPA on November 2, 2023. The next cycle of the triennial review is expected to begin in 2024.

Certification of Water Quality Standards by State Legal Authority

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, promulgation of the revisions into regulations, certification by the state legal authority that the standards revision and regulation development process meets all applicable state laws and regulations, and final approval by USEPA.

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.

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 has worked to use the findings from this threshold report in combination with the 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) 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. Development with USEPA is ongoing.

LDEQ also developed a QAPP for the *Investigation of Biological Nutrient Thresholds in Louisiana Inland Lakes*, which was approved by the USEPA on June 13, 2019 (LDEQ 2022e). 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, as well as data analysis, for the inland lakes nutrient stressor response study are ongoing. A report to USEPA is in progress.

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 *Nutrient Reduction and Management Strategy* (LDEQ 2021a). 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 1997b). 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. 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 2024 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 2019). 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*, USEPA 440/5-86-001, The Gold Book, (USEPA 1986); LAC 33:IX.1113.C.3). Louisiana waterways have natural deviations from the recommended national criteria, thus LDEQ 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 (LDEQ 2021b). 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 under a document entitled *Conceptual Approach to Revise Dissolved Oxygen Criteria in Louisiana's Stratified Coastal Waters* (LDEQ 2016b).
- 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 AWQMN site locations (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 (LDEQ 2022h). 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.

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.

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).

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. USGS completed the study in 2022, and data were made available in 2023 (Ivey et al. 2023). USGS presented results of the study at the November 2023 Society of

Environmental Toxicology and Chemistry (SETAC) North America annual meeting. LDEQ will coordinate with USEPA on the development of chloride and sulfate aquatic life criteria.

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 2023c) 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 will focus on subsegments without numeric criteria, but may also consider revisions of existing numeric criteria where changes are appropriate. LDEQ is currently working to develop the final project.

Water Permits

Louisiana's Water Quality Regulations (LAC 33:Chapter IX) require permits for the discharge of pollutants from any point source into waters of the state of Louisiana. In 1996, LDEQ assumed responsibility for administering the permitting, compliance, and enforcement activities of the National Pollutant Discharge Elimination System (NPDES) from the USEPA. This surface water discharge permitting system is administered under the Louisiana Pollutant Discharge Elimination System (LPDES) program. USEPA retained responsibility for the federal sewage sludge disposal program. The following sections address various facets and recent activities related to Louisina's point source water pollution control.

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.

Water Discharge Permits

The 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 (Table 8). More information on LDEQ's water discharge permits program can be found at: http://deq.louisiana.gov/pages/lpdes.

Table 8
LPDES permits/modifications issued October 1, 2018 through September 30, 2022.

State Permit	Number of Permits	Number of Permits (including modifications)
Minor Sanitary	228	242
Major Sanitary	55	71
Minor Industrial	312	360
Major Industrial	65	85
Major MS4[1]	2	3
Stormwater General[2]	2,274	2,278
Non-Stormwater General[3]	1, 727	1,948
Totals	**4,663**	**4,987**

[1] Major Municipal Separate Storm Sewer System Permits (MS4).
[2] Does not include 2,302 permits re-authorized when master general permits were reissued.
[3] Does not include 4,250 permits re-authorized when master general permits were reissued.

Wetlands Approved for Wastewater Assimilation Permits

The LDEQ permits the discharge of secondary treated wastewater into deteriorating natural wetlands to improve the sustainability of coastal wetland ecosystems. The intent is for the nutrients and solids present in the secondary treated wastewater to increase wetland health, offset subsidence, and provide an influx of freshwater to help combat saltwater intrusion. These wetlands have been termed assimilation wetlands and there are, currently, fifteen assimilation wetlands approved through LDEQ's assimilation wetland program under the LPDES permit program. LDEQ oversees the individual sites and ensures each permittee submits a completed Annual Wetland Report. Continuous five-year data is reviewed for long-term Net Primary Productivity (NPP). 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.

Above-ground productivity, more commonly termed NPP, is a measure of the vegetative growth occurring in one year. Analizing the NPP allows LDEQ to evaluate the wetland health and profile the vegetative community in order to determine overall wetland condition. The permit compliance criteria LDEQ utilizes can be found in LAC 33:IX.1113.B.12.b. Utilizing the rate of NPP, as opposed to individual productivity values, allows each site to be normalized to itself. A five-year period of data provides a better representation of the overall wetland productivity for each site by minimizing extremes. The decision to use no more than a 20% reduction in the NPP rate was intended to allow for natural fluctuations in data between ecosystems, as environmental data is inherently variable. A 20% reduction in NPP is not equivalent to a 20% loss of wetlands. Rather, the 20% reduction is the criterion at which the facility must instigate corrective measures, modifying their management methods as necessary to ensure appropriate productivity. If the

facility continually exceeds the 20% reduction criterion, LDEQ reserves the right to reopen and modify or revoke the permit as it deems necessary.

Analysis of NPP data has been completed for nine of the fifteen existing approved wetlands. Four of the wetland assimilation sites do not yet have enough data to assess NPP and two have not started discharging, see Table 9 below. Two different methods were used to evaulate the assimilation wetlands ability to meet the NPP criteria, long-term NPP (data from the entire length of the project) and analysis of the most recent five years of NPP. LDEQ used the perennial (stem growth) and ephemeral (litterfall) productivity to calculate total NPP data for forested sites. Marsh sites used the end-of-season live biomass as their NPP. The Near (site closest to point of effluent addition) and the Reference sites were used to calculate the outcome of the analysis. If a site had multiple wetland types, the nearest sites to the effluent addition for each wetland type were used to calculate the criterion.

Table 9
Permitted Wetland Assimilation Sites and Current NPP Review Status.

Facility	Receiving Wetland	NPP Analyzed
City of Breaux Bridge	Cypriere Perdue	Yes
City of Hammond	South Slough	Yes
City of Mandeville	Chinchuba/E. Tchefuncte	Yes
City of New Orleans	Bayou Bienvenue Wetlands Triangle	No[1]
City of St. Martinville	Cypress Island Coulee	Yes
City of Thibodaux	Pointe Au Chene	Yes
Guste Island Utility Co	Lower Tchefuncte	No[2]
Harveston Wastewater District LLC	Selene Bayou	No[1]
St. Bernard Parish	Poydras-Verret	No[2]
St. Charles Parish	Luling	Yes
St. Martin Parish-Stephensville	Bayou Milhomme	No[2]
St. Mary Parish	Bayou Ramos	Yes
Tchefuncta Club Estates	Lower Tchefuncte	Yes
Terrebonne Parish	Ashland Wetlands	No[2]
Town of Broussard	Cote Gelee	Yes

[1] Facility is not discharging into wetland assimilation area, Annual Wetland Report is not required.
[2] There is not five years of new/consecutive data currently available to calculate NPP.

The long-term NPP was analyzed to determine the long-term trend for the period of record at each site. A site fails to meet permit compliance when the site has experienced a 20% decrease in NPP in comparison to a reference site. The NPP for each year an assimilation wetland has data is plotted against time and the slope for each line is calculated. The slope of the line is equivalent to the rate of NPP change over time. Calculating the slope of all the data provides a mean of the long-term NPP rate and any extreme years are buffered by using all the data points. The slope of the reference site is used to calculate a 20% decrease using the following equation:

$$NPP_{80} = NPP_{ref} - \left|NPP_{ref} * 0.2\right|$$

where NPP_{ref} is the mean of all reference site slopes and || is the absolute value. The slope of each site is then compared to the NPP80 of a reference site of the same wetland type. If a site is less than the NPP80 it is considered to be failing. If a site is more than the NPP80, it is considered to pass. This method provides a more robust look at each assimilation wetland's long-term health. Permittees with failing sites are required to develop a study and test procedures to determine the origination of the cause(s) within 180 days. See Table 10 for a summary of the results of the long-term assimilation wetland annual NPP evaluation.

Table 10
Summary of long-term assimilation wetland annual evaluation[1].

Facility	Year Range	Reference Site NPP	80% Ref Site NPP	Near Site NPP	Evaluation Result
		($g/m^2/yr$)			
City of Breaux Bridge – Cypriere Perdue Swamp	2007-2022	52.92	42.34	5.14	Fail
City of Hammond – South Slough Wetland	2006-2022	-29.3	-35.13	47.9	Pass
City of Mandeville – Chinchuba Swamp	2007-2022	-10.18	-12.22	18.8	Pass
City of Mandeville – East Tchefuncte Marsh	2010-2022	-28.62	-34.35	7.19	Pass
City of St. Martinville – Cypress Island Coulee Swamp	2011-2022	-45.26	-54.32	-14.59 10.7 -12.35	Pass
City of Thibodaux – Pointe Au Chene Swamp	2007-2022	-20.16	-24.19	-12.85	Pass
St. Charles Parish – Luling Wetland	2007-2022	-17.91	-21.49	-18.17	Pass
St. Mary Parish – Bayou Ramos Swamp	2011-2022	149.11	119.29	84.04	Fail
Tchefuncta Club Estates	2009-2022	16.18	12.94	31.06	Pass
City of Broussard – Cote Gelee Swamp[2]	2008-2016	37.46	20.17	73.92 111.42	Pass

[1] The NPPs presented in the table are the slopes of all data.
[2] There is not five years of new/consecutive data currently available to calculate NPP.

To analyze the five year NPP, data from the Annual Wetland Monitoring Reports received from 2019 to 2023 was compiled, which presents data from 2018 to 2022. Five year NPP is calculated with the same equation and method as long-term NPP to provide an insight to each assimilation wetland's short-term health; for example, this often shows if there are possible issues at the assimilation site that can be addressed to help reduce or prevent any long-term issues at the site. If wetland monitoring of the Near site shows that there is more than a 20% reduction in the rate of NPP on the total aboveground wetland productivity over a 5-year period as compared to the reference site then, within 180 days the permittee shall develop a study and test procedures to

determine the origination of the cause. See Table 11 for a summary of the results of the five-year assimilation wetland NPP evaluation from 2018-2022.

Table 11
Summary of five-year assimilation wetland annual evaluation[1].

Facility	Year Range	Reference Site NPP	80% Ref Site NPP	Near Site NPP	Evaluation Result
		($g/m^2/yr$)			
City of Breaux Bridge – Cypriere Perdue Swamp	2018-2022	55.35	44.28	-28.34	Fail
City of Hammond – South Slough Wetland	2018-2022	-3.6	-4.27	157.6	Pass
City of Mandeville – Chinchuba Swamp	2018-2022	-163.83	-196.61	-230.74	Fail
City of Mandeville – East Tchefuncte Marsh	2018-2022	153.21	122.57	122.76	Pass
City of St. Martinville – Cypress Island Coulee Swamp	2018-2022	55.35	44.28	-10.91 6.11 13.34	Fail
City of Thibodaux – Pointe Au Chene Swamp	2017-2022	-1.27	-1.53	191.77	Pass
St. Charles Parish – Luling Wetland	2018-2022	-122.1	-146.57	-166.9	Fail
St. Mary Parish – Bayou Ramos Swamp	2018-2022	63.51	50.81	-43.42	Fail
Tchefuncta Club Estates	2018-2022	81.99	65.59	37.74	Fail
City of Broussard – Cote Gelee Swamp[2]	2012-2016	-75.7	-90.83	21.8 756.5	Pass

[1] The rate of change/slope of the net primary productivity (NPP) from 2018 to 2022 was calculated for each site.
[2] There is not five years of new/consecutive data currently available to calculate NPP.

For the assimilation sites that NPP has been evaluated for long-term, only two are failing, the City of Breaux Bridge – Cypriere Perdue Swamp and St. Mary Parish – Bayou Ramos Swamp. For the five-year NPP evaluation, six of the sites are failing, the City of Breaux Bridge – Cypriere Perdue Swamp, City of Mandeville – Chinchuba Swamp, City of St. Martinville – Cypress Island Coulee Swamp, St. Charles Parish – Luling Wetland, St. Mary Parish – Bayou Ramos Swamp, and Tchefuncta Club Estates. Those sites that are failing will be required to either submit study and test procedures to determine the origination of the cause of the failure or to address the decrease in NPP productivity through Adaptive Management Practices.

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 12). 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 12
Sewage Sludge and Biosolids Use or Disposal Permits and modifications issued from October 1, 2018 through September 30, 2022.

State Permit	Number of Permits	Number of Permits (including modifications)
Individual Commercial Preparer – Out-of-State	7	7
Individual Commercial Preparer – Exceptional Quality	5	5
Individual Commercial Preparer – Class B	6	6
LAJ650000 (Disposal in a Landfill)	168	168
LAJ660000 (Pump Out and Haul Off)[1]	---	---
Totals	**180**	**180**
Sewage Sludge Transporter Registrations[2]	**320**	**320**

[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, 9,015 facilities have coverage.
[2] Total number of registered transporters as of 9/30/2022.

Water Quality Certification

Certification is required for any federal license or permits that result in a discharge of fill 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, 2018 through September 30, 2022, 1175 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.

Surveillance

Municipal, industrial, federal, and agricultural point source dischargers are monitored to verify compliance with permitted effluent limitations and compliance schedules (Table 13). The types of compliance inspections undertaken by LDEQ include:

- Compliance Evaluation Inspections: Non-sampling inspections to verify permittee compliance with applicable LPDES permit requirements and compliance schedules.
- Compliance Sampling Inspections: 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 13
Compliance Inspections[1] performed from October 1, 2018 through September 30, 2022.

Inspection Type	Number of Inspections
Compliance Evaluation Inspections	2,003
Compliance Sampling Inspections	16
Total WQ Compliance Inspections	**2,019**

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

Incident Investigations

The LDEQ received 22,393 Incident Notifications (complaints or release/spills) across all media (air, water, hazardous waste, underground storage tanks, etc.) (Table 14). 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. Notifications may 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. More information on LDEQ's incident investigations can be found at: http://deq.louisiana.gov/page/surveillance.

Table 14
Incident Investigations performed from October 1, 2018 through September 30, 2022.

Notification Type	Number of Notifications
Complaint Notifications	12,078
Release/Spill Notifications	10,315
Total Notifications	**22,393**

Identification of Unpermitted Point Sources

The LDEQ Compliance Monitoring Strategy (LDEQ 2022b) outlines approaches for monitoring permit compliance to aid in addressing potential point source issues as well as identifying nonpoint

sources and unpermitted point source dischargers within targeted subsegments. The two primary types of inspections include: "Water Inspections" are scheduled inspections or routine compliance inspections that are conducted each fiscal year (majors, significant minors, and Class II General Sanitary Permit facilities); and "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, 2018 through September 30, 2022, LDEQ completed 219 Water Inspections within the 497 LDEQ subsegments and conducted Watershed Based Inspections in twenty subsegments (Table 15).

Table 15
Watershed Based Inspections from October 1, 2018 through September 30, 2022.

Subsegment Number	Water Body Segment Description	Inspections	Notice of Deficiency
LA030702_00 LA050601_00	English Bayou-From headwaters to Calcasieu River Lacassine Bayou-From headwaters to ICWW	46*	27*
LA060501_00	Bayou Teche-From Charenton Canal to Wax Lake Outlet	19	3
LA060801_00	Vermilion River-From headwaters to La. Highway 3073 bridge	68	3
LA080604_00	Bayou D'Arbonne Lake	21	0
LA080802_00	Cheniere Brake Lake	53	40
LA120605_00	Bayou Pointe Au Chien-From headwaters to St. Louis Canal	12	4

*Subsements in same geographic work area.

Enforcement

The LDEQ enforcement activities are designed to ensure that all possible infringements of water quality standards, rules, and regulations are handled in a rapid and consistent manner (Table 16 and Table 17) to prevent pollution of the waters of the state and to ensure remediation in the event of pollution. Field investigations, file reviews, permit noncompliances, and reviews of discharge monitoring reports are all used to initiate enforcement actions. More information on LDEQ's enforcement activities can be found at: http://deq.louisiana.gov/page/water-enforcement.

Table 16
Enforcement actions issued from October 1, 2018 through September 30, 2022.

Enforcement Actions	Number
Notice Of Corrected Violations/ Notice of Violations	36/85
Compliance Orders (CO)[1]	681
Amended Compliance Orders[2]	91
Notice of Potential Penalty (NOPP)	36
Administrative Orders	13

Table 16
Enforcement actions issued from October 1, 2018 through September 30, 2022.

Enforcement Actions	Number
Penalties[3]	211
Settlement Agreements[4]	147
Attended Educational Class (Sanitary Wastewater Assistance Training)	30

[1]Includes COs and Consolidated CO/NOPPs.
[2]Includes COs, CO/NOPPs and NOPPs also amended.
[3]Includes Penalties and Expedited Penalties (XPs) and Penalties and XPs also amended.
[4]Includes Water and Multi-Media Settlement Agreements that have a water component.
[5]Includes total number of attendees from October 2018 through June 18, 2019 (SWAT discontinued).

Table 17
Enforcement penalties issued from October 1, 2018 through September 30, 2022.

Penalties	Dollar Value
Penalties Issued[1]	$1,640,191.98
Penalties Paid	$3,635,179.15
Penalties Appealed	9
Cash From Settlement Agreements Paid[2]	$4,461,242.65

[1]Includes Multi-Media Penalties Issued that have a water component.
[2]Includes Multi-Media Settlement Agreements Paid that have a water component.

Nonpoint Source Program

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."

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 2022b). 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 LDENR, 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.

The NPS Management Plan included the following 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. In 2023, USEPA approved LDEQ's revised NPS Pollution Program Management Plan for the period of FFY 2023-2027. The revised plan provides an update of priority watersheds, milestones, schedule of implementation, and short- and long-term goals to address water quality. Louisiana has prioritized thirty-eight watersheds to improve or restore use support through statewide program activity or implementation of projects guided by watershed-based plans.

Watershed Implementation Planning

Nonpoint reduction activities frequently occur on a watershed basis. A watershed-based plan, or Watershed Implementation Plan (WIP), may be written describing the BMPs that will be implemented in the watershed to achieve water quality goals. USEPA outlined a set of nine key

elements for an acceptable WIP, and LDEQ's NPS Program utilizes this outline as a guide in partnering with stakeholders on protection and/or restoration of NPS-impaired 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.

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, but are not limited to, agriculture, forestry, urban, construction, hydromodification, and resource extraction (sand and gravel mining). The types of NPS pollution associated with land-use activities include sediment, nutrients, metals, pesticides, organic material, and bacteria. Some of these pollution sources are managed through stormwater permits, and others are managed through NPS program activities.

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 activities to reduce NPS pollution. Because the NPS Program is non-regulatory, partnerships and collaboration are key to both watershed planning and successful implementation to address NPS runoff. 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 contribute resources and assistance. 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 project-related §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 important components of Louisiana's NPS Program are the Drinking Water Protection Program (DWPP) and the ASSET Program. 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. Louisiana's major freshwater aquifers, monitored by the ASSET program, are also sources of drinking water that could be contaminated by NPS pollution. More details on the ASSET Program can be found in Part IV of this report. More information on LDEQ's DWPP can be found at https://www.deq.louisiana.gov/page/drinking-water-protection-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. For more information on the Clean Water State Revolving Fund refer to: http://www.deq.louisiana.gov/CWSRF.

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 18 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.

Table 18
Approximate yearly costs to implement the CWA by LDEQ and its contractors from October 1, 2021 – September 30, 2022.

Description	Amount
Federal Funds	
CWA Section 106	$5,020,000.00
CWA Section 106 supplemental (estimate)	$110,017.33
CWA Section 604(b)	$143,000.00
CWA Section 319	$1,968,900.00
Clean Water State Revolving Loan Fund (Administrative Costs) (FY2022)	$1,010,002.00
Total Federal Funds	**$7,595,619.33**
State Funds	
CWA Section 319 (cost share)	$1,312,600.00
Environmental Trust Fund and Other Fees	$415,106.14
General Fund	$911,212.28
Total State Funds	**$2,638,918.42**
Grand Total	**$10,234,537.75**

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. More information on LDEQ's NPS Program can be found in Part II of this report.

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. More information on LDEQ's TMDL program can be found in Part III of this report.

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 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 2021-2022 Annual Report* (LDWF

2022) states that the agency issued 8,600 commercial fishing licenses, generating in excess of $5 million in revenue from license sales. Boat registration/title transactions for 2021-2022 numbered 344,000; bringing in over $5.5 million in revenue. 185,376 commercial fishing trips were reported, producing more than 865 million pounds of seafood.

LDWF also reports that the shrimp fishery is Louisiana's most valuable commercial fishery. Louisiana continued to lead the nation in shrimp landings with approximately 83.1 million pounds landed in 2021-2022. The dockside value was about $119.4 million. Additionally, Louisiana blue crab landings for 2021-2022 totaled 51.0 million pounds, bringing in $77.2 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 2021, Louisiana provided over 6.6million pounds of oysters, with a dockside value of more than $68 million (LDWF 2022). Louisiana consistently ranks number one in landings among Gulf of Mexico states, bringing in approximately 48% 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 2021-2022, anglers took 11,269 recreational fishing trips (LDWF 2022). 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 208,200 deer hunters participated in hunting activities during the 2021-2022 deer season. There were also 37,300 duck hunters, 22,800 dove hunters, 1,000 quail hunters, 3,000 woodcock hunters, and 24,200 turkey hunters (LDWF 2022). 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 fiscal year 2021-2022, LDWF sold more than 1.5 million recreational hunting, fishing, trapping, and nonconsumptive use licenses to more than 800,000 customers, generating in excess of $27 million in revenue (LDWF 2022).

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 Programs

The surface water monitoring programs of the LDEQ, OEA 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 the 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

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 (ONR) waters. The primary use of the data from the AWQMN is to determine if water quality standards are being attained for each designated use. To accomplish this, core indicators are monitored and used to determine designated use support (Table 19). Data may also be used for/by other programs within LDEQ (e.g., standards/criteria determination, modeling, permitting, project planning) and by external entities.

Table 19
Designated use core indicators used to determine water quality standards attainment.

Designated Use	Core Indicators	Basis for Use Support Decision
Primary Contact Recreation (PCR)	Enterococci[1]	Percent exceedance and geometric mean
	Fecal Coliform	Percent exceedance
	Temperature	Percent exceedance
	Toxic Substances	Less than two exceedances in three years
Secondary Contact Recreation (SCR)	Fecal Coliform	Percent exceedance
	Toxic Substances	Less than two exceedances in three years
Fish and Wildlife Propagation (FWP)	Dissolved Oxygen[2]	Percent exceedance
	Temperature	Percent exceedance
	pH	Percent exceedance
	Chloride	Percent exceedance
	Sulfate	Percent exceedance
	Total Dissolved Solids	Percent exceedance
	Turbidity	Percent exceedance

Table 19
Designated use core indicators used to determine water quality standards attainment.

	Toxic Substances	Less than two exceedances in three years
	Metals	Less than two exceedances in three years
Limited Aquatic Life (LAL) Limited Aquatic Life (LAL)	Dissolved Oxygen[2]	Percent exceedance
	Temperature	Percent exceedance
	pH	Percent exceedance
	Chloride	Percent exceedance
	Sulfate	Percent exceedance
	Total Dissolved Solids	Percent exceedance
	Turbidity	Percent exceedance
Drinking Water Supply (DWS)	Fecal Coliform	Percent exceedance
	Color	Percent exceedance
	Toxic Substances	Less than two exceedances in three years
	Metals	Less than two exceedances in three years
Outstanding Natural Resource (ONR)	Turbidity	Percent exceedance
Oyster Propagation	Fecal Coliform	Percent exceedance and median
Agriculture	None (indicated by support of other designated uses)	

[1] Enterococci criteria apply only to coastal marine waters, gulf waters to the state three-mile limit, coastal bays, and estuarine waters (LAC 33:IX.1113.C.5.a.i.).
[2] 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, DO continuous monitor may be deployed.

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. Water quality monitoring data managed by the WPAD is stored in the Louisiana Environmental Assessment Utility (LEAU) database.

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. 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) (LDEQ 2024a). 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 2024b).

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. AWQMN and other special project data is also accessible to the public through the LEAU Web Portal (waterdata.deq.louisiana.gov).

Mercury Monitoring

LDEQ restarted the monitoring mercury in fish tissue July 2015 with sampling and signage for the program. Approximately 65-75 sampling events occurr each year. In addition to resampling of current advisory water bodies, LDEQ continues to sample additional water bodies as they are identified and scheduling allows. Advisory stickers are posted or updated as new or existing advisories are issued or revised.

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. New or revised advisories are

announced by press release and posted on the LDH and LDEQ websites. LDH is actively working on developing updates. More information on LDEQ's mercury monitoring can be found at: http://deq.louisiana.gov/page/mercury-initiative. More information on fish consumption and swimming advisories can be found in Part III, Chapter 8 of this report.

Total Maximum Daily Load Monitoring

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. The 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) during the period 2016 through 2022. The primary goals/elements of this vision include prioritization, assessment, protection, TMDL alternatives, engagement, and integration.

The second round, referred to as "New Vision 2.0" will span from 2023 through 2032. States must submit their priorities to USEPA for each of two-year cycle. The USEPA is allowing for a "Bridge" period to occur between 2023 and 2024, to allow states to complete any priorities that were identified in the New Vision.

LDEQ's activities include the development of new TMDLs, TMDL alternatives, and the revision of existing TMDLs in watersheds systematically prioritized and submitted to the USEPA. Work continues on several priority water bodies included in New Vision as well as planning for New Vision 2.0.

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 and TMDL revisions are expected to include water quality modeling, depending on the parameter being addressed. 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, which 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 are expected to be updated based on new data. LDEQ is considering addressing some of the TMDL revision workload through contract services.

Based on previous IR cycle assessments, the following list indicates the water bodies that are expected to be the focus of LDEQ's current IR cycle efforts, along with the type of activity planned for each water body:

- Subsegment 020101 Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou – TMDL revision
- Subsegments 040401 and 040403 Blind River – TMDL alternative
- Subsegment 040404 New River – TMDL alternative

- Subsegment 040503 and 040507 Natalbany River – TMDL alternative
- Subsegment 040504 Yellow Water River – TMDL alternative
- Subsegment 050201 Bayou Plaquemine Brule (dissolved oxygen) – TMDL revision
- Subsegment 050304 Bayou Blue (fecal coliform) – new TMDL
- Subsegment 070502 Bayou Sara – TMDL alternative

TMDL progress is shown in Table 20. More information on USEPA's TMDL program can be found at: https://www.epa.gov/tmdl. Information on LDEQ's TMDL program and New Vision approach can be found at https://www.deq.louisiana.gov/page/tmdl and https://www.deq.louisiana.gov/page/newvisionprogram, respectively.

Table 20
LDEQ TMDL/Alternative progress from October 1, 2018 through September 30, 2022.

Revised TMDLs Developed by LDEQ and Approved by USEPA				
Date Finalized	**Water Body**	**Subsegment Number(s)**	**Basin**	**TMDL/Alternative Parameters**
10/5/2020	Tunica Bayou-From headwaters to Mississippi River	LA070505_00	Mississippi River	Fecal Coliform
8/2/2021	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	Biochemical Oxygen Demanding Substances

Total Maximum Daily Load Prioritization

The New Vision required that states establish a prioritization framework by which a list of priority watersheds was created for restoration and protection efforts during the period FY2016-FY2022. As a part of New Vision, LDEQ developed such a framework and solicited public feedback. LDEQ also delivered presentations at various conferences and workshops; and held meetings with various state agencies, local governments, and watershed-based organizations. Comments received were considered during the development of the final list of priority watersheds. The prioritization framework is available to the public via LDEQ's website at: http://deq.louisiana.gov/page/ clean-water-act.

In June 2021, LDEQ began planning and prioritizing waterbodies for New Vision 2.0. The (draft) prioritization framework was submitted to Region 6 of the USEPA on December 19, 2022. The mechanisms for prioritization were presented with relative ranking considerations of high, medium, and low. High mechanisms included those that described current and historical water quality within a watershed, available screening and decision support tools, and public participation mechanisms; medium mechanisms included knowledge of national and state water quality initiatives and other strategic frameworks for Louisiana such as the Louisiana Nutrient Reduction

and Management Strategy; low mechanisms included other considerations that were not previously identified (see https://edms.deq.louisiana.gov/app/doc/view?doc=13822860). The list of watersheds that may be considered for priority under New Vision 2.0 are shown below in Table 21. However, other waterbodies may be added based upon future considerations.

Table 21
Draft list of watersheds prioritized for restoration and protection efforts under the New Vision 2.0 (FY2023 – FY2032).

Subsegment	Water Body Name	Projected Plan Type
LA020101_00	Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou	TMDL Revision (dissolved oxygen)
LA020101_00	Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou	New TMDL (fecal coliform)
LA020701_00	Bayou Segnette	TMDL Revision (dissolved oxygen)
LA030305_00	Contraband Bayou	TMDL Revision (dissolved oxygen)
LA030802_00	Hickory Branch	New TMDL (dissolved oxygen)
LA040102_00	Comite River	TMDL Alternative (turbidity/sedimentation)
LA040201_00 LA040202_00	Bayou Manchac and Ward Creek	TMDL Revision (dissolved oxygen)
LA040303_00	Lower Amite River	TMDL Revision (dissolved oxygen)
LA040304_00	Grays Creek	TMDL Revision (dissolved oxygen)
LA040305_00 LA040307_00 LA040308_00 LA040309_00	Colyell Creek	TMDL Revision (dissolved oxygen)
LA040401_00 LA040403_00	Blind River	TMDL Alternative (turbidity, temperature)
LA040404_00	New River	TMDL Alternative (dissolved oxygen)
LA040503_00 LA040507_00	Natalbany River	TMDL Alternative (dissolved oxygen, fecal coliform, temperature)
LA040504_00	Yellow Water River	TMDL Alternative (dissolved oxygen, fecal coliform)
LA040505_00 LA040508_00	Ponchatoula Creek and Ponchatoula River	TMDL Revision (dissolved oxygen)
LA040603_00 LA040606_00	Selsers Creek	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 (dissolved oxygen, chloride, temperature, low pH)

Table 21
Draft list of watersheds prioritized for restoration and protection efforts under the New Vision 2.0 (FY2023 – FY2032).

Subsegment	Water Body Name	Projected Plan Type
LA040801_00	Tchefuncte River	TMDL Alternative (turbidity/sedimentation, fecal coliform)
LA040803_00 LA040807_00 LA040808_00	Lower Tchefuncte River	TMDL Revision (dissolved oxygen)
LA040804_00	Bogue Falaya River	TMDL Alternative (turbidity/sedimentation, fecal coliform)
LA040901_00 LA040902_00 LA040912_00 LA040913_00	Bayou Lacombe	TMDL Revision (dissolved oxygen)
LA040903_00 LA040904_00 LA040914_00	Bayou Cane	TMDL Revision (dissolved oxygen)
LA040904_00	Bayou Cane	TMDL Alternative (copper)
LA040905_00 LA040906_00 LA040907_00 LA040908_00 LA040915_00 LA040916_00 LA040917_00	Bayou Liberty and Bayou Bonfouca	TMDL Revision (dissolved oxygen)
LA040907_00	Bayou Bonfouca	TMDL Alternative (copper)
LA041201_00	Bayou Labranche	TMDL Revision (dissolved oxygen)
LA041401_00	New Orleans East Leveed Waterbodies	TMDL Revision (dissolved oxygen)
LA041805_00	Lake Borgne (Violet Canal)	TMDL Revision (dissolved oxygen)
LA050103_00	Bayou Mallet	TMDL Revision (dissolved oxygen)
LA050201_00	Bayou Plaquemine Brule	TMDL Revision (dissolved oxygen)
LA050301_00	Bayou Nezpique	TMDL Revision (dissolved oxygen)
LA050304_00	Bayou Blue	New TMDL (fecal coliform)
LA050501_00	Bayou Queue de Tortue	TMDL Revision (dissolved oxygen)
LA070501_00	Bayou Sara	TMDL Alternative (fecal coliform)
LA080401_00	Bayou Bartholomew	TMDL Alternative (turbidity)
LA080905_00 LA080906_00	Turkey Creek	TMDL Alternative (dissolved oxygen)

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, permitted dischargers that are not meeting the limits provided in the current permit limits, or hydrologic (channel) conditions.

LDEQ anticipates that general alternative plans may include, but are not limited to, 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.

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 Energy and Natural Resources (LDENR);
- Coastal Protection and Restoration Authority (CPRA);
- Pontchartrain Conservancy (PC);
- Universities;
- local governments;

- local watershed-based organizations; and
- local watershed coordinators currently under LDEQ contract.

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.

Supplemental Monitoring

Monitoring to Support Water Quality Standards Review

During the 2021 Triennial Review, 27 parameters were documented as having insufficient or no monitoring data to support WQS reviews and evaluation efforts. From these identified parameters, LDEQ reviewed the USEPA 304(a) water quality criteria recommendations for aquatic life criteria (ALC) and human health criteria (HHC), available information from water quality databases [LDEQ LEAU database and USEPA Water Quality Portal (WQP)], permitting information from the Integrated Compliance Information System (ICIS), and laboratory detection limits and cost per analysis for a parameter from contract laboratories that perform sample analyses for LDEQ. Based on these factors and on the available supplemental monitoring funds, LDEQ prioritized the following six parameters to be monitored to support WQS review and evaluation efforts: Acrolein, Acrylonitrile, Bis(2-ethylhexly) phthalate, Silvex (2,4,5,-TP), Thallium, and Tributyltin. A study (LDEQ 2022g) was initiated in 2022 to collect data to aid LDEQ in determining appropriateness of water quality criteria for the six parameters. In order to leverage monitoring activities of the agency, monitoring sites for this project were selected from long-term and active sites in the Ambient Water Quality Monitoring Program. Sampling events should be completed by October 2026. Data analysis for these parameters should be completed by June 2027.

Escherichia coli (*E. coli*) and Enterococci Study

In 2012, the USEPA released 304(a) recreational water quality criteria recommendations for protecting human health in all coastal and non-coastal waters designated for PCR use that included enterococci for marine and freshwater, or *Escherichia coli* (*E. coli*) for freshwater. In 2016 LDEQ adopted enterococci as the indicator for coastal marine waters, gulf waters to the state three-mile limit, coastal bays, estuarine waters, and adjacent subsegments with recreational beach waters for PCR use, but retained the use of fecal coliform as an indicator in subsegments without applicable enterococci criteria (LAC 33:IX.1113.C.5). A study (LDEQ 2023d) was intiated to collect data on *E. coli* and enterococci in Louisiana freshwaters to aid in LDEQ's review of the appropriateness of *E. coli* and enterococci as bacterial indicators of recreational water quality. The monitoring for this study started in 2023 and is expected to occur over four sampling years.

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 2022d) and expanded in 2022 for select coastal lakes and areas in southeast Louisiana to determine the composition, environmental conditions, and toxicity associated with cyanobacteria blooms. This project sampled six lakes (Lac des Allenmands, Lakes Verrret, Lake Palourde, Lake Salvadour, Lake Maurpas, and Lake Pontchartrain) which were targeted during the recreational season using satellite imagery as a guide for bloom presence and severity for sampling locations. Several coastal sites were also sampled Breton Sound and Barataria Bay. Routine field and laboratory parameters were collected along with additional nutrient metrics, algal pigment parameters, and phycology. Field parameters and algal pigments were collected throughout the water column. Field sampling has been completed in 2023, and data review and analaysis is in progress. Results and data will be used to inform current conditons of state waters and steps forward concerning CyanoHABs.

Coastal Louisiana Water Quality Study

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 2020). 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 (USEPA 2019b, 2020), and the transect study provided data through 2022.

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 performed 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.

Biotic Ligand Model Methodology Study

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 2022f) 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 five years, and data will be used to evaluate the validity of the BLM in water quality criteria development for metals in Louisiana waters.

Pesticides Study

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, these 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 2024 IR assessment spreadsheet. A new study has been initiated by LDEQ to reevaluate 27 subsegments with lower detection levels (LDEQ 2023e). Results will be incorporated into a future IR at the conclusion of the study.

Metals

Ultra-clean metals sampling was discontinued in March 2015 due to lack of funding. LDEQ received supplemental funding in 2021 to conduct surface water clean metals sampling for ten subsegments that are currently impaired due to copper (2) or lead (8) (LDEQ 2021c). Clean Metals sampling resumed in the third quarter of 2023. Under the current project, ten subsegments are being sampled four times within a one-year period, at least two weeks apart, and will be assessed for copper or lead based on hardness-dependent freshwater/marine metals criteria (Table 3.2.1). This study will use “clean techniques” to address all aspects related to trace metals contamination problems, quality control and LDEQ’s greater assurance towards appropriate and defensible decisions based on metals data. Results will be incorporated into a future IR at the conclusion of the study.

Chapter 2: Water Quality Assessment Methods

The following outlines the methods LDEQ used to develop the CWA §305(b)/§303(d) list and water body categorizations found in the 2024 IR. LDEQ updated assessment procedures over a number of years following USEPA guidance documents (USEPA various dates). LDEQ based water quality assessments and §305(b)/§303(d) listings on specific water body subsegments as defined in Louisiana's Surface Water Quality Standards (LAC 33:IX.1101-1123). Designated uses have specific suites of ambient water quality parameters used to assess their support (Table 3.1.1). Links between designated uses and water quality parameters, as well as water quality assessment procedures, can be found in Table 3.2.1. Additional details of Louisiana's IR assessment process can be found in LDEQ's *Standard Operating Procedures for Production of Water Quality Integrated Report* (LDEQ 2023a).

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 AWQMN program to conduct water quality assessments for the 2024 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). Starting with the 2022-2023 monitoring cycle, AWQMN cycle runs from November to October. This represents a change from prior water years which ran from October to September. This change in water-year months did not impact the period for the 2024 IR data with a cutoff of September 2022. LDEQ collected monthly and quarterly (organics) water quality data (LDEQ 2022c, 2023b, 2024b). 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, 2018 and September 30, 2022. Typically, between one year (conventional sites, 12 samples) and up to four years (long-term trend sites, 48 samples) of data were available (LDEQ 2022c, 2023b, 2024b). Except where noted in Table 22, 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 22
Measured parameters for designated use and decision process for evaluating use support.[1]

Designated Use	Measured Parameter	Support Classification for Measured Parameter	
		Fully Supporting	Not Supporting
Primary Contact Recreation (PCR) (Designated swimming months of May-October, only)	Fecal coliform[2]	0-25% do not meet criteria	>25% do not meet criteria
	Enterococci[3]	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% do not meet criteria
	Metals[4,5,6,] and Toxics[5]	<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
Secondary Contact Recreation (SCR) (All months)	Fecal coliform[2]	0-25% do not meet criteria	>25% do not meet criteria
	Metals[4,5,6,] and Toxics[5]	<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

Designated Use	Measured Parameter	Support Classification for Measured Parameter	
		Fully Supporting	**Not Supporting**
Fish and Wildlife Propagation (FWP)	Dissolved oxygen (routine grab and continuous monitoring data, if needed)[7]	0-10% do not meet criteria	>10% do not meet criteria
	Temperature, pH, chloride, sulfate, TDS, turbidity	0-30% do not meet criteria	>30% do not meet criteria
	Metals[4,5,6,] and Toxics[5]	<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
Drinking Water Source (DWS)	Color	0-30% do not meet criteria	>30% do not meet criteria
	Fecal coliform[2]	0-30% do not meet criteria	>30 % do not meet criteria
	Metals[4,5,6,] and Toxics[5]	<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 (ONR) Waters	Turbidity	0-10% do not meet criteria	>10% do not meet criteria
Agriculture (AGR)	None	-	-
Oyster Propagation (OYS)	Fecal coliform[2]	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

Designated Use	Measured Parameter	Support Classification for Measured Parameter	
		Fully Supporting	Not Supporting
Limited Aquatic and Wildlife (LAL)	Dissolved oxygen (routine grab and continuous monitoring data, if needed)[7]	0-10% do not meet criteria	>10% do not meet criteria
	Temperature, pH, chloride, sulfate, TDS, turbidity	0-30% do not meet criteria	>30% do not meet criteria

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.
2. 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).
3. Enterococci criteria for water bodies apply only to selected subsegments during the swimming season of May-October (LAC 33:IX.1113.C.5.a.i.; LAC 33:IX.1123, Table 3).
4. Determination of the application of marine or freshwater metals criteria is made based on LAC 33:IX.1113.C.6.d.
5. Parameters collected quarterly (metals and organics) require a minimum of three samples.
6. 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.
7. In the event that analysis of routine ambient monitoring data for dissolved oxygen results in criteria exceedance, continuous monitoring (CM) may have been used for follow-up analysis. 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. 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.

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 3.2.1. Ten subsegments used for the 2024 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.

Dissolved Oxygen

Beginning in 2008, when appropriate, LDEQ collected two sets of data to conduct dissolved oxygen (DO) assessments. If routine ambient monitoring DO grab sample data indicated criteria exceedance, LDEQ may have collected and used DO continuous monitoring (DOCM) data for follow up anaylsis (Table 2). Continuous monitoring data allows evaluation of the 24-hour diurnal DO fluctuations and an improved determination of DO criteria exceedance (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 severely 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. During the 2024 IR, a total of 17 DOCM datasets were collected.

Additional Data and Information

LDEQ's routine AWQMN data provided the primary set of data and information used for water quality assessments and listing decisions; NPS Program and TMDL Program data collected at AWQMN sites was also incorporated. LDEQ used additional datasets which are described below. Full datasets are available upon request (https://deq.louisiana.gov/page/information-records).

Louisiana Department of Health Advisory and Beach Monitoring Data

LDEQ used LDH fishing and swimming advisory information, enterococci bacteria datasets collected for the Beach Monitoring Program, as well as fecal coliform data collected for the Molluscan Shellfish 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 2024 IR. Impairments of this nature are water body-specific issues not directly related to the overall subsegment. LDEQ evaluated the LDH monitoring data based on the federally-promulgated criteria for Louisiana (Table 3.2.1.). 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 June 15, 2023. No data was received through this process for the 2024 IR. LDEQ accessed datasets through USEPA's Water Quality Portal as well as directly from sources that are known to collect water quality information that are relevant to assessment. This resulted in the analysis of data from the following organizations: 1) Coastal Protection and Restoration Authority (CPRA); 2) U.S. Geological Survey (USGS); 3) Pontchartrain Conservancy (PC); 4) National Oceanic and Atmospheric Administration (NOAA); and 5) the Gulf States Marine Fisheries Commission, Southeast Area Monitoring and Assessment Program (SEAMAP). Project plans and data were reviewed to determine if data 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.

All data was limited to samples collected between October 1, 2018 to September 30, 2022. Sites were located using GIS to determine which Louisiana subsegments they represented and were limited to only those sites in assessed water bodies within Louisiana territorial waters. To assess a depth profile from a site, samples closest to each 0.5 meter increment were used 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. Third-party datasets are subject to LDEQ sample size requirements. Varying programs collected varying parameters; only data pertinent to LDEQ assessments was used. Accepted data was combined and assessed based on the appropriate LDEQ water quality criteria using conventional rules (Table 3.2.1).

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 2023a) and data quality objectives outlined in the QAPP for the AWQMN (LDEQ 2022h) 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 1.1.1) 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 prior IR assessment(s) was 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 23. For the 2024 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 160 samples at 60 sites. After reviewing the sites in question it was determined that no flow conditions are common for all of the streams. "Flood" was reported for 149 data points at 69 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; 102 samples were collected at 56 sites.

Identification of "Flood" sample events led to further investigation of Ouachita River, subsegment LA080101_00. One low DO occurrence coincided with high water at the USGS gage station on the Ouachita River at Felsenthal (USGS Station 07364078). 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 for LA080101_00, DO results collected when the gage at Felsenthal Dam was > 65 feet were rejected for assessment purposes.

Table 23
Flow severity ratings for Louisiana's AWQMN.

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 normal stream channel but stay within the stream banks.
7 = Flood	Flows that leave 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 2024 IR Appendix A spreadsheet and USEPA's ATTAINS database.

Integrated Report Category Determination

LDEQ made a preliminary determination of IR categorization (Table 1) based on statistical assessment of criteria exceedances and subsequent determination of a water body's designated use support (Table 22). LDEQ used additional information such as previous TMDL development (IRC 4a), insufficient data determinations (IRC 3), and remediation activities (IRC 4b). 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.

Prioritization

All water body impairments with organizational categorie IRC 5/5RC were prioritized as follows:

1. WICs listed as IRC 5 that are expected to be the focus of LDES's current IR cycle efforts for new TMDL/TMDL revision/TMDL alternative development were given medium priority.
2. WICs listed as IRC 5 but not part of LDEQ's current IR cycle efforts were assigned low priority for TMDL development.
3. WICs listed as IRC 5RC were assigned low priority for TMDL development to allow LDEQ time to evaluate the need for updated criteria.
4. WICs listed as 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.

Chapter 3: Integrated Report Category 4b Documentation

Introduction

Integrated Report Category 4b (Table 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, Unit LA030304_001

1. Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Bayou Olsen/Olsen Bayou (unit LA030304_001), 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). Bayou Olsen is a tributary of Moss Lake.

Impairment and pollutant causing impairment

Bayou Olsen is listed as impaired in Louisiana's 2024 Water Quality IR based on an LDH swimming advisory. It is listed as not fully supporting PCR designated use as a result of sediment contamination of 1,1,2-trichloroethane, 1,2-dichloroethane, and chloroform. In 1989, 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/Docu ments/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, available at: 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, available at: 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

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 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 the ongoing LDH swimming advisory for 1,1,2-trichlorethane, 1,2-dichloroethane, and chloroform.

4. Schedule for Implementing Pollution Controls

Remediation activities at the site have been completed.

5. Monitoring Plan to Track Effectiveness of Pollution Controls

In addition to annual site inspections, sediment and 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, available at: 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 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3443861&ob=yes&child=yes). The most recent surface water sampling event occurred October 24, 2021 (see https://edms.deq.louisiana.gov/app/doc/view?doc=13180935). 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 2022* (Geosyntec, March 27, 2023, available at: https://edms.deq.louisiana.gov/app/doc/view?doc=13748726), 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 2022 CAP report is available at: https://edms.deq.louisiana.gov/app/doc/view?doc=13748247.

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 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 2024 Water Quality IR as not fully supporting the FWP use as a result of suspected impairment from PCBs. Capitol Lake is under a "no fish consumption" advisory issued by 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/20181221ADVISORIESTABLEOtherChemicals.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 (LDEQ 2024a) under 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 PCR and SCR designated uses. 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.

In April 2022, USEPA documented the presence of PCBs, pesticides and inorganic analytes (antimony, arsenic, cadmium, copper, lead, manganese, mercury, and zinc) in Capitol Lake at concentrations that meet the criteria for an observed release. In addition, fish tissue samples collected were above the PCB fish tissue Hazard Ranking System (HRS) benchmark document Level 1, establishing actual contamination of a fishery (see https://edms.deq.louisiana.gov/app/doc/view?doc=13890328). 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 (see 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 (LDEQ 2024a), under AI#2056.

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.

In April 2022, USEPA analysis of fish tissue samples from Sunfish, Smallmouth Buffalo, and Yellow Catfish in North Lake, found PCBs at concentrations above the Human Food Chain Cancer Risk benchmark. The Capitol Lake site was proposed for addition to the National Priorities List (NPL) in the Federal Register on March 29, 2023. This site has not been finalized on the NPL at this time. It is estimated that remedial investigation and feasibility study will start between June and August of 2024. For more information on the status of site cleanup actions, available at: https://cumulis.epa.gov/ supercpad/cursites/csitinfo.cfm?id=0600622.

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

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

There have been no cleanup activities involving the contaminated sediments of the lake system. There are currently no published reports and documents for this site.

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 2024 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) 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 (USGS, available 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 2024 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/Devils_SwampLakeHC082906.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://ldh.la.gov/page/health-fish-consumption-advisories-program and also https://ldh.la.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/devils_swamp_advisory_2015.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 x 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 x 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:

1. North and west of Petro-Processors (Petro-Processors is a 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.
2. Immediately south to about 3,000 feet south of the former Hall-Buck Marine Road: Wastes released from pits during operation of the Petro-Processors 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 72ichlorination of the contaminants.

3. 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.
4. Devil's Swamp Lake: The lake and the swamp immediately adjacent have been shown to be contaminated by some of the chlorinated compounds present in the area described in 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.
5. 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, available 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 (see https://edms.deq.louisiana.gov/app/doc/view?doc=8277285). A Tier 2 Remedial investigation was conducted to collect additional data to support findings in the Tier 1 report and completed October 31, 2015 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9998159).

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 to 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=1846348). The latest monthly progress report was July, 2023 (see https://edms.deq.louisiana.gov/app/doc/view?doc=13885987). 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.

Subsegments Impacted by Non-Native Aquatic Plants

1. Identification of Subsegment and Statement of Problem Causing Impairment

Subsegment Description

Louisiana is home to an incredibly diverse system of rivers, streams, lakes, swamps, and marsh. Unfortunately, many nonnative aquatic plant species have been introduced into Louisiana's environment and their overgrowth can impact native plants and animals, clog waterways, limit access, and alter water quality. The LDEQ assessment of non-native aquatic plant impact was based on presence noted during routine AWQMN sampling and LDEQ SD staff evaulative decisions. The subsegments currently listed as IRC 4b for FWP use impairment caused by non-native aquatic plants are found in Appendix A.

Impairment and pollutant causing impairment

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). 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 may include but are not limited to water hyacinth (Eichhornia crassipes), hydrilla (Hydrilla verticillata), giant salvinia (Salvinia molesta), and common salvinia (Salvinia minima).

Sources of pollutant causing impairment

The suspected source of impairment for these IRC 4b subsegments is *introduction of non-native organisms (accidental or intentional)*. 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. Invasive plants may also be

introduced to Louisiana through the aquarium trade, as a result of nursery sales, or possibly with beneficial intent. Many species are 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

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 (see https://www.epa.gov/vessels-marinas-and-ports/vessel-incidental-discharge-act-vida). 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 (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.

The Louisiana Aquatic Invasive Species (LAIS) Task Force was formed by authority of Executive Order MJF 02-11 on June 4, 2002 and convened six times during 2002-2004. The Task Force, led by the LDWF, submitted 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). 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

In Louisiana, LDWF has jurisdiction over non-native aquatic plant related activities. Currently LDWF uses an integrated pest management approach, which combines chemical, mechanical, and biological controls for reducing nuisance aquatic vegetation to maintain boating and fishing access to public waters (https://www.wlf.louisiana.gov/page/controlling-aquatic-plants-and-enhancing-freshwater -habitat).

Descriptions of requirements under which pollution controls will be implemented

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).

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).

Louisiana Revised Statute 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).

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 ongoing activities described above. Because invasive aquatic plants are spread by numerous pathways to and among water bodies full eradication 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 noting presence of non-native aquatic plants during routine AWQMN sampling.

6. Commitment to Revise Pollution Controls, As Necessary

Revisions to controls for non-native aquatic plants are made through the LDWF management plan. Implementation reports are required every year to the state legislature.

Chapter 4: River and Stream Water Quality Assessment

The information reported in Table 24 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 25. The miles and count impacted by various suspected sources of impairment are shown in Table 26. Water body sizes may be different from prior IRs due to changes in GIS resolution accuracy. Tables 25 and 26 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 24
Designated use support for all Louisiana rivers and streams (miles (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Insufficient Data	Total Size
Primary Contact Recreation	5,527 (157)	3,538 (176)	417 (20)	9,482 (353)
Secondary Contact Recreation	9,196 (340)	297 (12)	149 (12)	9,643 (364)
Fish and Wildlife Propagation	3,282 (112)	6,375 (257)	55 (7)	9,712 (376)
Drinking Water Supply	524 (12)	567 (11)	0	1,091 (23)
Limited Aquatic Life and Wildlife Use	32 (3)	60 (3)	0	91 (6)
Outstanding Natural Resource Waters	672 (30)	968 (31)	71 (3)	1,710 (64)
Oyster Propagation	121 (7)	477 (22)	0	598 (29)
Agriculture	2,089 (59)	0	0	2,089 (59)

Table 25
Size (miles) and count of suspected causes of Louisiana river and stream impairments.

Suspected Cause of Impairment	Size	Count
1,1,2-Trichloroethane - Swimming Advisory	0.7	1
1,2-Dichloroethane	85.1	2
4,4'-DDT	468.3	5
Atrazine	83	1
Carbofuran	930.5	23
Chloride	202.2	14
Chloroform - Swimming Advisory	0.7	1
Color	482.4	10
Copper	6.6	2
Dioxins - Swimming Advisory	12.3	1
Dioxins - Fish Consumption Advisory	148.4	5
Dissolved Oxygen	4,570.8	183
Enterococcus	810.6	77
Fecal Coliform	3,220.7	131
Fipronil	351.4	7
Furans - Fish Consumption Advisory & Swimming Advisory	68	5
Lead	292.7	8

Table 25
Size (miles) and count of suspected causes of Louisiana river and stream impairments.

Suspected Cause of Impairment	Size	Count
Mercury - Fish Consumption Advisory	2,732.1	99
Methoxychlor	4	1
Methyl Parathion	83	1
Nitrate/Nitrite (Nitrite + Nitrate as N)	831.8	35
Non-Native Aquatic Plants	23.2	1
PCBs - Fish Consumption Advisory	68	3
PCBs - Swimming Advisory	12.3	2
pH, High	24.2	1
pH, Low	326	13
Phenol	4	1
Phosphorus, Total	766	33
Polycyclic Aromatic Hydrocarbons (PAHs)	16.3	1
Sulfate	4	15
Temperature	239.1	4
Total Dissolved Solids (TDS)	51.4	43
Toxaphene	1,229.9	1
Turbidity	184.9	87

Table 26
Size (miles) and count of suspected sources of Louisiana river and stream impairments.

Suspected Sources of Impairment	Size	Count
Agriculture	2,706.8	77
Animal Feeding Operations (NPS)	40.4	1
Atmospheric Deposition - Toxics	2,732.1	99
Changes in Tidal Circulation/Flushing	3.7	1
Construction	2.1	1
Construction Stormwater Discharge (Permitted)	0.7	1
Contaminated Sediments	132.1	1
Crop Production (Irrigated)	132.1	4
Crop Production (Non-Irrigated)	103.5	4
Discharges From Municipal Separate Storm Sewer Systems (MS4)	39.7	5
Dredging (e.g., For Navigation Channels)	141.8	1
Drought-Related Impacts	58.2	5
Erosion And Sedimentation	45.7	1
Forced Drainage Pumping	16.3	5
Golf Courses	7.1	2
Highways, Roads, Bridges, Infrastructure (New Construction)	106.1	1
Impacts From Hydrostructure Flow Regulation/Modification	199.6	4
Industrial Point Source Discharge	50.3	9
Industrial/Commercial Site Stormwater Discharge (Permitted)	2,706.8	4
Introduction of Non-Native Organisms (Accidental or Intentional)	23.2	1

Table 26
Size (miles) and count of suspected sources of Louisiana river and stream impairments.

Suspected Sources of Impairment	Size	Count
Landfills	42.4	3
Livestock (Grazing or Feeding Operations)	203.2	8
Low Water Crossing	31.9	1
Managed Pasture Grazing	83	1
Manure Runoff	55	1
Marina Boat Maintenance	5.9	1
Marina/Boating Sanitary On-Vessel Discharges	287.6	11
Municipal (Urbanized High Density Area)	86.9	4
Municipal Point Source Discharges	634.6	24
Natural Sources	3,406.7	141
Naturally Occurring Organic Acids	41.7	4
Non-Point Source	26.5	1
On-Site Treatment Systems (Septic Systems And Similar Decentralized Systems)	1,725.8	94
Package Plant Or Other Permitted Small Flows Discharges	865.2	49
Petroleum/Natural Gas Activities	111.9	2
Petroleum/Natural Gas Production Activities (Permitted)	15	1
Point Source(s) – Unspecified	229.4	5
Reduced Freshwater Flows	13.5	5
Residential Districts	27.6	3
Runoff From Forest/Grassland/Parkland	195.9	6
Rural (Residential Areas)	323.5	9
Sand/Gravel/Rock Mining or Quarries	28.7	1
Sanitary Sewer Overflows (Collection System Failures)	273.5	13
Sediment Resuspension (Clean Sediment)	3.6	6
Sewage Discharges in Unsewered Areas	92.7	26
Silviculture Activities	745.1	14
Silviculture Harvesting	441.1	22
Site Clearance (Land Development or Redevelopment)	513.5	5
Source Unknown	138.1	192
Sources Outside State Jurisdiction or Borders	4,744.2	4
Unknown Point Source	97.1	1
Upstream Source	20.2	4
Water Diversions	53.5	4
Waterfowl	144.1	3
Wetland Drainage	54.7	4
Wildlife Other Than Waterfowl	49.7	15

Chapter 5: Lake Water Quality Assessment

The information reported in Table 27 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 28. The acres and count impacted by various suspected sources of impairment are shown in Table 29. Water body sizes may be different from prior IRs due to changes in GIS resolution accuracy. Tables 28 and 29 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 27
Designated use support for Louisiana lakes (acres (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Insufficient Data	Total Size
Primary Contact Recreation	479,675 (41)	44,106 (13)	48,465 (11)	572,246 (65)
Secondary Contact Recreation	559,059 (60)	0	13,188 (5)	572,246 (65)
Fish and Wildlife Propagation	59,807 (14)	517,018 (60)	4,621 (2)	581,445 (76)
Drinking Water Supply	214,483 (9)	29,278 (3)	29 (1)	243,790 (13)
Agriculture	345,249 (16)	0	0	345,249 (16)

Table 28
Size (acres) and count of suspected causes of Louisiana lake impairments.

Suspected Cause of Impairment	Size	Count
Arsenic - Swimming Advisory	64.3	1
Carbofuran	47,869	1
Chloride	56,487.1	1
Color	29,277.6	3
Dissolved Oxygen	115,907.2	26
Fecal Coliform	27,641.8	6
Hexachlorobenzene - Swimming Advisory	64.3	1
Hexachlorobutadiene - Swimming Advisory	64.3	1
Lead - Swimming Advisory	64.3	1
Mercury - Swimming Advisory	64.3	1
Mercury - Fish Consumption Advisory	277,446.7	31
Nitrate/Nitrite (Nitrite + Nitrate As N)	5,309.6	4
Non-Native Aquatic Plants	2,752	1
Oil And Grease	64.3	1
PCBs - Fish Consumption Advisory	119.7	2
pH, High	31,555.6	6
Phosphorus, Total	7,310	4
Temperature	5,309.6	7
Total Dissolved Solids (TDS)	18,526.6	1

Table 28

Size (acres) and count of suspected causes of Louisiana lake impairments.

Suspected Cause of Impairment	Size	Count
Turbidity	213,227.3	18

Table 29

Size (acres) and count of suspected sources of Louisiana lake impairments.

Suspected Sources of Impairment	Size	Count
Agriculture	74,355.5	9
Atmospheric Deposition – Toxics	277,382.4	30
Contaminated Sediments	64.3	1
Crop Production (Non-Irrigated)	12,529.8	2
Discharges from Municipal Separate Storm Sewer Systems (MS4)	55.4	1
Industrial Point Source Discharge	64.3	1
Industrial/Commercial Site Stormwater Discharge (Permitted)	119.7	2
Introduction of Non-Native Organisms (Accidental or Intentional)	2752	1
Natural Sources	188,331.3	28
On-Site Treatment Systems (Septic Systems/Similar Decentralized Systems)	374.3	2
Pesticide Application	1,685.4	1
Sanitary Sewer Overflows (Collection System Failures)	3004	2
Sediment Resuspension (Clean Sediment)	11,986.3	2
Sewage Discharges in Unsewered Areas	3,543.8	3
Shallow Lake/Reservoir	4,893.1	2
Silviculture Harvesting	34,562.3	8
Source Unknown	356,235.3	42
Unknown Point Source	1,685.4	1
Unspecified Land Disturbance	2,184.2	1
Upstream Source	64.3	1
Waterfowl	1,685.4	1

Chapter 6: Estuary and Coastal Water Quality Assessment

The information reported in Table 30 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 31. The square miles and count impacted by various suspected sources of impairment are shown in Table 32. Water body sizes may be different from prior IRs due to changes in GIS resolution accuracy. Tables 31 and 32 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 30
Designated use support for Louisiana estuaries (square miles (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Insufficient Data	Total Size
Primary Contact Recreation	917 (13)	5,125 (39)	0	6,043 (52)
Secondary Contact Recreation	5,170 (51)	0	872 (1)	6,043 (52)
Fish and Wildlife Propagation	3,352 (31)	2,662 (20)	28 (1)	6,043 (52)
Oyster Propagation	2,208 (25)	2,236 (14)	872 (1)	5,317 (40)

Table 31
Size (square miles) and count of suspected causes of Louisiana estuary impairments.

Suspected Cause of Impairment	Size	Count
Carbofuran	207.6	1
Dioxins - Fish Consumption Advisory	72	4
Dissolved Oxygen	715	7
Enterococcus	5,125.3	39
Fecal Coliform	2,236.1	14
Furans - Fish Consumption Advisory	72	4
Mercury - Fish Consumption Advisory	2,093	9
PCBs - Fish Consumption Advisory	72	4
Turbidity	53.7	3

Table 32
Size (square miles) and count of suspected sources of Louisiana estuary impairments.

Suspected Sources of Impairment	Size	Count
Agriculture	207.6	1
Atmospheric Deposition – Toxics	2,093	9
Discharges from Municipal Separate Storm Sewer Systems (MS4)	1.7	1
Industrial Point Source Discharge	72	4
Industrial/Commercial Site Stormwater Discharge (Permitted)	68.7	2
Marina/Boating Pumpout Releases	156	1

Table 32
Size (square miles) and count of suspected sources of Louisiana estuary impairments.

Suspected Sources of Impairment	Size	Count
Marina/Boating Sanitary On-Vessel Discharges	379.8	4
Natural Sources	888.4	13
Non-Point Source	9.3	1
On-Site Treatment Systems (Septic Systems/Similar Decentralized Systems)	208.6	7
Package Plant or Other Permitted Small Flows Discharges	841.9	6
Sanitary Sewer Overflows (Collection System Failures)	1.7	2
Sediment Resuspension (Clean Sediment)	0.8	1
Sewage Discharges in Unsewered Areas	187.7	3
Silviculture Harvesting	83.5	1
Source Unknown	5,470.7	38
Waterfowl	141.7	3
Wet Weather Discharges (Non-Point Source)	150.3	1
Wildlife Other Than Waterfowl	888.4	4

Chapter 7: Wetland Water Quality Assessment

The information reported in Table 33 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 34. The acres impacted by various suspected sources of impairment are shown in Table 35. Water body sizes may be different from prior IRs due to changes in GIS resolution accuracy. Tables 34 and 35 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 33
Designated use support for all Louisiana wetlands (acres (water body count)).

Designated Uses	Size Fully Supported	Size Not Supported	Total Size
Primary Contact Recreation	641,517 (3)	299,872 (3)	941,389 (6)
Secondary Contact Recreation	941,389 (6)	0	941,389 (6)
Fish and Wildlife Propagation	75,219 (1)	866,170 (5)	941,389 (6)
Drinking Water Supply	356,046 (1)	0	356,046 (1)
Oyster Propagation	0	72,519 (1)	72,519 (1)

Table 34
Size (acres) and count of suspected causes of Louisiana wetland impairments.

Suspected Cause of Impairment	Size	Count
Chloride	7,077.3	1
Dissolved Oxygen	78,6574	3
Enterococcus	72,519	1
Fecal Coliform	299,872.3	3
Mercury - Fish Consumption Advisory	22,0276	1
Temperature	7,077.3	1
Total Dissolved Solids (TDS)	72,519	1
Turbidity	7,077.3	1

Table 35
Size (acres) and count of suspected sources of Louisiana wetland impairments.

Suspected Sources of Impairment	Size	Count
Atmospheric Deposition – Toxics	220,276	1
Natural Sources	655,918.3	4
Source Unknown	430,528	2
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

LDH issues fish consumption and swimming advisories after collaboartion with LDEQ, LDWF, and LDAF (LDH 2024). 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 LDH's website at: https://ldh.la.gov/page/health-fish-consumption-advisories-program and https://ldh.la.gov/page/beach-monitoring-water-testing-and-advisories.

PART IV: GROUNDWATER ASSESSMENT

Introduction

The LDEQ, WPAD, Aquifer Sampling and Assessment Program (ASSET) 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. The program provides water quality data to LDEQ, governmental and non-governmental entities at the local, state and federal level, as well as to businesses and citizens.

The USEPA encourages states to select an aquifer or hydrogeologic setting and discuss available data that best reflects its quality. ASSET data is reported in the integrated reports by aquifer with aquifers that are in the same geologic series reported together. Figure 3 shows the hydrogeologic column of aquifers in Louisiana and the occurrence of aquifers reported in this report in relation to each other and to the other freshwater aquifers in the state. The previous integrated report started this new schedule off by reporting data from aquifers in the Pleistocene Series. The next oldest series in age is the Pliocene Series, therefore this integrated report will show data collected for the Evangeline aquifer (Figure 4) and Evangeline Equivalent aquifer (Figure 5). Following this schedule, the next integrated report will show data for the Miocene Series.

Data Reported

The location of each aquifer and a list of wells sampled can be found in each aquifer's respective section. Non-analytical well information for registered water wells, such as depth, use categorization and aquifer assignment were obtained from the LDENR Strategic Online Natural Resources Information System (SONRIS). A general overview of the geology and hydrogeology of each aquifer is given which includes a description of the material that makes up the aquifer and the occurrence of fresh water within it.

Monitoring results are reported below by aquifer. Each aquifer is monitored for field parameters, conventional parameters, inorganic parameters, volatile organic compounds (VOCs), semi-volatile organic compound (SVOCs) and pesticides/PCBs. For quality control, duplicate samples and field blanks are also taken. Results for VOCs, SVOCs and pesticides/PCBs are not reported as the number of analytes is very large. However, a discussion of these analytes is included for each aquifer. The list of analytes for these three categories is included prior to the aquifer sections in Tables 36, 37, and 38.

Under the Federal Safe Drinking Water Act, the USEPA has established water quality standards for public drinking water in the form of maximum contaminant levels (MCLs) for pollutants that may pose a health risk along with secondary standards (SMCLs) which are defined as non-enforceable taste, odor, and appearance guidelines. While not all wells sampled were public supply wells, the ASSET Program uses these standards as benchmarks for further evaluation. Those ASSET wells reporting turbidity levels greater than 1.0 NTU do not exceed the Primary MCL of 1.0, as this standard applies to public supply water wells that are under the direct influence of

surface water. The Louisiana Department of Health has determined that no public water supply well in Louisiana is in this category.

A discussion of historical data and related trends is found at the end of each aquifer's section along with a general summary. This includes a statistical overview of field, conventional, and inorganic data for each aquifer and a listing of the minimum, maximum, and average results for these parameters along with a comparison to historical ASSET-derived data. The average values are determined using all valid reported results, including those reported as non-detect or less than the detection limit (< DL). The method used to generate the descriptive statistics varies, depending on the dataset and the proportion of values that are <DL. When estimating a dataset with more than 50 observations, the Maximum Likelihood Estimation (MLE) method is used. This is used to describe Upper and Lower confidence intervals or historical descriptive statistics. For datasets of less than 50 observations, the Kapan-Meier method is used to calculate descriptive statistics of a single sampling round. If all values for a particular analyte are reported as < DL, then the minimum, maximum, and average values are all reported as < DL. Trends of selected parameters based on the averaged value of that parameter for each three-year reporting period are also given. Water hardness classifications in the summaries are based on the hardness scale from Peavy, H.S. et al. Environmental Engineering. New York: McGraw-Hill. 1985.

Figure 3
Hydrogeologic column of aquifers in Louisiana (Bold 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	Upper 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]
						"500-foot" sand "700-foot" sand	Lower sand unit				
Tertiary	Pliocene	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**	
	-----?-----										
	Miocene		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

Table 36
ASSET Program VOC 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 37
ASSET Program Semi-VOC 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
Hexachlorobenzene	625	5
Hexachlorobutadiene	625	10

Table 37
ASSET Program Semi-VOC analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
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 38
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
p,p'-DDE	608	0.10
p,p'-DDT	608	0.02
PCB-1016 (Arochlor 1016)	608	0.20

Table 38
ASSET Program Pesticide and PCB analyte list with method and detection limits.

Compound	Method	Detection Limits (µg/L)
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

Evangeline Aquifer

Geology

The Evangeline aquifer is comprised of unnamed Pliocene sands and the Pliocene-Miocene Blounts Creek member of the Fleming formation. The Blounts Creek consists of sands, silts, and silty clays, with some gravel and lignite. The sands of the aquifer are moderately well to well sorted and fine to medium grained with interbedded coarse sand, silt, and clay. The mapped outcrop corresponds to the outcrop of the Blounts Creek member, but downdip, the aquifer thickens and includes Pliocene sand beds that do not crop out. The confining clays of the Castor Creek member (Burkeville aquiclude) retard the movement of water between the Evangeline and the underlying Miocene aquifer systems. The Evangeline aquifer is separated in most areas from the overlying Chicot aquifer by clay beds; in some areas the clays are missing and the upper sands of the Evangeline are in direct contact with the lower sands and gravels of the Chicot.

Hydrogeology

Recharge to the Evangeline aquifer occurs by the direct infiltration of rainfall in interstream, upland outcrop areas and the movement of water through overlying terrace deposits, as well as leakage from other aquifers. Fresh water in the Evangeline is separated from water in stratigraphically equivalent deposits in southeast Louisiana by a saltwater ridge in the Mississippi River valley. The hydraulic conductivity of the Evangeline varies between 20 and 100 feet/day. The maximum depths of occurrence of fresh water in the Evangeline range from 150 feet above sea level, to 2,250 feet below sea level. The range of thickness of the freshwater interval in the Evangeline is 50 to 1,900 feet. The depths of the Evangeline wells that were monitored in conjunction with the ASSET Program range from 170 to 1,715 feet. The list of wells sampled can be found in Table 39.

Field and Conventional Parameters

Table 40 shows the field and conventional parameters for which samples are collected at each well and the analytical results for those parameters. Table 41 provides an overview of this data for the Evangeline aquifer, listing the minimum, maximum, and average results for these parameters. Table 42 shows the inorganic parameters for which samples are collected at each well and the analytical results for those parameters. Table 43 provides an overview of inorganic data for the Evangeline aquifer, listing the minimum, maximum, and average results for these parameters.

Figure 4

Location plat of the Evangeline Aquifer.

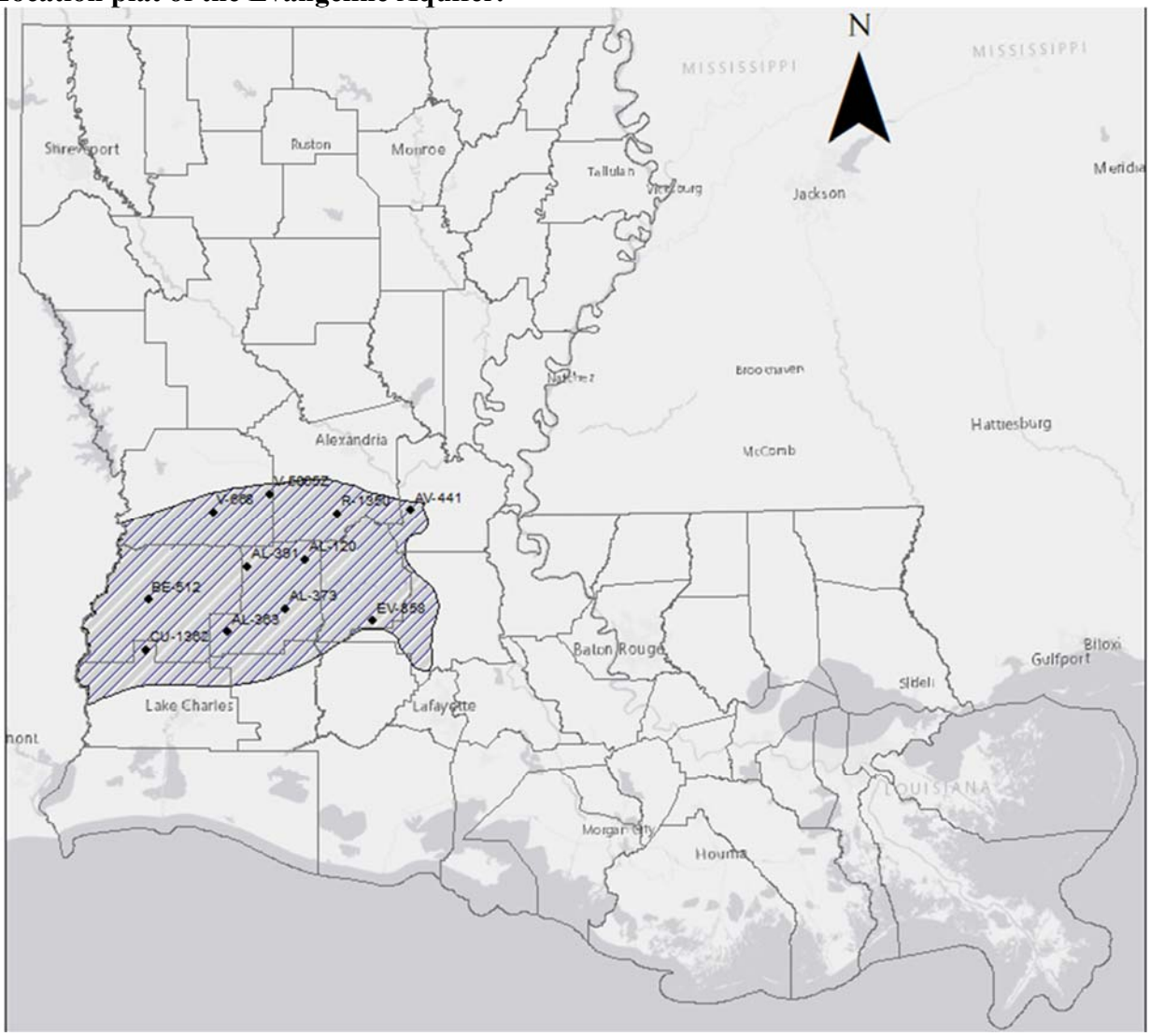


Table 39

Wells sampled in the Evangeline Aquifer-FY 2019.

Well ID	Parish	Date	Owner	Depth (Feet)	Well Use
AL-120	ALLEN	06/12/2019	CITY OF OAKDALE	910	PUBLIC SUPPLY
AL-363	ALLEN	06/12/2019	WEST ALLEN PARISH WATER DIST.	1715	PUBLIC SUPPLY
AL-373	ALLEN	06/12/2019	TOWN OF OBERLIN	747	PUBLIC SUPPLY
AL-391	ALLEN	06/12/2019	FAIRVIEW WATER SYSTEM	800	PUBLIC SUPPLY
AV-441	AVOYELLES	05/22/2019	TOWN OF EVERGREEN	319	PUBLIC SUPPLY
BE-512	BEAUREGARD	06/13/2019	SINGER WATER DISTRICT	918	PUBLIC SUPPLY
CU-1362	CALCASIEU	06/13/2019	LA WATER CO	635	PUBLIC SUPPLY
EV-858	EVANGELINE	06/12/2019	SAVOY SWORDS WATER SYSTEM	472	PUBLIC SUPPLY
R-1350	RAPIDES	05/22/2019	PRIVATE OWNER	180	IRRIGATION
V-5065Z	VERNON	05/22/2019	PRIVATE OWNER	170	DOMESTIC
V-668	VERNON	07/01/2019	LDWF/FORT POLK WMA HQ	280	OTHER

Table 40
Field and Conventional Data Results for the Evangeline Aquifer-FY 2019.

Well ID	pH SU	Sal ppt	Sp Cond mmhos/cm	Temp Deg C	TDS g/L	Alk mg/L	Cl mg/L	Color PCU	Hard mg/L	Nitrite-Nitrate as N) mg/L	NH3 mg/L	Tot P mg/L	Sp Cond µmhos/cm	SO4 mg/L	TDS mg/L	TKN mg/L	TSS mg/L	Turb NTU
	Laboratory Reporting Limits →					2	1	5	5	0.05	0.1	0.05	1	1	10	0.1	4	0.1
	Field Parameters					Laboratory Parameters												
AL-120	8.99	0.15	0.32	20.30	0.21	144	4.10	< DL	< DL	< DL	< DL	0.23	328	5.90	115	< DL	< DL	0.32
AL-120*	8.99	0.15	0.32	20.30	0.21	135	3.90	< DL	< DL	< DL	< DL	0.34	321	5.90	190	< DL	< DL	0.61
AL-363	9.26	0.25	0.52	24.67	0.34	250	4.30	30	< DL	< DL	0.12	0.40	500	1.60	255	< DL	< DL	0.67
AL-373	7.91	0.16	0.34	20.22	0.22	154	9.20	7	< DL	< DL	0.12	0.44	335	< DL	220	< DL	< DL	0.80
AL-391	7.73	0.11	0.23	19.31	0.15	93.60	7.90	60	90	< DL	0.15	0.25	217	< DL	240	< DL	< DL	12.90
AV-441	7.49	0.64	1.27	17.92	0.83	373	115	8	56	< DL	0.60	0.17	1340	72.50	710	0.68	< DL	1.20
BE-512	8.98	0.14	0.35	21.38	0.22	156	5.50	< DL	32	< DL	< DL	0.14	335	5.50	160	< DL	< DL	0.20
CU-1362	7.39	0.58	0.28	20.03	0.19	117	16.30	10	74	< DL	0.12	0.36	278	1.80	75	0.17	< DL	0.32
EV-858	7.74	0.04	1.17	18.57	0.76	356	140	15	96	< DL	0.49	0.47	1200	< DL	600	0.28	< DL	0.91
R-1350	6.16	0.04	0.09	19.07	0.06	21.10	4.20	< DL	12	< DL	< DL	< DL	81.90	5.90	180	0.25	< DL	0.51
V-5065Z	6.97	0.02	0.09	19.01	0.06	47.90	6.40	< DL	20	0.09	< DL	< DL	87.30	< DL	130	0.16	< DL	0.23
V-668	6.22	0.15	0.04	22.99	0.03	9.70	2.80	< DL	14	< DL	< DL	< DL	36.80	< DL	35	0.20	< DL	3.20

* Denotes duplicate sample

Table 41
Field and Conventional Statistical Results for the Evangeline Aquifer-FY 2019.

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	pH (SU)	6.16	9.26	7.71
	Salinity (ppt)	0.02	0.64	0.21
	Specific Conductance (mmhos/cm)	0.04	1.27	0.43
	Temperature (^{O}C)	17.92	24.67	20.32
	Total Dissolved Solids (g/L)	0.03	0.83	0.28
LAB	Alkalinity (mg/L)	9.70	373	156.57
	Chloride (mg/L)	2.80	140	28.70
	Color (PCU)	< DL	60.00	14.09
	Hardness (mg/L)	< DL	96.00	37.18
	Nitrite - Nitrate, as N (mg/L)	< DL	0.09	< DL
	Ammonia, as N (mg/L)	< DL	0.60	0.19

	Total Phosphorus (mg/L)	< DL	0.47	0.24
	Specific Conductance (µmhos/cm)	36.80	1340	430.82
	Sulfate (mg/L)	< DL	72.50	8.93
	Total Dissolved Solids (mg/L)	35	710	247.27
	Total Kjeldahl Nitrogen (mg/L)	< DL	0.68	0.20
	Total Suspended Solids (mg/L)	< DL	< DL	< DL
	Turbidity (NTU)	0.20	12.90	1.93

Table 42

Inorganic Data Results for the Evangeline Aquifer-FY 2019.

Well ID	Antimony ug/L	Arsenic ug/L	Barium Ug/L	Beryllium ug/L	Cadmium ug/L	Chromium ug/L	Copper ug/L	Iron ug/L	Lead ug/L	Mercury ug/L	Nickel ug/L	Selenium ug/L	Silver ug/L	Thallium ug/L	Zinc ug/L
Laboratory Detection Limits	**1**	**1**	**1**	**0.5**	**1**	**1**	**3**	**50**	**1**	**0.2**	**1**	**1**	**0.5**	**0.5**	**5**
AL-120	< DL	< DL	8.5	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AL-120*	< DL	< DL	8.3	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AL-363	< DL	< DL	10.5	< DL	< DL	< DL	30.90	< DL	2.20	< DL	< DL	< DL	< DL	< DL	8.90
AL-373	< DL	5.10	12.1	< DL	< DL	< DL	< DL	133	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AL-391	< DL	< DL	176	< DL	< DL	< DL	3.20	4140	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AV-441	1.20	< DL	85.8	< DL	< DL	< DL	6.00	626	1.70	< DL	< DL	< DL	< DL	< DL	15.20
BE-512	< DL	1.40	15.7	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CU-1362	< DL	1.10	179	< DL	< DL	< DL	< DL	369	< DL	< DL	< DL	< DL	< DL	< DL	7.60
EV-858	< DL	< DL	287	< DL	< DL	< DL	< DL	73.40	< DL	< DL	< DL	< DL	< DL	< DL	< DL
R-1350	< DL	< DL	16.9	< DL	< DL	< DL	< DL	799	< DL	< DL	< DL	< DL	< DL	< DL	< DL
V-5065Z	< DL	< DL	76.4	< DL	< DL	< DL	12.30	< DL	< DL	< DL	< DL	< DL	< DL	< DL	5.10
V-668	< DL	< DL	39.3	< DL	< DL	< DL	3.50	< DL	< DL	< DL	< DL	< DL	< DL	< DL	6.80

Table 43
Inorganic Statistics for the Evangeline Aquifer-FY 2019.

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (µg/L)	< DL	1.20	< DL
Arsenic (µg/L)	< DL	5.10	1.42
Barium (µg/L)	8.50	287.00	82.47
Beryllium (µg/L)	< DL	< DL	< DL
Cadmium (µg/L)	< DL	< DL	< DL
Chromium (µg/L)	< DL	< DL	< DL
Copper (µg/L)	< DL	30.90	6.72
Iron (µg/L)	< DL	4140.00	580.95
Lead (µg/L)	< DL	1.2	< DL
Mercury (µg/L)	< DL	< DL	< DL
Nickel (µg/L)	< DL	< DL	< DL
Selenium (µg/L)	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL
Zinc (µg/L)	< DL	15.20	6.69

Table 44
Historical Field and Conventional Statistics for the Evangeline Aquifer.

PARAMETER		AVERAGE VALUES BY FISCAL YEAR								
		FY 1995	FY 1998	FY 2001	FY 2004	FY 2007	FY 2010	FY 2013	FY 2016	FY 2019
FIELD	pH (SU)	7.14	7.08	7.05	7.54	8.06	7.98	7.59	7.59	7.71
	Salinity (ppt)	0.22	0.21	0.14	0.15	0.22	0.24	0.18	0.18	0.21
	Specific Conductance (mmhos/cm)	0.500	0.500	0.300	0.320	0.460	0.480	0.378	0.378	0.43
	Temperature (^{O}C)	23.71	22.87	21.33	22.69	22.44	21.43	19.14	19.14	20.32
	Total Dissolved Solids (g/L)	-	-	-	0.210	0.300	0.310	0.246	0.246	0.28
LABORATORY	Alkalinity (mg/L)	206	193	177	137	176	179	157	157	156.57
	Chloride (mg/L)	15.2	27.0	38.3	18.1	37.3	41.8	22.0	22.0	28.70
	Color (PCU)	23	7	8	8	-	8	11	11	14.09
	Hardness (mg/L)	16	11	32	23	28	< DL	29	29	37.18
	Nitrite - Nitrate, as N (mg/L)	< DL	< DL	< DL	< DL	< DL	0.01	< DL	< DL	< DL
	Ammonia, as N (mg/L)	0.20	0.16	0.22	0.15	0.20	< DL	0.26	0.26	0.19
	Total Phosphorus (mg/L)	0.16	0.15	0.17	0.10	0.16	0.21	0.14	0.14	0.24
	Specific Conductance (µmhos/cm)	490	454	446	322	446	470	309	309	430.82
	Sulfate (mg/L)	4.7	4.4	5.7	5.4	5.4	8.2	32.5	32.5	8.93
	Total Dissolved Solids (mg/L)	308	323	264	209	289	461	219	219	247.27
	Total Kjeldahl Nitrogen (mg/L)	0.72	0.16	0.69	0.28	0.25	< DL	0.40	0.40	0.20
	Total Suspended Solids (mg/L)	< DL	< DL	< DL	< DL	< DL	< DL	3	3	< DL
	Turbidity (NTU)	< DL	< DL	< DL	1.04	< DL	< DL	1.29	1.29	1.93

Table 45
Historical Inorganic Statistics for the Evangeline Aquifer.

PARAMETER	AVERAGE VALUES BY FISCAL YEAR								
	FY 1995	FY 1998	FY 2001	FY 2004	FY 2007	FY 2010	FY 2013	FY 2016	FY 2019
Antimony (µg/L)	< DL	-	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Arsenic (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	1.0	1.42
Barium (µg/L)	62.7	41.4	127.0	85.4	127.9	110.0	94.3	81.9	82.47
Beryllium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Cadmium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Chromium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Copper (µg/L)	25	49	7.9	6.6	3.4	4.3	3.43	5.1	6.72
Iron (µg/L)	203	105	161	267	178	107	144	406	580.95
Lead (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Mercury (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Nickel (µg/L)	8.1	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Selenium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Silver (µg/L)	< DL	1.19	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Zinc (µg/L)	134.2	106.6	15.2	26.8	15.5	< DL	< DL	< DL	6.69

Federal Drinking Water Standards

A review of the data shows that no primary MCL was exceeded for field or conventional parameters (Table 40), or inorganics (Table 42), during this reporting period. A review of the analysis listed in Table 41 shows that five wells exceeded the SMCL for pH, two wells exceeded the SMCL for color, and two wells exceeded the SMCL for total dissolved solids. Four wells exceeded the SMCL for iron (Table 42). Laboratory results override field results in exceedance determinations, thus only lab results will be counted in determining SMCL exceedance numbers for TDS. The following is a list of SMCL parameter exceedances with well numbers and results.

pH (SMCL = 6.5 – 8.5 Standard Units):

AL-120	8.99 SU (Duplicate 8.99 SU)
AL-363	9.26 SU
BE-512	8.98 SU
R-1350	6.16 SU
V-668	6.22 SU

Total Dissolved Solids (SMCL = 500 mg/L or 0.5 g/L):

LAB RESULTS (in mg/L)		FIELD MEASURES (in g/L)
AV-441	710 mg/L	0.83 g/L
EV-858	600 mg/L	0.76 g/L

Color (SMCL = 15 PCU):

AL-363	30 PCU
AL-391	60 PCU

Iron (SMCL = 300 µg/L):

AL-391	4140 µg/L
AV-441	626 µg/L
CU-1362	369 µg/L
R-1350	799 µg/L

VOCs, SVOCs, Pesticides/PCBs

There were no confirmed detections of these parameters at or above their detection limits during the FY 2019 sampling of the Evangeline aquifer.

Historical Data and Related Trends

Table 44 and Table 45 show that the quality and characteristics of groundwater produced from the Evangeline aquifer show the same trends when comparing current and historical data. Over the 24-year period data averages show that temperature and total dissolved solids have demonstrated a decrease while remaining parameters show no consistent change or are non-detect. The current number of wells with SMCL exceedances has stayed the same from the previous sampling event in FY 2016. In FY 2016, at least one SMCL exceedance was reported in six wells with a total of nine exceedances. In FY 2019, at least one SMCL was exceeded in nine of 11 wells with 13 total exceedances.

Summary

In summary, the data show that the groundwater produced from this aquifer is generally soft and is of good quality when considering short-term and long-term health risk guidelines. Laboratory data show that no well that was sampled during this reporting period exceeded a primary MCL. The data also show that this aquifer is of good quality when considering taste, odor, and appearance guidelines. A comparison to historical ASSET data show that two analytes have increased in their average concentrations while all other analytes show no consistent change or have remained non-detect.

Evangeline Equivalent Aquifer

Geology

The Evangeline Equivalent aquifer is composed of the Pliocene aged aquifers of the Baton Rouge area and St. Tammany, Tangipahoa, and Washington Parishes. These Pliocene sediments crop out in southwestern Mississippi. The sedimentary sequences that make up the aquifer system are 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 consist of moderately to well sorted, fine to medium grained sands, with interbedded coarse sand, silt, and clay.

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. A zone or ridge of saline water occurs within the Pliocene sediments beneath the Mississippi River alluvial valley. Recharge occurs primarily by the direct infiltration of rainfall in interstream, upland outcrop areas, and by the movement of water between aquifers.

The hydraulic conductivity varies between 10-200 feet/day. The maximum depths of occurrence of freshwater in the Evangeline Equivalent range from zero to 2,500 feet below sea level. The range of thickness of the fresh water interval in the Evangeline Equivalent is 50 to 1,500 feet. The depths of the Evangeline Equivalent wells that were monitored in conjunction with the ASSET Program range from 185 to 1900 feet below ground surface. The list of wells sampled can be found in Table 46.

Field and Conventional Parameters

Table 47 shows the field and conventional parameters for which samples are collected at each well and the analytical results for those parameters. Table 48 provides an overview of this data for the Evangeline Equivalent aquifer, listing the minimum, maximum, and average results for these parameters. Table 49 shows the inorganic parameters for which samples are collected at each well and the analytical results for those parameters. Table 50 provides an overview of inorganic data for the Evangeline aquifer, listing the minimum, maximum, and average results for these parameters.

Table 46
Wells sampled in the Evangeline Equivalent Aquifer-FY 2021.

Well ID	Parish	Date	Owner	Depth (Feet)	Well Use
AV-680	Avoyelles	08/19/2020	Avoyelles Water Commission	553	Public Supply
EB-1003	East Baton Rouge	11/17/2020	Baton Rouge Water Works	1,430	Public Supply
EF-MILEY	East Feliciana	09/09/2020	Private Owner	185	Domestic
PC-325	Pointe Coupee	08/19/2020	Alma Plantation LTD	1,252	Industrial
SL-679	St. Landry	08/19/2020	Alon USA	1,152	Industrial
ST-532	St. Tammany	03/22/2021	Northlake Hospital	1,520	Public Supply
ST-6711Z	St. Tammany	03/30/2021	Private Owner	860	Domestic
TA-284	Tangipahoa	11/18/2021	City of Ponchatoula	608	Public Supply
TA-286	Tangipahoa	10/21/2020	Town of Kentwood	640	Public Supply
TA-10046Z	Tangipahoa	10/21/2020	Highway 51 MHP	590	Public Supply
WA-241	Washington	03/08/2021	Private Owner	400	Irrigation
WA-5210Z	Washington	03/09/2021	Private Owner	752	Domestic
WBR-181	West Baton Rouge	11/17/2020	Port of Greater Baton Rouge	1,900	Industrial
WF-DELEE	West Feliciana	09/09/2020	Private Owner	240	Domestic

Figure 5
Location plat of the Evangeline Equivalent Aquifer.

Table 47
Field and Conventional Data Results for the Evangeline Equivalent Aquifer-FY 2021.

Well ID	pH SU	Sal. ppt	Sp. Cond. mmhos /cm	Temp Deg. C	TDS mg/L	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate (as N) mg/L	NH3 mg/L	Tot. P mg/L	Sp. Cond. umhos/cm	SO4 mg/L	TDS mg/L	TKN mg/L	TSS mg/L	Turb. mg/L
	LABORATORY REPORTING LIMITS →					2	1	5	5	0.05	0.1	0.05	1	1	10	0.1	4	0.1
	FIELD PARAMETERS					LABORATORY PARAMETERS												
AV-680	8.56	0.21	430.00	23.83	279.50	171	16.10	< DL	12	< DL	0.28	0.16	474	5.40	105	0.45	< DL	1.00
EB-1003	8.69	0.14	290.99	25.22	189.14	83.90	3.30	< DL	24	< DL	0.24	0.27	371	8.80	260	0.54	< DL	0.36
EF-MILEY	5.80	0.02	52.18	21.24	33.91	26.20	2.90	< DL	10	< DL	< DL	< DL	67.20	< DL	25	0.11	< DL	0.23
PC-325	8.55	0.14	289.09	25.41	187.91	123	2.70	< DL	< DL	< DL	0.16	0.33	323	9.30	115	0.49	< DL	0.47
SL-679	9.01	0.18	380.63	26.81	247.41	159	6	< DL	< DL	< DL	0.17	0.30	420	10.80	170	0.21	< DL	0.46
ST-532	9.13	0.15	319.37	26.59	207.59	144	3.10	10	10	< DL	< DL	0.39	335	11.50	210	0.89	< DL	0.29
ST-6711Z	9.03	0.29	598.67	21.42	389.14	290	16.20	10	10	< DL	0.21	0.45	835	3.40	370	0.55	< DL	0.23
TA-10046Z	6.33	0.04	90.98	23.80	59.14	28	3.60	< DL	22	< DL	< DL	0.05	101	1.70	75	0.50	< DL	0.45
TA-284	8.71	0.13	280.04	22.55	182.03	124	2.90	10	88	< DL	0.16	0.36	308	9.90	200	0.38	< DL	0.42
TA-286	6.26	0.03	58.82	23.46	38.23	18	2.50	< DL	14	< DL	< DL	< DL	67.30	3.90	70	0.66	< DL	0.42
WA-241	5.71	0.02	41.21	17.48	26.78	6	3.50	< DL	8	0.43	< DL	< DL	39.10	< DL	45	0.46	< DL	1.50
WA-5210Z	6.98	0.07	149.73	21.48	97.33	52.40	2.90	10	42	< DL	0.26	0.25	147	9.00	150	0.32	< DL	0.15
WBR-181	8.99	0.14	305.32	25.72	198.46	85.90	2.40	< DL	124	< DL	0.25	0.29	380	8.50	280	0.46	< DL	0.29
WF-DELEE	7.60	0.07	143.00	25.32	92.95	128	9.70	< DL	14	< DL	0.68	0.81	393	9.00	80	0.52	< DL	1.60

Table 48
Field and Conventional Statistics for the Evangeline Equivalent Aquifer-FY 2021.

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	pH (SU)	5.71	9.09	7.90
	Salinity (ppt)	0.02	0.29	0.13
	Specific Conductance (mmhos/cm)	41.21	598.67	267.86
	Temperature (^{O}C)	17.48	26.81	23.58
	TDS (g/L)	26.78	389.14	174.11
LAB	Alkalinity (mg/L)	6.00	290.00	112.89
	Chloride (mg/L)	2.40	17.60	6.36

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Color (PCU)	< DL	10	< DL
Hardness (mg/L)	< DL	124	26.53
Nitrite - Nitrate, as N (mg/L)	< DL	0.43	< DL
Ammonia, as N (mg/L)	< DL	0.68	0.20
Total Phosphorus (mg/L)	< DL	0.81	0.28
Specific Conductance (µmhos/cm)	39.10	835	335.17
Sulfate (mg/L)	< DL	11.50	6.65
TDS (mg/L)	25	370	164.67
TKN (mg/L)	0.11	0.89	0.46
TSS (mg/L)	< DL	< DL	< DL
Turbidity (NTU)	0.15	1.60	0.57

Table 49

Inorganic Data Results for the Evangeline Equivalent Aquifer-FY 2021.

Well ID	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 Reporting Limits	**1**	**1**	**1**	**0.5**	**1**	**1**	**3**	**50**	**1**	**0.2**	**1**	**1**	**0.5**	**0.5**	**5**
AV-680	< DL	< DL	76.90	< DL	< DL	< DL	2.70	23.70	< DL	< DL	< DL	< DL	< DL	< DL	< DL
EB-1003	< DL	< DL	16.30	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
EF-MILEY	< DL	< DL	84.70	< DL	< DL	0.96	23.70	< DL	1.20	< DL	< DL	< DL	< DL	< DL	20.10
PC-325	< DL	< DL	6.20	< DL	< DL	< DL	< DL	27.30	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SL-679	< DL	< DL	14.80	< DL	< DL	0.60	< DL	70.60	< DL	< DL	< DL	< DL	< DL	< DL	< DL
ST-532	< DL	< DL	6.40	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	5.80
ST-6711Z	< DL	< DL	11.80	1.10	< DL	< DL	< DL	< DL	1.40	< DL	< DL	< DL	< DL	< DL	< DL
TA-10046Z	< DL	0.59	71.80	< DL	< DL	1.20	2.40	< DL	< DL	< DL	< DL	< DL	< DL	< DL	5.10
TA-284	< DL	< DL	16.50	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
TA-286	< DL	3.4	67.00	< DL	< DL	0.87	13.40	53	< DL	< DL	< DL	< DL	< DL	< DL	9.90
WA-241	< DL	< DL	27.70	< DL	< DL	< DL	25.60	615	< DL	< DL	< DL	< DL	< DL	< DL	9.50
WA-5210Z	< DL	< DL	62.20	< DL	< DL	2.40	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
WBR-181	< DL	< DL	1.80	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	6.80
WF-DELEE	< DL	< DL	55.80	< DL	< DL	< DL	6.90	70.90	< DL	< DL	< DL	< DL	< DL	< DL	3.10

Table 50
Inorganic Statistics for the Evangeline Equivalent Aquifer-FY 2021.

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (µg/L)	< DL	< DL	< DL
Arsenic (µg/L)	< DL	0.59	< DL
Barium (µg/L)	1.80	84.70	35.23
Beryllium (µg/L)	< DL	1.10	< DL
Cadmium (µg/L)	< DL	< DL	< DL
Chromium (µg/L)	< DL	2.40	0.94
Copper (µg/L)	< DL	25.60	6.51
Iron (µg/L)	< DL	615	70.83
Lead (µg/L)	< DL	1.60	0.65
Mercury (µg/L)	< DL	< DL	< DL
Nickel (µg/L)	< DL	< DL	< DL
Selenium (µg/L)	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL
Zinc (µg/L)	< DL	20.10	5.67

Table 51
Historical Field and Conventional Statistics for the Evangeline Equivalent Aquifer.

PARAMETER		AVERAGE VALUES BY FISCAL YEAR								
		FY 1997	FY 2000	FY 2003	FY 2006	FY 2009	FY 2012	FY 2015	FY 2018	FY 2021
FIELD	pH (SU)	7.45	8.02	8.41	7.88	8.12	7.77	7.62	8.02	7.90
	Salinity (ppt)	0.14	0.12	0.12	0.13	0.12	0.12	0.12	0.12	0.13
	Specific Conductance (mmhos/cm)	0.330	0.240	0.270	0.280	0.260	0.250	0.256	0.251	267.86
	Temperature (OC)	25.17	22.73	22.74	22.59	22.88	22.17	22.22	20.53	23.58
	Total Dissolved Solids (g/L)	-	-	-	0.180	0.170	0.160	0.166	0.163	174.11
LABORATORY	Alkalinity (mg/L)	125	110	118	120	126	112	150	116	112.89
	Chloride (mg/L)	13.7	8.3	7.3	11.8	8.4	6.8	5.9	5.6	6.36
	Color (PCU)	14	8	8	14	< DL	< DL	5	< DL	< DL
	Hardness (mg/L)	10	13	11	11	7	12	12	9	26.53
	Nitrite - Nitrate, as N (mg/L)	0.04	0.10	0.17	0.07	0.06	0.07	0.14	0.08	< DL
	Ammonia, as N (mg/L)	0.30	0.13	0.15	0.17	< DL	0.17	0.23	0.15	0.20
	Total Phosphorus (mg/L)	0.19	0.27	0.22	0.21	0.27	0.24	0.23	0.24	0.28
	Specific Conductance (µmhos/cm)	277	250	237	269	248	249	217	261	335.17
	Sulfate (mg/L)	5.8	6.5	7.6	7.4	6.3	6.4	6.8	7.6	6.65
	Total Dissolved Solids (mg/L)	233	163	170	198	185	163	172	186	164.67
	Total Kjeldahl Nitrogen (mg/L)	1.14	0.27	0.24	0.23	0.35	< DL	0.62	0.72	0.46
	Total Suspended Solids (mg/L)	< DL	4.7	< DL	< DL	< DL	< DL	< DL	< DL	< DL
	Turbidity (NTU)	1.6	2.0	1.3	< DL	< DL	0.2	0.8	0.6	0.57

Table 52
Historical Inorganic Statistics for the Evangeline Equivalent Aquifer.

PARAMETER	AVERAGE VALUES BY FISCAL YEAR								
	FY 1997	FY 2000	FY 2003	FY 2006	FY 2009	FY 2012	FY 2015	FY 2018	FY 2021
Antimony (µg/L)	11.5	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Arsenic (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Barium (µg/L)	29.1	41.0	39.9	47.8	39.3	40.8	40.3	37.8	35.23
Beryllium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Cadmium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Chromium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	2.3	0.94
Copper (µg/L)	12.9	9.0	6.7	< DL	< DL	6.2	10.8	4.6	6.51
Iron (µg/L)	331	943	204	265	174	152	261	164	70.83
Lead (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	1.0	< DL	0.65
Mercury (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Nickel (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	1.40	2.1	< DL
Selenium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Zinc (µg/L)	141.6	178.0	11.8	< DL	< DL	6.0	21.0	21.8	5.67

Federal Drinking Water Standards

A review of the data shows that no MCL was exceeded for field or conventional parameters (Table 47), or metals (Table 49), during this reporting period. A review of the analysis shows that 12 wells exceeded the SMCL for pH (Table 47) and one well exceeded the SMCL for iron (Table 49). Laboratory results take precedence over field results in total dissolved solids (TDS) exceedance determinations, thus only laboratory results are counted in determining SMCL exceedance numbers for TDS. The following is a list of SMCL exceedances with well numbers and results.

pH (SMCL = 6.5 – 8.5 Standard Units):

AV-680	8.56 SU	TA-10046Z	6.33 SU
EB-1003	8.69 SU	TA-284	8.71 SU
EF-MILEY	5.80 SU	TA-286	6.26 SU
PC-325	8.55 SU	WA-241	5.71 SU
SL-679	9.01 SU	WBR-181	8.99 SU
ST-532	9.13 SU		
ST-6711Z	9.03 SU		

Iron (SMCL = 300 µg/L):

WA-241 615 µg/L

VOCs, SVOCs, Pesticides/PCBs

There were no confirmed detections of these parameters at or above their detection limits during the FY 2021 sampling of the Evangeline Equivalent aquifer

Historical Data and Related Trends

Table 51 and Table 52 show that the quality and characteristics of groundwater produced from the Evangeline Equivalent aquifer show some changes when comparing current data to historical data. Over the 24-year period two analytes, specific conductance and hardness, have shown a general increase in average concentration. For this same period, three analytes, temperature, total dissolved solids, and color, have demonstrated a decrease in average concentration. The remaining analytes were non-detect or have been consistent with only minor fluctuations over this period. The number of secondary exceedances in the Evangeline Equivalent aquifer has increased from the FY 2018 sampling. In FY 2018 there were 10 exceedances in eight wells, the FY 2021 sampling period showed 13 exceedances in 12 wells.

Summary

In summary, the data show that the groundwater produced from this aquifer is soft and is of good quality when considering short-term and long-term health risk guidelines. Laboratory data show that no ASSET well that was sampled during the Fiscal Year 2021 monitoring of the Evangeline Equivalent aquifer exceeded an MCL. The data also show that this aquifer is of good quality when considering taste, odor, and appearance guidelines, with 13 MCL exceedances in 12 wells. Comparison to historical ASSET-derived data shows only a slight change in the quality or characteristics of the Evangeline Equivalent aquifer, with two parameters showing consistent increases in concentration and three decreasing in concentration over the previous 24 years.

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: 2024 Integrated Report of Water Quality in Louisiana

Appendix A contains the 2024 IR water quality assessment for Louisiana regulated water bodies.

The full water quality assessment spreadsheet is contained in Appendix A in the document 24_IR1_App_A_Assessments_3-28-2024.

APPENDIX B: 2024 Integrated Report – Category 1 Addendum

Appendix B of the 2024 Integrated Report, Category 1 Addendum, contains those water body impairment combinations (WICs) that were removed from LDEQ's 2022 Integrated Report during development of the 2024 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 2022 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, 24_IR1_App_B_Cause_Removals_3-28-2024.

APPENDIX C: Louisiana's Ambient Water Quality Monitoring Network Sites

The full list of ambient surface water quality network sites used for the 2024 IR is contained in Appendix C in the document 24_IR1_App_C_Ambient_Station_List_3-28-2024. Some sites in this list are no longer actively sampled as part of LDEQ's rotating monitoring sites program.

APPENDIX D: Suspected causes of impairment and cause descriptions used in USEPA's ATTAINS Assessment Database

The complete list of suspected causes of impairment and cause descriptions available for states to use in the ATTAINS database is contained in Appendix D in the document 24_IR1_App_D_ATTAINS_Causes_3-28-2024.

APPENDIX E: Suspected sources of impairment used in USEPA's ATTAINS Assessment Database

The complete list of suspected sources of impairment available for states to use in the ATTAINS database is contained in Appendix E in the document 24_IR1_App_E_ATTAINS_Sources_3-28-2024.

APPENDIX F: Public Comments on the 2024 Integrated Report and LDEQ's Response to Comments

Appendix F is a compilation of all comments received regarding the 2024 Integrated Report, along with LDEQ's response to those comments. Also included in this response are changes made to the 2024 Integrated Report during the review period following public notice. Such changes are typically done to correct technical mistakes encountered during initial development of the 2024 IR.

The full summary of public comments and LDEQ's responses is contained in Appendix F in the document 24_IR1_App_F_Response_Comments_ 3-28-2024.

APPENDIX G: Louisiana's 2024 Section 303(d) List

Appendix G represents a subset of Louisiana's 2024 IRIR 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 impairments that have not already had a TMDL developed. ***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 is contained in Appendix G in the document 24_IR1_App_G_Louisiana_303d_List_3-28-2024.

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.

The USEPA published the final report for the 2016 National Wetland Conditions Assessment (NWCA) in April 2023. To characterize wetland conditions, USEPA 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 2024 IR, LDEQ has included a Louisiana specific summary of USEPA's NARS report from its 2016 NWCA. The full summary is contained in Appendix H in the document 24_IR1_App_H_USEPA_NARS_3-28-2024.