

PROPOSED
September 2003

Phase One

Total Maximum Daily Load

For Biological Impairment

Due to Toxicity (Total Toxics)

Howard Creek

Tombigbee River Basin

Lowndes County, Mississippi

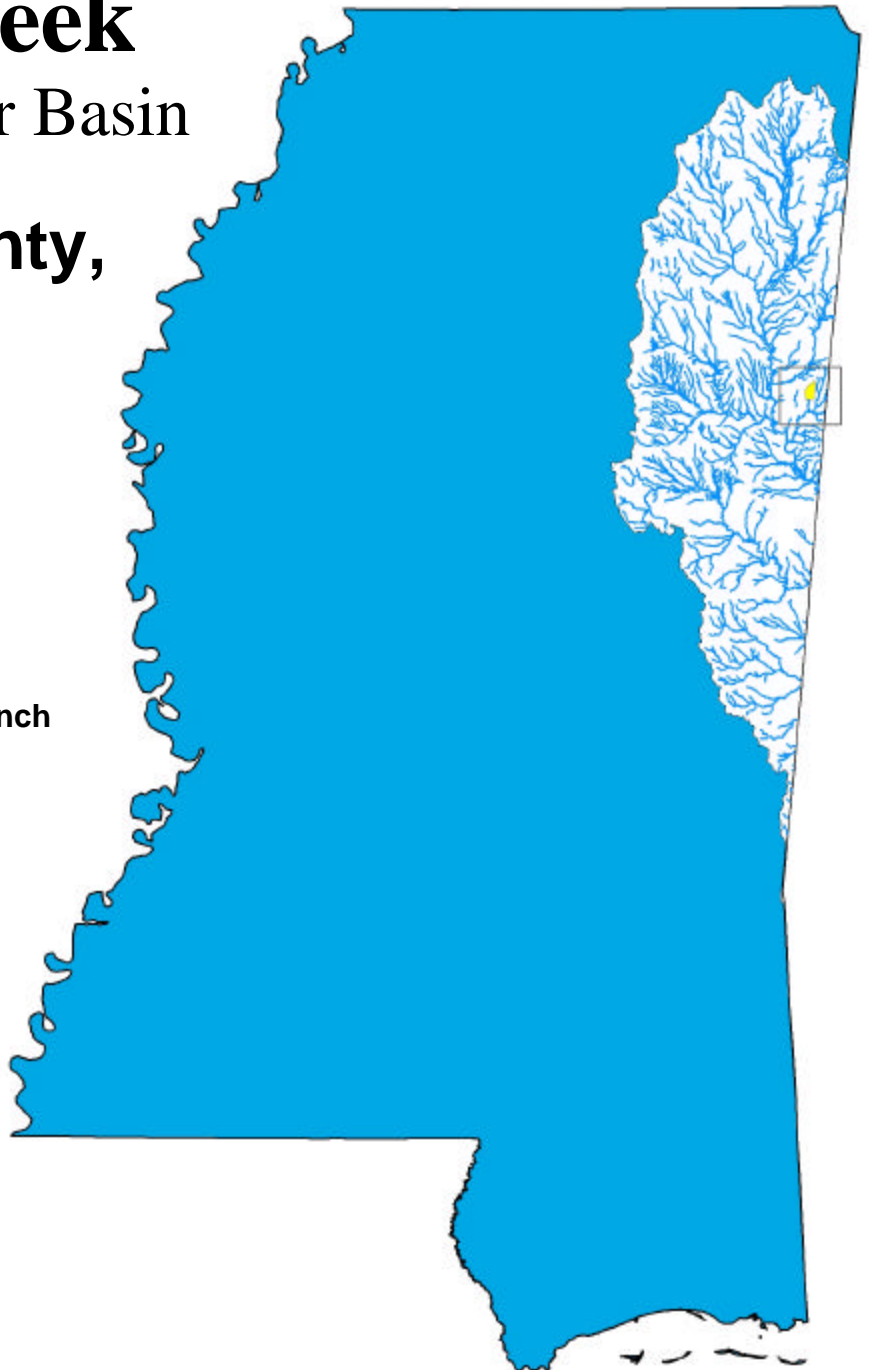
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FOREWORD

This report contains one or more Total Maximum Daily Loads (TMDLs) for water body segments found on Mississippi's 1996 Section 303(d) List of Impaired Water Bodies. 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.

Prefixes for fractions and multiples of SI units

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	:	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

Conversion Factors

To convert from	To	Multiply by	To Convert from	To	Multiply by
Acres	Sq. miles	0.0016	Days	Seconds	86400
Cubic feet	Cu. Meter	0.028	Feet	Meters	0.305
Cubic feet	Gallons	7.48	Gallons	Cu feet	0.134
Cubic feet	Liters	28.32	Hectares	Acres	2.47
cfs	Gal/min	448.83	Miles	Meters	1609.3
cfs	MGD	0.646	mg/l	ppm	1
Cubic meters	Gallons	264.17	: g/l * cfs	Gm/day	2.45

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TMDL INFORMATION PAGE

Table i. Listing Information

Name	ID	County	HUC	Cause	Mon/Eval
Howard Creek	MS028M1	Lowndes	03160105	Biological Impairment due to unknown toxicity	Monitored
Near Steens at Woodlawn Road: From just upstream of station to next county road down (NE of Wells)					

Table ii. Water Quality Standard

Parameter	Beneficial use	Water Quality Criteria
Total Toxics	Aquatic Life Support	Waters shall be free from materials attributable to municipal, industrial, agricultural, or other dischargers producing color, odor, taste, total suspended solids, or other conditions in such degree as to create a nuisance, render the waters injurious to public health, recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses

Table iii. NPDES Facilities

There are no facilities permitted to discharge into Howard Creek.

Table iv. Total Maximum Daily Load

Pollutant of Concern	WLA	LA	MOS	TMDL
Toxicity Unit, Chronic	1 TUc	1 TUc	Implicit	1 TUc*
Toxicity Unit, Acute	1 TUa	1 TUa	Implicit	1 TUa*

*This expression of zero toxicity in the receiving water is applicable to each discharger and runoff area separately.

EXECUTIVE SUMMARY

Howard Creek, segment MS028M1, is on the Mississippi 1998 Section 303(d) List of Impaired Waterbodies for Biological Impairment. Biological Impairment is listed as a cause for water bodies in which at least one assemblage (fish, macroinvertebrates, or algae) indicates less than full support with moderate modification of the biological community noted.

The pollutant of concern causing the biological impairment could not be determined through field studies conducted in 2001 and 2002. Results indicate the biology was slightly impaired in the upstream segment of Howard Creek, MS028M1, but habitat is rated as good and the chemical sampling did not detect any pollutants of concern. A phase one sediment loading analysis, conducted using the Sediment Tool, which is an extension of the Watershed Characterization System (WCS), indicates that pollutants associated with nonpoint source wet weather runoff are not the cause of the suspected biological problems. Therefore, this Phase One TMDL is being completed for toxicity due to total toxics.

Because the State of Mississippi *Water Quality Criteria for Intrastate, Interstate and Coastal Waters* regulation does not include a numerical water quality standard for aquatic life protection, the narrative standard for the protection of aquatic life was interpreted to determine an applicable target for this TMDL. The TMDL is expressed as a toxic unit value because no specific pollutant causes were measured.

The 4,896 acre watershed contains many landuse types including agricultural land, pasture land, and forest areas. However, the dominant landuses within the watershed are agriculture and forest. Since most nonpoint sources of pollutants would be associated with sediment, a phase one sediment loading analysis was conducted. This analysis in conjunction with the habitat evaluations completed in 2002 indicates that pollutants associated with nonpoint source wet weather runoff are not the cause of the suspected biological problems.

This toxicity TMDL is being established in phases with this TMDL document representing the first phase of the process. A phased approach is appropriate for this TMDL since the state is committed to conducting a more comprehensive biological monitoring survey of Howard Creek to better assess potential sources of impairment.

INTRODUCTION

Section 303(d) of the Clean Water Act (CWA) and the United States Environmental Protection Agency's (USEPA/EPA) Water Quality Planning and Management Regulations [Title 40 of the Code of Federal Regulation (40 CFR), Part 130] require each State to identify those waters within its boundaries not meeting water quality standards applicable to the water's designated uses. Total maximum daily loads (TMDLs) for all pollutants violating or causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with consideration given to seasonal variations and margins of safety. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a water body, based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (USEPA, 1991).

1.1 Background

The identification of water bodies not meeting their designated uses and the development of total maximum daily loads (TMDLs) for those water bodies are required by Section 303(d) of the Clean Water Act and the Environmental Protection Agency's Water Quality Planning and Management Regulations (40 CFR part 130). The TMDL process is designed to restore and maintain the quality of those impaired water bodies through the establishment of pollutant specific allowable loads. The pollutant of concern is not known, therefore this TMDL is being written for toxic units to prevent additional stressors that may cause further biological impairment.

The location of the Howard Creek Watershed and 303(d) segment are shown in Figures 1 and 2, respectively. The landuse of the watershed is shown in Figure 3 and described in Table 1.

Figure 1. Howard Creek Watershed Location Map

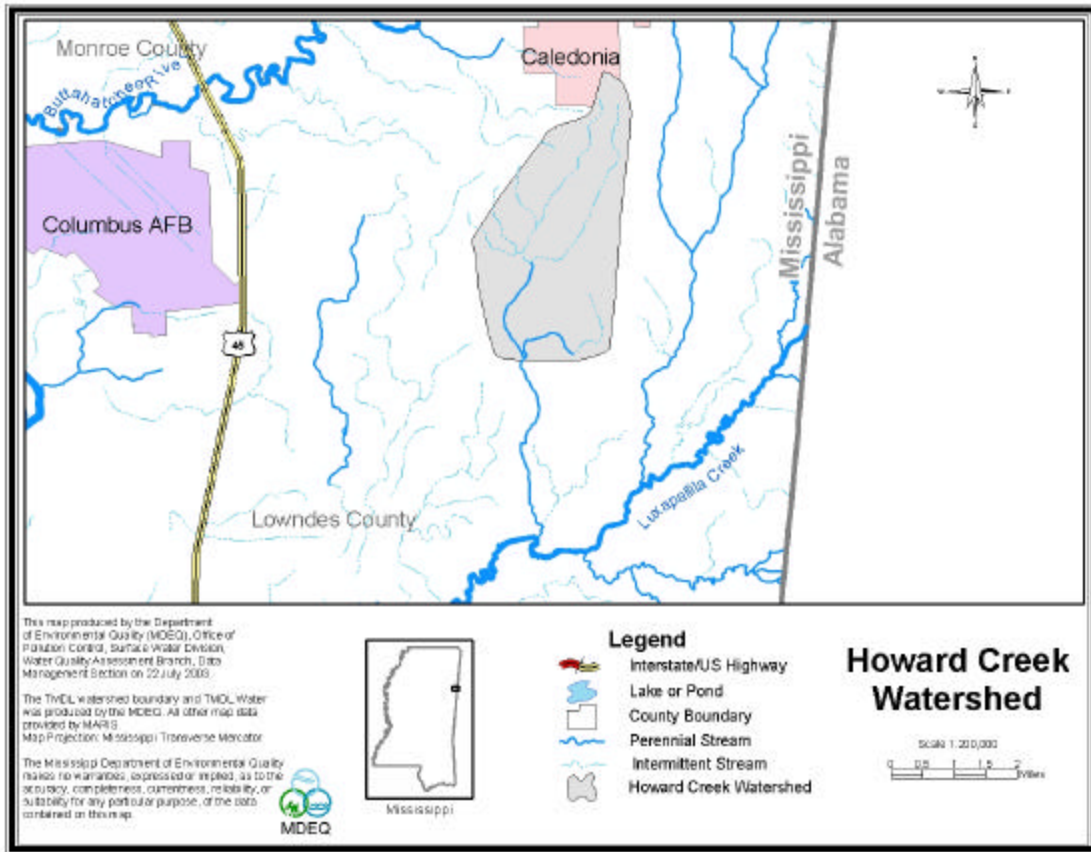


Figure 2. Howard Creek 303d Segment Location Map

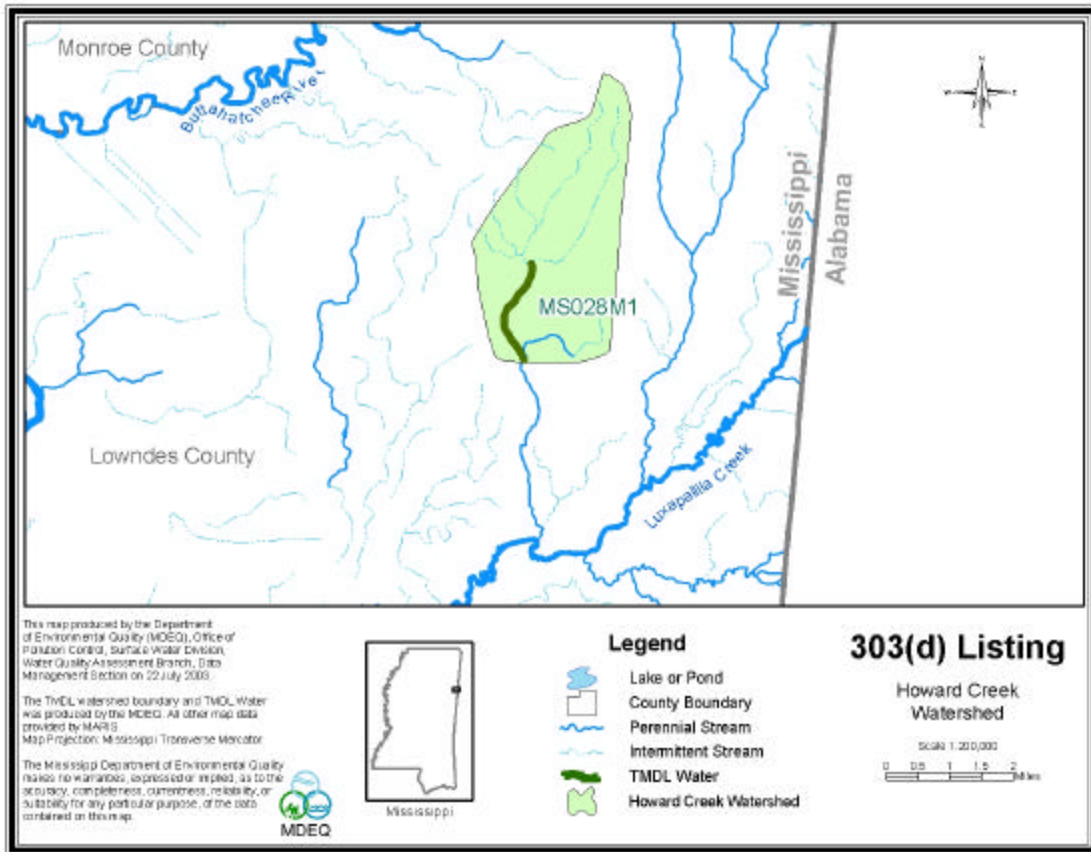


Figure 3. Howard Creek Watershed Landuse Distribution

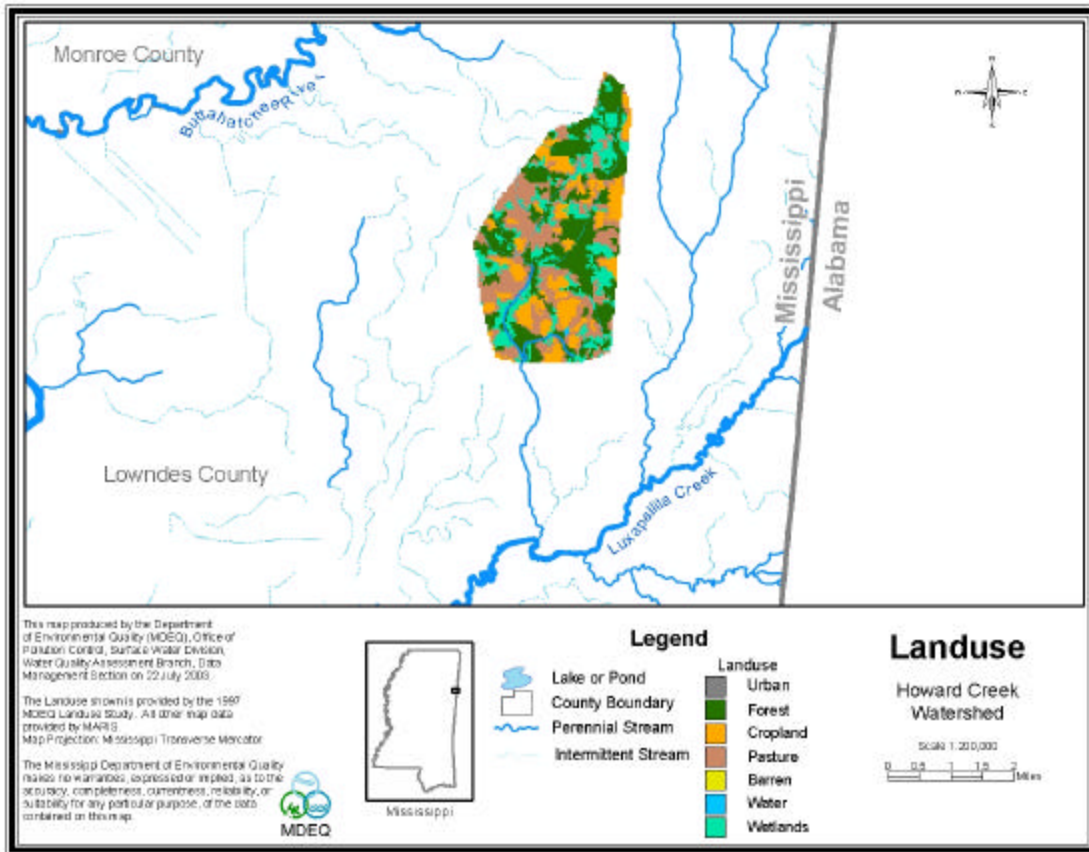


Table 1. Landuse Distribution in Acres for the Howard Creek Watershed

	Urban	Forest	Cropland	Pasture	Barren	Water	Wetland	Total
Area (acres)	0	1,658	866	1,421	0	6	945	4,896
Percent	0.0%	33.9%	17.7%	29.0%	0.0%	0.1%	19.3%	100.0%

1.2 Applicable Water Body Segment Use

The water use classification for Howard Creek, 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.

1.3 Applicable Water Body Segment Standard

The *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* do not include a water quality standard applicable to aquatic life protection due to unknown toxicity. However, a narrative standard for the protection of aquatic life was interpreted to determine an applicable target for this TMDL. The standard states the following.

“Waters shall be free from materials attributable to municipal, industrial, agricultural, or other dischargers producing color, odor, taste, total suspended solids, or other conditions in such degree as to create a nuisance, render the waters injurious to public health, recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses.”

TMDL ENDPOINT AND WATER QUALITY ASSESSMENT

2.1 Selection of a TMDL Endpoint

One of the major components of a TMDL is the establishment of target endpoints, which are used to evaluate the attainment of acceptable water quality. Target 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 conditions and conditions that are expected to restore designated uses.

The end point for unknown toxicity is that both the WLA and LA potential dischargers and runoff be not toxic to the biology of the system and will be expressed in toxic units. The critical condition for toxicity is low flow, and the 7Q10 low flow for Howard Creek is approximately zero. Therefore no benefits from dilution will be given, and the TMDL Chronic and Acute Toxic Unit must be equal to one.

2.2 Discussion and Inventory of Instream Water Quality Data

Mississippi Department of Environmental Quality (MDEQ) collected appropriate biological data in 2002 as a part of phase two of the Index of Biological Indicators (IBI) Project. The resulting score and assessment are shown in Table 2. While the assessment of the downstream segment was at first only considered preliminary due to its proximity to the reference condition, the process of assessment of the IBI data in terms of the reference condition has been finalized. Implementation of that process resulted in the decision that the downstream segment is not impaired. The data and corresponding assessments are not preliminary. More sampling was not necessary to make the final assessment. Because the downstream segment of Howard Creek, MS028M2, is not impaired, it is not included in this TMDL.

Table 2. IBI scores and assessment of Howard Creek based on 2002 sampling

	IBI Score	Bioregional Reference Condition Criteria	Assessment
Howard Creek at Hwy 12 (downstream segment)	58.1	57.7	Non-impaired
Howard Creek at Anderson Grove Road (upstream segment)	37.7	57.7	Impaired

In March 2002, EPA Region 4 Science and Ecosystem Support Division conducted a water and sediment chemical sampling and habitat assessment study. However, no direct bioassay or toxicity studies were performed. The results of this study are included in the May 2002 report (EPA, 2002). The EPA study indicated no toxicity problems, based on chemical data, and no stream habitat impairments during the high flow conditions of the study.

SOURCE ASSESSMENT

The TMDL evaluation summarized in this report examined the known potential sources of pollutants in the Howard Creek watershed. Because the pollutant of concern causing the biological impairment could not be determined through field studies, a phase one sediment loading analysis was conducted. The source assessment below was used as the basis of development for the sediment loading analysis. The sediment analysis indicates that pollutants associated with nonpoint source wet weather runoff are not the cause of the suspected biological problems. This Phase One TMDL is being completed for toxicity due to total toxics.

3.1 Assessment of Point Sources

There are no facilities permitted to discharge into Howard Creek.

3.2 Assessment of Nonpoint Sources

The potential nonpoint loading of toxicity may result from the transport of the material attached to sediments into receiving waters by the processes of weathering and erosion, and hillslope delivery. Sources of sediment could include:

- Agriculture
- Silviculture
- Range land
- Construction sites
- Roads
- Urban areas
- Surface mining
- In-stream sources
- Historical land use activities and channel alterations

The 4,896 acre watershed contains many landuse types including agricultural land, pasture land, and forestry areas. However, the dominant landuses within the watershed are agriculture and forest. Since most nonpoint sources of pollutants would be associated with sediment, a phase one sediment loading analyses was conducted. This analysis in conjunction with the habitat evaluations completed in 2002 indicates that pollutants associated with nonpoint source wet weather runoff are not the cause of the suspected biological problems.

ALLOCATION

The allocation for this Phase One TMDL involves a waste load allocation (WLA), load allocation (LA) for nonpoint sources, and an implicit margin of safety (MOS), which will result no additional toxicity impacting the biological community in Howard Creek.

4.1 Wasteload Allocations

The wasteload allocation specified in this TMDL is one toxic unit per discharger. Note that a toxic unit of one (1) means zero toxicity. Because there are no NPDES permitted facilities that discharge to Howard Creek, this is the WLA available to any future dischargers, which would include any storm water discharges from future constructions activities in the watershed that disturb one to five acres and, therefore, become subject to Phase II of the NPDES storm water program.

Through its National Pollutant Discharge Elimination System (NPDES) permitting process, MDEQ will determine whether any permitted dischargers to this segment of Howard Creek have a reasonable potential of discharging chronically toxic effluent. An allocation to an individual point source discharger does not automatically result in a permit limit or a monitoring requirement. The MDEQ NPDES permitting group will use its professional judgment to determine whether a reasonable potential exists for these facilities to discharge chronically or acutely toxic effluent. If the NPDES permitting group determines that such a reasonable potential exists, effluent monitoring requirements or limitations will be established as appropriate.

4.2 Load Allocations

The load allocation developed for this TMDL is one toxic unit chronic and acute toxicity. Measurements of the relative contribution of actual sources in the watershed were not considered, but the data indicated that there were no obvious sources. Potential sources can be prevented if the appropriate practices are implemented at the potential pollution sites that are near the stream's drainage network and the stream's riparian zone and if buffer zones are maintained or restored. To effectively control soil erosion and the pollutants transported with the soil in this watershed, the appropriate best management practices (BMPs) for a given source should be implemented, as outlined in 1) "Mississippi's BMPs: Best Management Practices for Forestry in Mississippi" (MFC, 2000), 2) "Planning and Design Manual for the Control of Erosion, Sediment, and Stormwater" (MDEQ, et. al, 1994), or 3) "Field Office Technical Guide" (NRCS, 2000).

Nonpoint source pollution is deemed to be properly controlled and in compliance with the pertinent water quality standards when appropriate BMPs are implemented, e.g. forestry activities managed in compliance with the Voluntary Best Management Practices for Forestry in Mississippi (MFC, 2000) are judged to be in compliance with this TMDL.

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. The MOS selected for this TMDL is the implicit assumption of using the 7Q10 low flow of zero, which is the worst case condition for evaluating toxicity.

4.4 Calculation of the TMDL

4.4.1 TMDL Expression (Chronic)

The load and wasteload allocations are set to zero chronic toxicity, which is equivalent to one chronic toxic unit from each source, with any future potential LA or WLA also being set at one chronic toxic unit. The load allocation includes the contributions from surface runoff, which is set at one chronic toxic unit. TMDLs are generally calculated with the following equation, for units that are additive:

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

Toxic Units, however, are not additive; they are comparative. (For an example, runoff with 20 TUCs is twice as toxic as runoff with 10 TUCs.) This TMDL specifies that zero toxicity is required of any discharge to Howard Creek, which results in the following:

WLA = One toxic unit
LA = One toxic unit
MOS = Implicit

The TMDL expression then becomes:

$$\text{TMDL} = 1 \text{ TUC}: \text{WLA} = 1 \text{ TUC}: \text{LA} = 1 \text{ TUC}: \text{MOS is implicit}$$

4.4.2 TMDL Expression (Acute)

MDEQ regulations require a case-by-case evaluation for establishing NPDES permit limits related to acute toxicity in the zone of initial dilution. For this TMDL the acute toxicity load (LA) and wasteload (WLA) allocations are set to zero acute toxicity (one acute toxic unit). The TMDL expression, in terms of acute toxicity, then becomes:

$$\text{TMDL} = 1 \text{ TUa}: \text{WLA} = 1 \text{ TUa}: \text{LA} = 1 \text{ TUa}: \text{MOS is implicit}$$

4.4.3 Toxic Units

Toxicity (see EPA 1991) involves an inverse relation to the Effective Concentration (EC), which is the lowest percentage (greatest dilution) of effluent or runoff that would still cause the minimum specified effect upon a given fraction of the test organisms, (e.g. EC₁₀ or EC₅₀). The lower the EC, the higher the toxicity. The number of toxicity units in an effluent is defined as 100 divided by the EC (expressed as a percentage):

$$\text{TU}_a = 100/\text{LC}_{50}$$

$$\text{TU}_c = 100/\text{NOEC}$$

where:

TU_a = toxic unit acute

TU_c = toxic unit chronic

LC₅₀ = the concentration that is lethal to 50% of the test organisms

NOEC = No Observed Effect Concentration = the highest tested concentration (%) of an effluent or a toxicant (or of runoff) at which no adverse effects are observed on the aquatic test organisms at a specific time of observation

4.5 Seasonality

The low flow critical condition will be protective of all seasons.

CONCLUSION

5.1 Future Activities

MDEQ 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 Tombigbee River Basin, the Howard Creek watershed may receive additional monitoring to identify any changes or improvements in water quality. Specific monitoring requirements for Howard Creek could include a chemical toxic screen and further biological and sediment testing.

5.2 Phase Two TMDLs

This is a Phase One TMDL based on limited information, yet on sufficient information to suggest that toxicity is not a problem at high flows. If future monitoring demonstrates toxicity at any flow, then a source assessment study should be conducted and attempts should be made to identify the particular pollutant(s) involved. If the compliance program is not sufficient to correct the problem, then additional TMDLs should be developed to set limits on the individual toxicants involved.

5.3 Public Participation

A draft of the Howard Creek TMDL (due to total toxics) was completed by EPA in 2002 and publicly noticed through various means. This TMDL will replace the EPA proposed TMDL and be published for a 30-day public notice. During this time, the public will be notified by publication in the statewide newspaper. The public will be given an opportunity to review the TMDL and submit comments. 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 Greg Jackson at (601) 961-5098 or Greg_Jackson@deq.state.ms.us.

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

REFERENCES

- MDEQ, MSWCC, and USDA SCS. 1994. Planning and Design Manual for the Control of Erosion, Sediment, and Stormwater.
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DEFINITIONS

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 water body may be based upon a similar, unaltered or least impaired, water body or on historical pre-alteration data.

Critical Condition: Hydrologic and atmospheric conditions in which the pollutants causing impairment of a water body 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 water body or segment regardless of actual attainment.

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.

Effluent: Treated wastewater flowing out of the treatment facilities.

Impaired Water Body: Any water body 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

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.

Storm Runoff: Rainfall that does not evaporate or infiltrate the ground because of impervious land surfaces or a soil infiltration rate than rainfall intensity, but instead flows into adjacent land or water bodies or is routed into a drain or sewer system.

Total Maximum Daily Load or TMDL: The calculated maximum permissible pollutant loading to a water body 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

ARS	Agricultural Research Service
BMP	Best Management Practice
CWA	Clean Water Act
DA	Drainage Area
DEM	Digital Elevation Model
EPA	Environmental Protection Agency
GIS	Geographic Information System
HUC	Hydrologic Unit Code
LA	Load Allocation
MDEQ	Mississippi Department of Environmental Quality
MFC	Mississippi Forestry Commission
MOS	Margin of Safety
MRLC	Multi-Resolution Land Characterization
NPDES	National Pollution Discharge Elimination System
NPS	Non-Point Source
NRCS	Natural Resource Conservation Service
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
WCS	Watershed Characterization System
WLA	Waste Load Allocation