

Total Maximum Daily Load

Bayou Casotte

Phenol

Coastal Streams Basin

Jackson County, Mississippi

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FOREWORD

The report contains one or more Total Maximum Daily Loads (TMDLs) for waterbody segments found on Mississippi's 1996 Section 303(d) List of Impaired Waterbodies. Because of the accelerated schedule required by the consent decree, many of these TMDLs have been prepared out of sequence with the State's rotating basin approach. The implementation of the TMDLs contained herein will be prioritized within Mississippi's rotating basin approach.

The amount and quality of the data on which this report is based are limited. As additional information becomes available, the TMDLs may be updated. Such additional information may include water quality and quantity data, changes in pollutant loadings, or changes in landuse within the watershed. In some cases, additional water quality data may indicate that no impairment exists.

Conversion Factors

To convert from	To	Multiply by	To Convert from	To	Multiply by
acres	sq. miles	0.0015625	days	seconds	86400
cubic feet	cu. meter	0.028316847	feet	meters	0.3048
cubic feet	gallons	7.4805195	gallons	cu. feet	0.133680555
cubic feet	liters	28.316847	hectares	acres	2.4710538
cfs	gal/min	448.83117	miles	meters	1609.344
cfs	MGD	0.6463168	mg/l	ppm	1
cubic meters	gallons	264.17205	µg/l * cfs	gm/day	2.45
cubic meters	liters	1000	µg/l * MGD	gm/day	3.79

Fraction	Prefix	Symbol	Multiple	Prefix	Symbol
10 ⁻¹	deci	d	10	deka	da
10 ⁻²	centi	c	10 ²	hecto	h
10 ⁻³	milli	m	10 ³	kilo	k
10 ⁻⁶	micro	µ	10 ⁶	mega	M
10 ⁻⁹	nano	n	10 ⁹	giga	G
10 ⁻¹²	pico	p	10 ¹²	tera	T
10 ⁻¹⁵	femto	f	10 ¹⁵	peta	P
10 ⁻¹⁸	atto	a	10 ¹⁸	exa	E

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TMDL Information Page

Listing Information

Name	ID	County	HUC	Cause	Mon/Eval
Bayou Casotte	MS109E04M	Jackson	03170009	Phenol	Evaluated
Location – At Pascagoula: From county road on West Prong to mouth at Pascagoula Bay					

Water Quality Standard

Parameter	Beneficial use	Water Quality Criteria
Phenol	Aquatic Life Support	<i>Fresh Water</i> <u>Acute:</u> instantaneous concentration may not exceed 300 µg/l <u>Chronic:</u> average concentration may not exceed 102 µg/l <i>Salt Water</i> <u>Acute:</u> instantaneous concentration may not exceed 300 µg/l <u>Chronic:</u> average concentration may not exceed 58 µg/l

NPDES Facilities

NPDES ID	Facility Name	County	Receiving Water	Type of Outfall
MS0003115	Mississippi Phosphates Corporation	Jackson	Bayou Casotte	Processwater and Stormwater
MS0028487	Bird-Johnson Company	Jackson	Bayou Casotte	Wastewater and Stormwater
MS0001481	Chevron Pascagoula Refinery	Jackson	Bayou Casotte	Stormwater
MS0057568	Amoco Production Company	Jackson	Bayou Casotte	Stormwater
MS0001791	First Chemical Corporation	Jackson	Bayou Casotte	Stormwater
MSR110152	Friede Goldman Halter – Halter Pascagoula Facility	Jackson	Bayou Casotte	Stormwater
MSR001316	Friede Goldman Halter – Pascagoula East Facility	Jackson	Bayou Casotte	Stormwater

Total Maximum Daily Load

Type	Number	Unit	MOS Type
WLA	0	gm/day	
LA	0	gm/day	
MOS	0	gm/day	Implicit
TMDL	0	gm/day	

EXECUTIVE SUMMARY

Bayou Casotte is on the Mississippi 1998 Section 303(d) List of Waterbodies as evaluated due to priority organics, which MDEQ has modified to be phenol to reflect the original pollutant of concern. It was originally listed due to the findings of the *Pollutant Transport in Mississippi Sound Study* (Lytle and Lytle, 1985). Elevated levels of phenol were measured in the sediment of upper Bayou Casotte. Several industrial facilities were discharging into Bayou Casotte during the 1985 study and continue to do so today. Even though the majority of the elevated phenol sediments identified in the 1985 study were “located near industrial dump sites”, a current source assessment and review of all permitted outfalls into Bayou Casotte did not identify any current sources of phenol. In addition, several facilities have made improvements in treatment or modifications to their facility grounds that eliminated outfalls to Bayou Casotte since the 1985 study.



Figure 1. Photo of Bayou Casotte in May 2001

Bayou Casotte, shown in Photo 1, is an estuary that empties into the Mississippi Sound and is frequently trafficked by large ocean going vessels. Bayou Casotte is fed by two freshwater tributaries, the East Prong and West Prong. The Bayou Casotte watershed is approximately 8.4 square miles and drains the southeast areas of the cities of Pascagoula and Moss Point. The predominant landuse is urban.

A thorough source assessment of the point and nonpoint sources did not identify any sources of phenol in the Bayou Casotte watershed. Due to the previous indication of phenol contamination in the sediments of Bayou Casotte, the TMDL for this waterbody is zero, which will prevent the approval of any permitted discharge of phenol to Bayou Casotte without additional monitoring that indicated no phenol contamination.

1.0 INTRODUCTION

1.1 Background

The identification of waterbodies not meeting their designated use and the development of total maximum daily loads (TMDLs) for those waterbodies are required by Section 303(d) of the Clean Water Act and the Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR part 130). The TMDL process is designed to restore and maintain the quality of those impaired waterbodies through the establishment of pollutant specific allowable loads. The pollutant of concern for this TMDL is phenol.

According to the *Toxicological Profile for Phenol* (ATSDR, 1998):

Phenol is a colorless-to-white solid when pure; however, the commercial product, which contains some water, is a liquid. Phenol has a distinct odor that is sickeningly sweet and tarry. Phenol evaporates more slowly than water, and a moderate amount can form a solution with water. Phenol can catch on fire. Phenol is both a man-made chemical and produced naturally. It is found in nature in some foods and in human and animal wastes and decomposing organic material. The largest single use of phenol is as an intermediate in the production of phenolic resins. However, it is also used in the production of caprolactam (which is used in the manufacture of nylon 6 and other synthetic fibers) and bisphenol A (which is used in the manufacture of epoxy and other resins). Phenol is also used as a slimicide (a chemical toxic to bacteria and fungi characteristic of aqueous slimes), as a disinfectant, and in medicinal preparations such as over-the-counter treatments for sore throats. Phenol ranks in the top 50 in production volumes for chemicals produced in the United States.

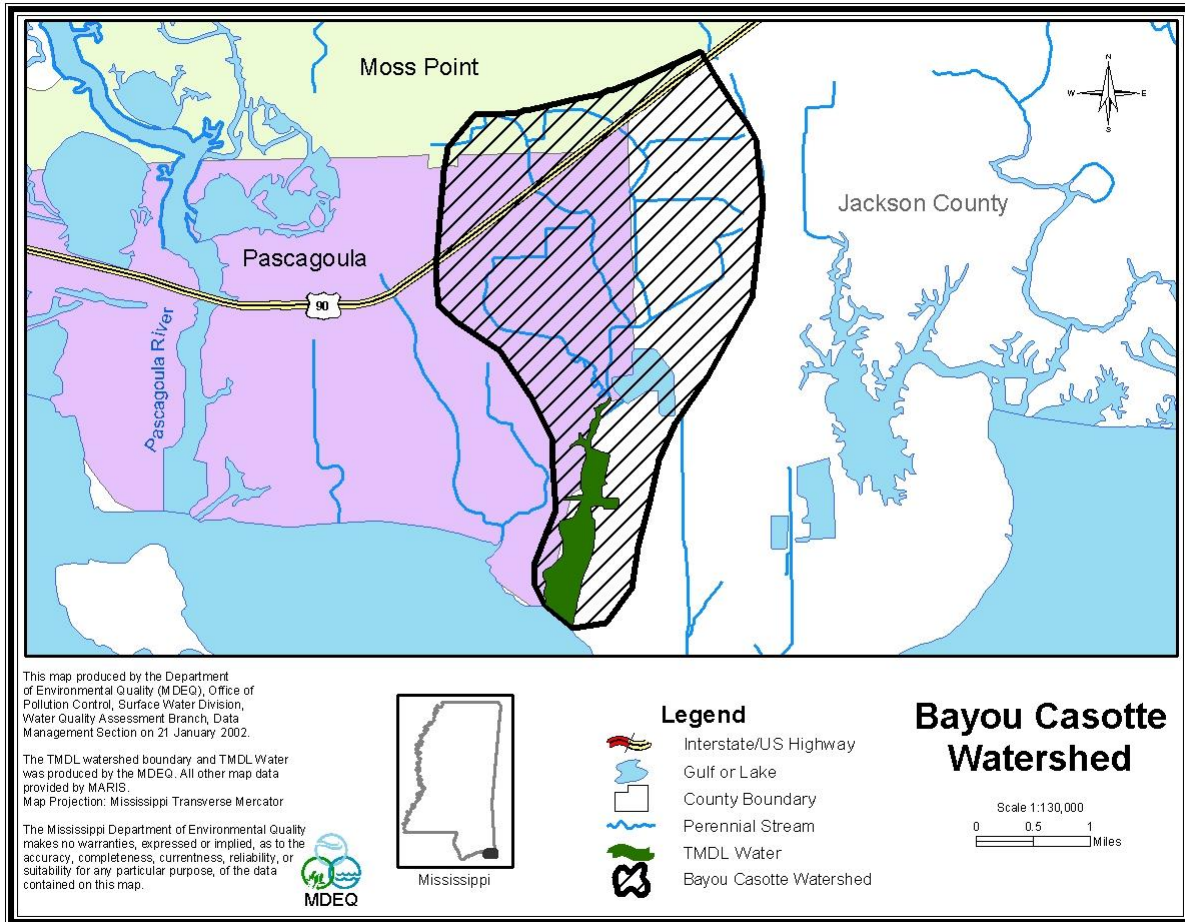
Following small, single releases, phenol is rapidly removed from the air; generally, half is removed in less than 1 day. It is also relatively short-lived in the soil (generally, complete removal in 2-5 days). However, it can remain in water a week or more. Phenol can remain in the air, soil, and water for much longer periods of time if a large amount of it is released at one time, or if it is constantly released to the environment. Levels of phenol above those found naturally in the environment are usually found in surface waters and surrounding air contaminated by phenol released from industrial activity and from the commercial use of products containing phenol. Phenol has been detected, however, in the materials released from landfills and hazardous waste sites, and it has been found in the groundwater near these sites. The levels of phenol found in indoor environments as a part of environmental tobacco smoke (ETS) are usually below 100 ppb, although much higher levels have been reported. One ppb or less of phenol has been found in relatively unpolluted surface water and groundwater, and low levels are also found in indoor environments and are principally derived from ETS. Only low levels of phenol are found in the organisms that live in water which also contains low levels of phenol.

Phenol is present in a number of consumer products which are swallowed, rubbed on, or added to various parts of the body. These include ointments, ear and nose drops, cold sore lotions, mouthwashes, gargles, toothache drops, analgesic rubs, throat lozenges, and antiseptic lotions. Phenol has been found in drinking water, tobacco smoke, air, and certain foods, including smoked summer sausage, fried chicken, mountain cheese, and some species of fish. It is also found in urine of children and adults. The magnitude, frequency, and likelihood of exposure, and the relative contribution of each exposure route and source to total phenol exposure cannot be estimated using information currently available. Nonetheless, for persons not exposed to phenol in the workplace, possible routes of exposure include: breathing industrially contaminated air; inhaling cigarette, cigar, or pipe smoke, or ETS polluted air; drinking water from contaminated surface water or groundwater supplies; swallowing products containing phenol; changing diapers; and coming into contact with contaminated water and products containing phenol through bathing or skin application. Populations residing near phenol spills, waste disposal sites, or landfill sites may be at risk for higher exposure to phenol than other populations. If phenol is present at a waste site near homes that have wells as a source of water, it is possible that the well water could be contaminated. If phenol is spilled at a waste site, it is possible for a person, such as a child playing in dirt containing phenol, to have skin contact or to swallow soil or water contaminated with phenol. Skin contact with phenol or swallowing products containing phenol may lead to increased exposure. This type of exposure is expected to occur infrequently and generally occurs over a short time period. At the workplace, exposure to phenol can occur from breathing contaminated air. However, skin contact with phenol during its manufacture and use is considered the major route of exposure in the workplace. It has been estimated that about 584,000 people in the United States are exposed to phenol at work. Total exposure at the workplace is potentially higher than in non-workplace settings.

1.2 Waterbody Location

The listed segment of Bayou Casotte is in the Coastal Streams Basin Hydrologic Unit Code (HUC) 03170009 in south Mississippi. The drainage area, shown in Figure 2, is approximately 8.4 square miles and lies within Jackson County.

Figure 2. Map showing the location of Bayou Casotte



1.3 Applicable Waterbody Segment Use

The water use classification for Bayou Casotte, as established by the State of Mississippi in the *Water Quality Criteria for Intrastate, Interstate and Coastal Waters* regulation, is Fish and Wildlife Support. Waters with this classification are intended for fishing and propagation of fish, aquatic life, and wildlife. Waters that meet the Fish and Wildlife Support criteria should also be suitable for secondary contact, which is defined as incidental contact with water including wading and occasional swimming.

1.4 Applicable Waterbody Segment Standard

The water quality standard applicable to the use of the waterbody and the pollutant of concern is defined in the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*. The state standard for phenol in salt water is an acute criteria of 300 µg/l and a chronic criteria of 58 µg/l. This water quality standard would be used as the targeted endpoint to evaluate impairments and to establish a TMDL for phenol if needed.

2.0 TMDL ENDPOINT AND WATER QUALITY ASSESSMENT

2.1 Selection of a TMDL Endpoint and Critical Condition

One of the major components of a TMDL is the establishment of instream numeric endpoints, which are used to evaluate the attainment of acceptable water quality. Instream numeric endpoints, therefore, represent the water quality goals that are to be achieved by meeting the load and waste load allocations specified in the TMDL. The endpoints allow for a comparison between observed instream conditions and conditions that are expected to restore designated uses. However, for the Bayou Casotte TMDL no instream data are available. Also, because no sources of phenol have been identified, the TMDL is set at zero rather than using the criteria per typical procedure.

2.2 Discussion and Inventory of Instream Water Quality Data

MDEQ recently collected and assessed instream toxicity data for Bayou Casotte and determined that the waterbody is fully supporting the designated use. In May of 2001 toxicity tests were conducted on samples from two stations in Bayou Casotte along with several other coastal Mississippi waterbodies. The samples were analyzed by the Science and Ecosystem Support Division (SESD) of EPA. There was no indication of toxicity in any of the samples.

The previous assessment of Bayou Casotte, which resulted in the phenol listing, was based on the findings of the Pollutant Transport in Mississippi Sound Study (Lytle and Lytle, 1985). The surface sediments of Bayou Casotte were sampled in November of 1979 as a part of the study. Phenol was identified as elevated in the surface sediments of the upper Bayou Casotte area.

More recent phenol data are not available to MDEQ. MDEQ does not typically sample for phenol, nor sediment. However, sediment toxicity sampling has recently been completed in Bayou Casotte related to dredging projects. Due to the infrequent collection of such data and the lack of guidance specific to the relation of such data to the overlying water quality, MDEQ has not fully assessed the results, but a cursory assessment indicates that sediment toxicity is minimal in Bayou Casotte (Geoscience Inc., 1983; AscI Corporation, 1998; Barry A. Vittor and Associates, Inc., 1998; EA Engineering, Science, and Technology, Inc., 1999; Thompson Engineering Testing, Inc., 2000).

3.0 SOURCE ASSESSMENT

The TMDL evaluation summarized in this report examined all known potential sources of phenol in Bayou Casotte. The source assessment was used as the basis of development for the TMDL calculation. Sources were characterized with the best available permit information and personal communication. This section documents the available information.

3.1 Assessment of Point Sources

There are six facilities permitted to discharge in Bayou Casotte. The other businesses and homes located in the area discharge to the regional sewer system. The facilities with permitted outfalls into Bayou Casotte are listed in Table 1.

Table 1. Facilities with NPDES permitted outfalls into Bayou Casotte

Facility Name	Permit Number	Outfall Type
Mississippi Phosphates Corporation	MS0003115	Processwater and Stormwater
Bird-Johnson Company	MS0028487	Wastewater and Stormwater
Chevron Pascagoula Refinery	MS0001481	Stormwater
Amoco Production Company	MS0057568	Stormwater
First Chemical Corporation	MS0001791	Stormwater
Friede Goldman Halter – Halter Pascagoula Facility	MSR110152	Stormwater
Friede Goldman Halter – Pascagoula East Facility	MSR001316	Stormwater

3.2 Assessment of Nonpoint Sources

Nonpoint loading of phenol in a waterbody could result from the transport of the material into receiving waters by overland surface runoff, groundwater infiltration, and atmospheric deposition. However, industries are typically the primary source to water (ATSDR, 1998). Because all of the facilities adjacent to Bayou Casotte contain and treat their stormwater prior to discharge, the overland flow component should not be an issue in Bayou Casotte.

The 5,349 acre drainage area of Bayou Casotte contains different landuse types, including urban, forest, agriculture, water, and wetlands. The landuse information, shown in Figure 3, is based on the State of Mississippi’s Automated Resource Information System (MARIS, 1997). This data set is based on Landsat Thematic Mapper digital images taken between 1992 and 1993. The land use distribution is shown in Table 2. Urban areas represent the largest percentage of landuses within the watershed.

Figure 3. Map showing the landuse/landcover of the Bayou Casotte watershed

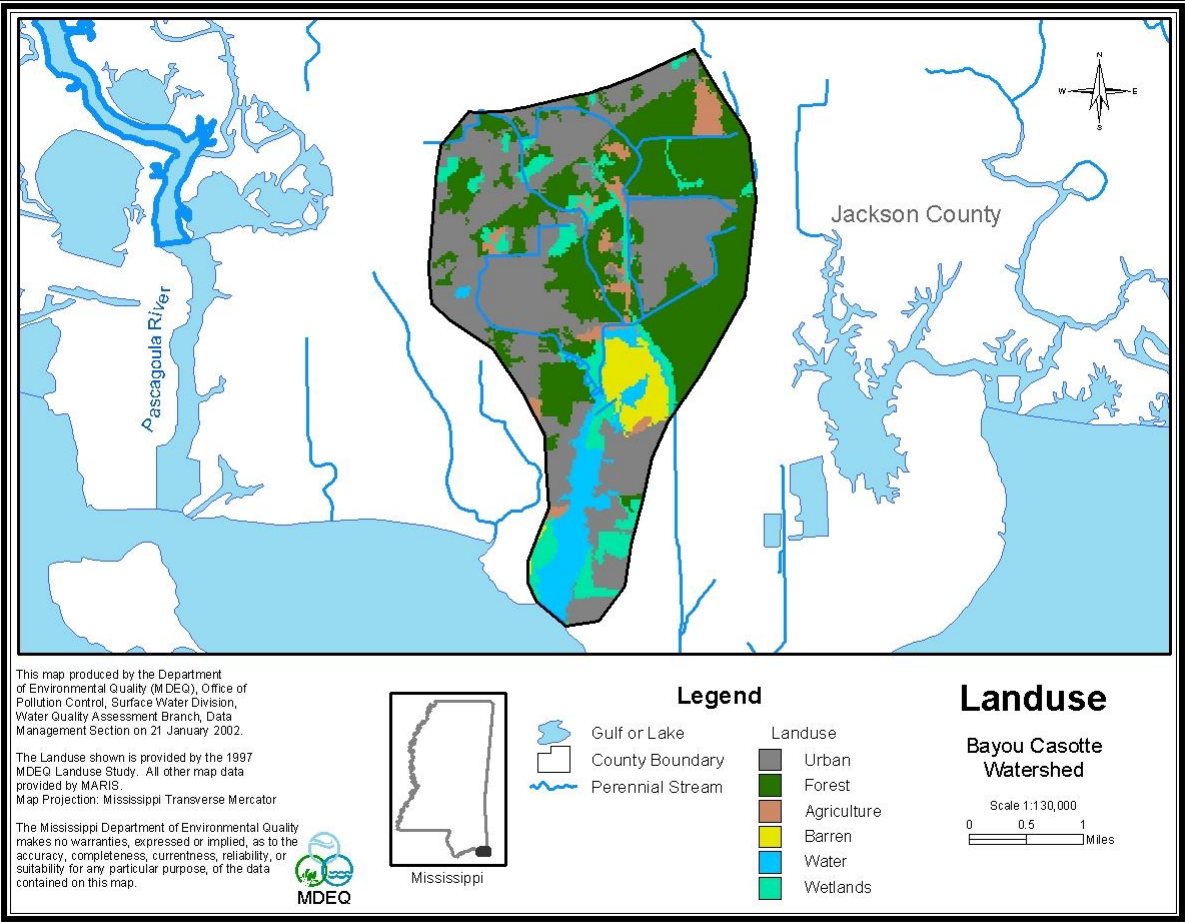


Table 2. Landuse Distribution in Acres for the Bayou Casotte Watershed

	Urban	Forest	Agriculture	Barren	Water	Wetland	Total
Area (acres)	2,176	1,935	209	204	356	469	5,349
% Area	41	36	4	4	7	9	100

4.0 ALLOCATION

Due to the nature of this waterbody and the lack of identifiable sources the TMDL for phenol in Bayou Casotte is zero. Therefore, the allocation for this TMDL involves a wasteload allocation (WLA) for point sources of zero, a load allocation (LA) for nonpoint sources of zero, and an implicit margin of safety (MOS). The allocations specified in this TMDL are zero because this waterbody is not an appropriate discharge for phenol without further monitoring to determine whether sediment contamination exists. There is a current regional sewer system available for any potential discharger in this watershed. Due to the limitations of minimal data, it is recognized that the actual assimilative capacity of the waterbody may be greater than the loads specified in this TMDL.

4.1 Wasteload Allocations

The contribution of load from point sources, which is zero, was evaluated based on the facilities' current NPDES permit limits and available discharge monitoring data. No reduction in the current wasteload allocation was necessary to establish this TMDL. None of the facilities had a direct impact on this waterbody.

This waterbody may not be an appropriate location for the discharge of phenol. Further monitoring could be completed to determine the appropriateness of future discharges.

4.2 Load Allocations

The load allocation developed for this TMDL is also zero due to the absence of identifiable nonpoint sources of phenol in the watershed. Measurements of the relative contribution of actual sources in the watershed were not considered due to the difficulty of obtaining such data.

4.3 Incorporation of a Margin of Safety (MOS)

The two types of MOS development are to implicitly incorporate the MOS using conservative model assumptions or to explicitly specify a portion of the total TMDL as the MOS. Because the TMDL established for this waterbody is zero, an additional MOS is not necessary.

4.4 Seasonality

The TMDL is set to zero at all times, which will account for seasonal variation.

5.0 CONCLUSION

MDEQ's current assessment methodology indicates that Bayou Casotte is fully supporting for the designated use. The listing for phenol is based on historical sediment data, and the TMDL for phenol is set to zero.

5.1 Future Monitoring

MDEQ has adopted the Basin Approach to Water Quality Management, a plan that divides Mississippi's major drainage basins into five groups. During each yearlong cycle, MDEQ resources for water quality monitoring will be focused on one of the basin groups. During the next monitoring phase in the Coastal Streams Basin, Bayou Casotte will receive additional monitoring to identify any changes or improvements in water quality.

5.2 Public Participation

MDEQ contacted each NPDES permit holder to determine the existence of phenol in their industrial processes. The permit holders agreed with MDEQ's approach to this zero based TMDL.

This TMDL will be published for a 30-day public notice. During this time, the public will be notified by publication in the statewide newspaper and a newspaper in the area of the watershed. The public will be given an opportunity to review the TMDL and submit comments. At the end of the 30-day period, MDEQ will determine the level of interest in the TMDL and make a decision on the necessity of holding a public meeting.

MDEQ also distributes all TMDLs at the beginning of the public notice to those members of the public who have requested to be included on a TMDL mailing list. TMDL mailing list members may request to receive the TMDL reports through either, email or the postal service. Anyone wishing to become a member of the TMDL mailing list should contact Linda Burrell by phone, at (601) 961-5062, or by email, at Linda_Burrell@deq.state.ms.us.

All comments received during the public notice period and at any public meeting become a part of the record of this TMDL. All comments will be considered in the ultimate completion of this TMDL for submission of this TMDL to EPA Region 4 for final approval.

DEFINITIONS

Ambient stations: a network of fixed monitoring stations established for systematic water quality sampling at regular intervals, and for uniform parametric coverage over a long-term period.

Assimilative capacity: The capacity of a body of water or soil-plant system to receive wastewater effluents or sludge without violating the provisions of the State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters and Water Quality regulations.

Background: The condition of waters in the absence of man-induced alterations based on the best scientific information available to MDEQ. The establishment of natural background for an altered waterbody may be based upon a similar, unaltered or least impaired, waterbody or on historical pre-alteration data.

Chronic toxicity: Toxicity impact that lingers or continues for a relatively long period of time, often one-tenth of an organism's life span or longer. Chronic effects could include mortality, reduced growth, or reduced reproduction.

Critical Condition: Hydrologic and atmospheric conditions in which the pollutants causing impairment of a waterbody have their greatest potential for adverse effects.

Daily discharge: The "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily average" is calculated as the average.

Designated Use: Use specified in water quality standards for each waterbody or segment regardless of actual attainment.

Discharge monitoring report: Report of effluent characteristics submitted by a NPDES permitted facility.

Diurnal: Actions or processes that have a period or a cycle of approximately one tidal-day or are completed within a 24-hour period and that recur every 24 hours.

Effluent: Treated wastewater flowing out of the treatment facilities.

Effluent standards and limitations: All State or Federal effluent standards and limitations on quantities, rates, and concentrations of chemical, physical, biological, and other constituents to which a waste or wastewater discharge may be subject under the Federal Act or the State law. This includes, but is not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, pretreatment standards, and schedules of compliance.

Impaired Waterbody: Any waterbody that does not attain water quality standards due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment.

Land Surface Runoff: Water that flows into the receiving stream after application by rainfall or irrigation. It is a transport method for nonpoint source pollution from the land surface to the receiving stream.

Load allocation (LA): The portion of a receiving water's loading capacity attributed to or assigned to nonpoint sources (NPS) or background sources of a pollutant. The load allocation is the value assigned to the summation of all direct sources and land applied fecal coliform that enter a receiving waterbody.

Loading: The total amount of pollutants entering a stream from one or multiple sources.

Nonpoint Source: Pollution that is in runoff from the land. Rainfall, snowmelt, and other water that does not evaporate become surface runoff and either drains into surface waters or soaks into the soil and finds its way into groundwater. This surface water may contain pollutants that come from land use activities such as agriculture, construction, silviculture, surface mining, disposal of wastewater, hydrologic modifications, and urban development.

NPDES permit: An individual or general permit issued by the Mississippi Environmental Quality Permit Board pursuant to regulations adopted by the Mississippi Commission on Environmental Quality under Mississippi Code Annotated (as amended) §§ 49-17-17 and 49-17-29 for discharges into State waters.

Point Source: Pollution loads discharged at a specific location from pipes, outfalls, and conveyance channels from either wastewater treatment plants or industrial waste treatment facilities. Point sources can also include pollutant loads contributed by tributaries to the main receiving stream.

Pollution: Contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the State, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance, or leak into any waters of the State, unless in compliance with a valid permit issued by the Permit Board.

Publicly Owned Treatment Works (POTW): A waste treatment facility owned and/or operated by a public body or a privately owned treatment works which accepts discharges which would otherwise be subject to Federal Pretreatment Requirements.

Total Maximum Daily Load or TMDL: The calculated maximum permissible pollutant loading to a waterbody at which water quality standards can be maintained.

Waste: Sewage, industrial wastes, oil field wastes, and all other liquid, gaseous, solid, radioactive, or other substances which may pollute or tend to pollute any waters of the State.

Wasteload allocation (WLA): The portion of a receiving water's loading capacity attributed to or assigned to point sources of a pollutant.

Water Quality Standards: The criteria and requirements set forth in *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*. Water quality standards are standards composed of designated present and future most beneficial uses (classification of waters), the numerical and narrative criteria applied to the specific water uses or classification, and the Mississippi antidegradation policy.

Water quality criteria: Elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports the present and future most beneficial uses.

Waters of the State: All waters within the jurisdiction of this State, including all streams, lakes, ponds, wetlands, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, situated wholly or partly within or bordering upon the State, and such coastal waters as are within the jurisdiction of the State, except lakes, ponds, or other surface waters which are wholly landlocked and privately owned, and which are not regulated under the Federal Clean Water Act (33 U.S.C.1251 et seq.).

Watershed: The area of land draining into a stream at a given location.

ABBREVIATIONS

- 7Q10.....Seven-Day Average Low Stream Flow with a Ten-Year Occurrence Period
- ATSDRAgency for Toxic Substances and Disease Registry
- BMPBest Management Practice
- CWAClean Water Act
- DMR Discharge Monitoring Report
- EPA..... Environmental Protection Agency
- GIS Geographic Information System
- HUCHydrologic Unit Code
- LALoad Allocation
- MARIS State of Mississippi Automated Information System
- MDEQ..... Mississippi Department of Environmental Quality
- MOS Margin of Safety
- NPDES National Pollution Discharge Elimination System
- NPSM..... Nonpoint Source Model
- USGS United States Geological Survey
- WLAWaste Load Allocation

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