TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For Fish Consumption Guidelines due to *Toxaphene*

in

Dupree Creek and Terry Creek near Brunswick, Georgia

(HUC 03070203)

EPA United States Environmental Protection Agency

Region 4 serving the southeast

Summary Page

The U.S. Environmental Protection Agency (EPA) Region 4 is establishing the Total Maximum Daily Load (TMDL) for total toxaphene in Dupree Creek and an adjoining portion of Terry Creek near Brunswick, Georgia. These segments are listed on the State of Georgia's 2000 Section 303(d) list as not supporting their designated use due to the potential for toxaphene contamination in fish tissue. The Georgia Department of Natural Resources has issued fish consumption guidelines for these waters due to potential toxaphene contamination in fish in all listed segments.

This TMDL satisfies a consent decree obligation established in Sierra Club, et. al. v. EPA, Civil Action No: 94-CV-2501-MHS. The Consent Decree requires TMDLs to be developed for all waters on Georgia's current Section 303(d) consistent with the schedule established by Georgia for its rotating basin management approach. The State of Georgia requested EPA to develop this TMDL for impaired segments of Terry and Dupree Creeks.

The State of Georgia issued the fish consumption guidelines for these segments due to the potential for toxaphene contamination in fish tissue during a sediment remediation project addressing toxaphene contaminated sediments related to the Terry Creek Superfund Site (Site). Potential toxaphene contamination in the listed segments is likely a result of historical discharges of toxaphene that have become embedded in the estuarine sediments as well as discharges from an NPDES outfall which receives wash-off from the Site. Hercules, Inc. has intermittently exceeded its NPDES permitted discharge limit for toxaphene in the past. Toxaphene contamination in the sediments is documented in a report prepared by a consultant to Hercules, Inc.

This TMDL targets toxaphene loading to the waterbodies to achieve the State of Georgia's water column chronic criterion of 0.0002 ug/l protective of aquatic life. However, the amount of the current background sources and nonpoint sources of toxaphene to this system are not quantifiable given present detection limits. Ultimately, the wasteload and load allocation cumulatively for this system should not cause or contribute to exceedences of the water quality standard of 0.0002 ug/l in-stream concentration for toxaphene. While this information is not available at this time, it is expected that the Superfund process will provide the information needed to make this determination in the future during a subsequent phase of the TMDL. The margin of safety is applied based on the application of the more protective aquatic life criterion of 0.0002 ug/l as opposed to the human health criterion of

0.00075 ug/l.

The Georgia Environmental Protection Division established NPDES permit limits for Hercules, Inc. that consider the effects of tidal dilution (a 4 to 1 dilution ratio). The permitted daily average discharge concentration of toxaphene from this facility is 0.00081 ug/l. The aquatic life criterion for toxaphene is 0.0002 ug/l. Laboratory method detection limits for measuring toxaphene in organic wastewater are several orders of magnitude higher than either the permit limit or the standard. While the TMDL will ultimately develop targets and reductions needed to meet water quality standards, the Phase 1 TMDL will maintain current permit limits while acknowledging that ongoing Superfund activities will provide information that can help quantify the toxaphene load being released into Dupree and Terry Creeks. The Superfund Record of Decision (ROD) will then identify the selected cleanup alternative and establish the level of cleanup expected to be achieved through implementation of the remedy selected in the ROD. The ROD will address both background load (contaminated sediments) and point source load (effluent released through Hercules's NPDES discharge). This information will be critical to potential future revisions of this TMDL.

EPA anticipates that future Superfund activities will result in Dupree and Terry Creeks attaining water quality standards for toxaphene through reductions in both point source and nonpoint source toxaphene loadings to the waterbodies. CERCLA provides that the remedy selected in the ROD achieve all applicable and relevant and appropriate requirements, including water quality standards. EPA expects necessary load reductions can be achieved through implementation of the ROD for the Terry Creek Site. Ongoing Superfund activities related to the Site provide reasonable assurance that the necessary reductions in toxaphene can be achieved in this system. Therefore, Phase 1 of this TMDL establishes the TMDL target at concentrations consistent with the most protective water quality criterion. Follow-up monitoring conducted in relation to ongoing Superfund activities and any other necessary monitoring will determine the necessity for additional reductions.

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Introduction

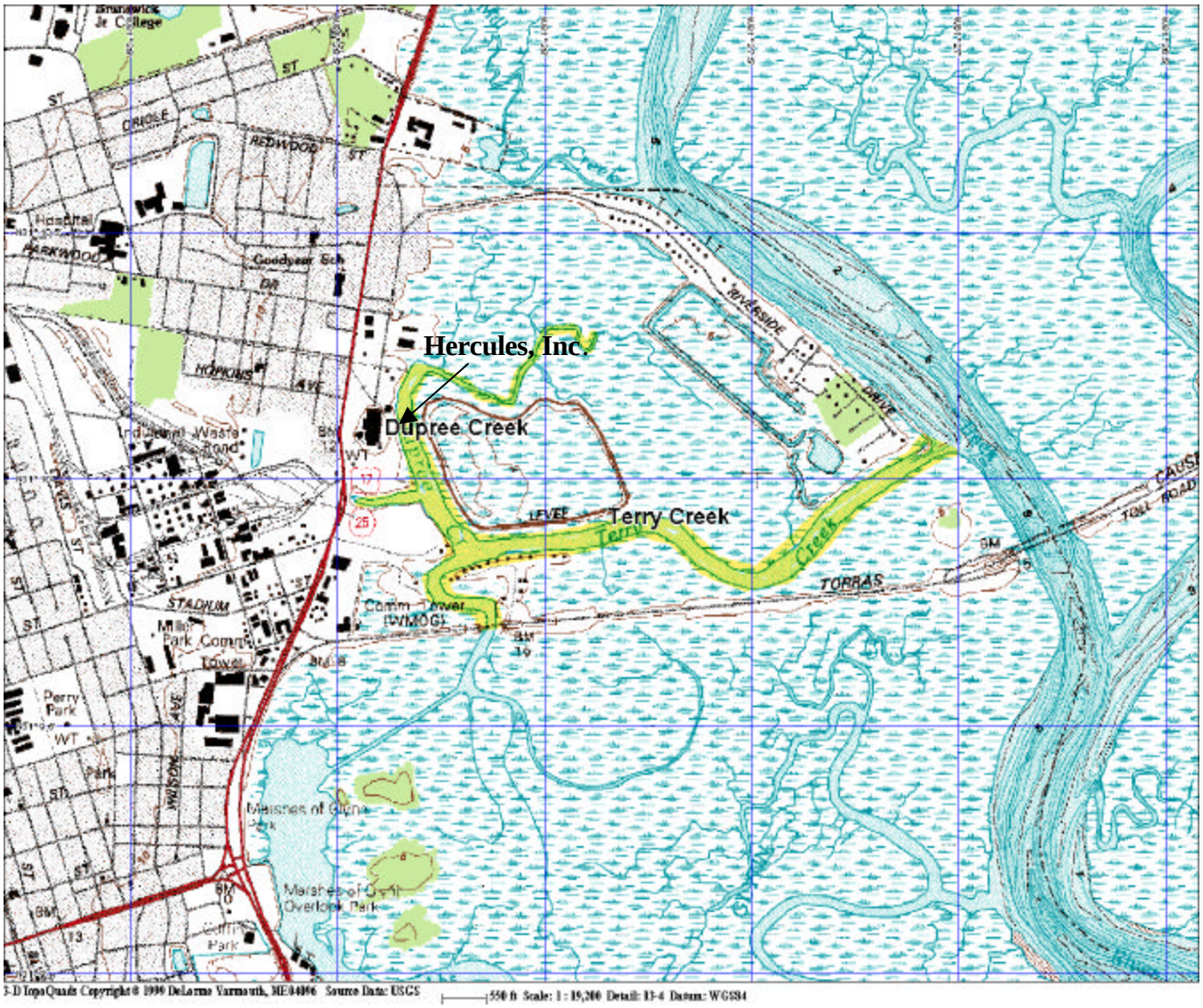
TMDLs are required for waters on a state's section 303(d) list by Section 303(d) of the Clean Water Act (CWA) and the associated regulations at 40 CFR Part 130. A TMDL establishes the maximum amount of a pollutant a waterbody can assimilate without exceeding the applicable water quality standard. The TMDL allocates the total allowable load to individual sources or categories of pollution sources through wasteload allocations (WLAs) for point sources regulated by the National Pollutant Discharge Elimination System (NPDES) program and through load allocations (LAs) for other sources. The WLAs and LAs in the TMDL provide a basis for states to reduce pollution from both point and nonpoint sources that will lead to restoration of the quality of the impaired waterbody. The purpose of this TMDL is to identify the allowable load of toxaphene that will result in attainment of the applicable water quality standard and the unrestricted use of the identified segments for fish consumption.

This TMDL satisfies a consent decree obligation established in Sierra Club, et. al. v. EPA, Civil Action No: 94-CV-2501-MHS. The Consent Decree requires TMDLs to be developed for all waters on Georgia's current Section 303(d) consistent with the schedule established by Georgia for its rotating basin management approach.

Problem Definition

On its 2000 §303(d) list, the State of Georgia has identified all of Terry and Dupree Creeks north of Torras Causeway to 1/2 mile west of the confluence with the Back River as not supporting their designated use due to the issuance of fish consumption guidelines because of toxaphene contamination.

Figure 1 – Site Location Map



Toxaphene is the tradename for an organochlorine pesticide widely used during the 1970s in the United States that is comprised of a mixture of at least 670 chlorinated camphenes. This pesticide readily binds to soils and sediment with a soil half-life of 1 to 14 years. This substance is known to bioaccumulate in the fatty tissue of fish exposed to the substance. Toxaphene was banned for most uses in the U.S. in 1982, and banned for all uses in 1990. The listing of toxaphene resulted from the assessment of water quality data performed by Georgia Department of Natural Resources Fish and Wildlife toxicologists (Georgia Department of Natural Resources, 2000). Specifically, fish

consumption guidelines were issued in these two estuarine tributaries due to the cleanup of toxaphene contaminated sediments. Sampling conducted by the Georgia Department of Natural Resources, Skidaway Institute, and contractors to Hercules, Incorporated have not detected measurable levels of technical grade toxaphene in the water column or in fish and animal tissue in Terry or Dupree Creeks.

Hercules Inc. is an NPDES permitted industrial discharger to Dupree Creek (NPDES #GA0003735). This facility was, at one time, a producer of toxaphene. This industrial facility currently produces products derived from the extract of aged pine stumps as well as specialty organic chemical products. The Terry Creek site is contaminated with toxaphene that enters the Hercules effluent during storm wash-off from the site. Hercules has intermittently exceeded its permitted discharge limit for toxaphene in the past. Considerable contamination of the sediments in and around Terry and Dupree Creeks is documented (Hercules Incorporated, March 1998). Response activities to date have included the dredging and removal of toxaphene-contaminated sediments. Hercules is assessing the extent of toxaphene contamination at the site and what further remediation activities are to be undertaken pursuant to CERCLA.

Applicable Water Quality Standard

TMDLs are established at levels necessary to attain and maintain water quality standards. See 40 CFR 130.7(c)(1). Georgia's in-stream criterion for toxaphene is established for all waters and is deemed to be necessary and applicable to all waters of the State. Georgia's Water Quality Standard for toxaphene is expressed in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised April 2000. Georgia Regulation 391-3-6-.03(5)(e)(iii) states that "In-stream concentrations of the following chemical constituents listed by the US EPA as toxic priority pollutants pursuant to Section 307(a)(1) of the Federal Clean Water Act (as amended) shall not exceed criteria indicated below under 7-day, 10-year minimum flow (7Q10) or higher stream flow conditions except within mixing zones or in accordance with site specific effluent limitations developed in accordance with procedures presented in 391-3-6-.06." TMDLs are established at

levels necessary to attain and maintain the applicable water quality standards. (See 40 CFR Section 130.7(c)(1).) The State of Georgia's Rules and Regulations for Water Quality Control include a numeric water quality standard for human health for total toxaphene of 0.00073 ug/l in-stream concentration. See Chapter 391-3-6, Revised April 2000. The chronic numeric water quality standard for aquatic life for total toxaphene is 0.0002 ug/l in-stream concentration. EPA has identified the aquatic life criterion of 0.0002 ug/l as the applicable water quality standard. This TMDL will, therefore, ultimately target toxaphene concentrations above 0.0002 ug/l. Current laboratory toxaphene detection limits of 2 ug/l is 4 orders of magnitude higher than the water quality standard protective for aquatic life of 0.0002 ug/l.

Recent research has led many in the scientific community to suggest that congener-specific approaches based on new developments in mass spectrometric detection may provide a more conclusive profile of toxaphene-contaminated sites, both in sediments and in animal tissues. U.S. EPA has not yet adopted any of the new nomenclature systems being applied by the scientific community to delineate toxaphene contamination, and so this TMDL will only address and consider data measured as technical toxaphene. Toxaphene and some of its congeners have demonstrated mutagenic risk and there exists a perceived threat of carcinogenic risk to humans. EPA has classified toxaphene as a probable human carcinogen (EPA-823-F-99-018, September 1999).

Background

Available Monitoring Data

Toxaphene contamination in the sediments of Terry and Dupree Creeks north of Torras Causeway to 1/2 mile west of the confluence with the Back River have been demonstrated through monitoring conducted by the Georgia Department of Natural Resources as well as Hercules, Incorporated. Hercules, Incorporated manufactured toxaphene during a portion of their previous industrial operations.

Hercules is currently permitted to discharge technical toxaphene (congeners not distinguished) into

Dupree Creek with a daily average limit of 0.00081 ug/l. Currently the detection limit for toxaphene in the discharger's effluent is 2 ug/l. The State maintains the right to modify the detection limit as new techniques are developed and the detection limit decreases. The discharger has exceeded its permit limit for toxaphene on 9 occasions between December 1993 and August 1998 with the most serious exceedence occurring in September 1995 as 22 ug/l technical toxaphene in the effluent with an average reported effluent outflow of 7.9 million gallons per day (MGD).

Numeric Targets and Sources - Model Development

Extensive contamination of sediments in and around Terry and Dupree Creeks has been demonstrated. U.S. EPA Region 4 Waste Management Division has been overseeing Hercules, Incorporated's clean-up effort which has included recent dredging and removal of contaminated sediments as well as ongoing remedial investigation and feasibility study activities. These activities have been undertaken pursuant to Administrative Orders on Consent between EPA and Hercules.

As of the date of this TMDL, data have not been made available to assess the impact of the dredging effort on in-situ water quality, sediment contamination levels, or impacts on biotic communities and fish contamination. Previous sampling has resulted in non-detects for technical grade toxaphene in fish tissues and in-situ waters. The appropriate in-situ water quality standard is 0.0002 ug/l toxaphene per Georgia's Rules and Regulations. Due to the much higher detection limit for toxaphene in the water column relative to the water column standard as part of the margin of saefty, this TMDL will assume that there exists no assimilative capacity in the listed segments of Terry Creek and Dupree Creek for discharge of toxaphene at concentrations above the aquatic life water quality standard for toxaphene of 0.0002 ug/l (0.2 parts per trillion).

Ongoing Environmental Activities

The Terry Creek Site is proposed for listing on the National Priorities List. Superfund response activities are currently ongoing at the Site. A removal action did take place, which included the dredging of sediments that resulted in the issuance of the Georgia fish consumption guidelines.

The Superfund cleanup process proceeds through several phases. Usually, after a site is listed or proposed for listing on the NPL, a remedial investigation/feasibility study (RI/FS) is performed at the site. This is the phase of the cleanup process currently being undertaken at the Site. The remedial investigation serves as the mechanism for collecting data to characterize site conditions. As part of this investigation, Hercules will take steps to quantify the amount of toxaphene being released into Dupree and Terry Creeks and assess the risk of those releases to human health and the environment. The FS is the mechanism for the development, screening, and detailed evaluation of alternative remedial actions for the toxaphene contamination at the Site. Data collected in the RI influence the development of remedial alternatives in the FS, which in turn affect the data needs and scope of any necessary treatability studies and additional field investigations. The RI/FS results in a Record of Decision (ROD), which is a public document that explains which cleanup alternatives will be used to clean up a Superfund site.

Phased Total Maximum Daily Load (TMDL) Approach

The amount of the current background sources and nonpoint sources of toxaphene to this system are not quantifiable given present detection limits. Ultimately, the wasteload and load allocation cumulatively for this system should not cause or contribute to exceedences of the water quality standard of 0.0002 ug/l in-stream concentration for toxaphene. While this information is not available at this time, it is expected that the Superfund process will provide the information needed to make this determination in the future. For this reason, EPA is using a phased approach for this TMDL.

The phased TMDL approach recognizes that additional data and information may be necessary to validate the assumptions of the TMDL and to provide greater certainty that the TMDL will achieve the applicable water quality standard. Thus, Phase 1 identifies the level needed to protect the waterbody and identifies the data and information that needs to be collected to determine the current loads and the appropriate pollutant reductions. The Phase 2 TMDL will include targeted pollution allocation strategies for specific causes of impairment and a margin of safety that addresses

uncertainty about the relationship between load allocations and receiving water quality and will use the data and information being developed through the ongoing Superfund process.

EPA guidance states that TMDLs under the phased approach include allocations that confirm existing limits or would lead to new limits or new controls while allowing for additional data collection to more accurately determine assimilative capacities and pollution allocations. (USEPA, 1991)

Total Maximum Daily Load (TMDL)

Critical Condition Determination

A critical condition for detecting and elevating levels of toxaphene in fish tissue in Terry Creek and Dupree Creek occurs when dredging is conducted to remove toxaphene contaminated sediments, possibly representing significant potential short-term risk as suspended toxaphene associated with disturbed sediments is made more readily available for consumption by fish. In addition, the discharger (Hercules, Inc.) has, during site remediation activities, exceeded its permitted concentration of effluent toxaphene. Additionally, other pathways for the exposure of fish to toxaphene may be through the wash-off of toxaphene-contaminated sediment from the site or exposure of fish to toxaphene via bioaccumulation through the food chain.

Seasonal Variation

Wet-weather scenarios tend to pose more risk for increased toxaphene concentrations in the Hercules effluent. It is believed that on-site toxaphene is mixed with stormwater and the contamination is washed into the effluent ditch before leaving the Terry Creek site.

Margin of Safety

The margin of safety is applied based on the application of the more protective aquatic life criterion of 0.0002 ug/l (0.2 ppt) as opposed to the human health criterion of 0.00073 ug/l (0.73 ppt).

TMDL Determination

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while achieving water quality standards. The components of the TMDL are the Wasteload Allocation (WLA) and the Load Allocation (LA) and taking into consideration a margin of safety (MOS) and seasonality. The WLA is the pollutant allocation to point sources while the LA is the pollutant allocation to natural background and nonpoint sources.

Background sources and nonpoint sources of toxaphene to this system are not quantifiable given present detection limits. Ultimately, the wasteload and load allocation cumulatively for this system should not cause or contribute to exceedences of the water quality standard of 0.0002 ug/l in-stream concentration for toxaphene. The margin of safety is applied implicitly based on the application of the more protective aquatic life criterion (0.2 ppt) as opposed to the human health criterion (0.73 ppt), even though fish consumption guidelines led to the 303(d) listing for these waterbodies.

The total amount of toxaphene which Dupree and Terry Creeks could receive from all load sources and attain and maintain the applicable water quality standard of 0.0002 ug/l is not currently quantifiable. Because of this limitation, expression of the TMDL in numeric form must, therefore, be deferred until a subsequent phase of the TMDL. It is also not feasible at this time to quantify the current load the system is actually receiving for the following reasons: 1) EPA's method for the analysis of toxaphene is not sensitive enough to measure toxaphene at low trace level concentrations, making it impossible to quantify either the levels of toxaphene actually present in the water column or the amount of loadings the system is receiving; 2) the effect of the toxaphene-laden sediments on the surface waters at the Terry Creek Site is still under investigation under CERLA. Therefore, EPA is unable to quantify in Phase 1 of this TMDL what the reductions will be from each [category of] toxaphene source[s] identified in the TMDL

The Georgia Environmental Protection Division established NPDES permit limits for Hercules, Inc. that consider the effects of tidal dilution (a 4 to 1 dilution ratio). The permitted daily average discharge concentration of toxaphene from this facility is 0.00081 ug/l. The aquatic life criterion for toxaphene is 0.0002 ug/l. Laboratory method detection limits for measuring toxaphene in organic wastewater are several orders of magnitude higher than either the permit limit or the standard. While the TMDL will ultimately develop targets and reductions needed to meet water quality standards, the Phase 1 TMDL will maintain current permit limits while acknowledging that ongoing Superfund activities will provide information that can help quantify the toxaphene load being released into Dupree and Terry Creeks. The Superfund Record of Decision (ROD) will then identify the selected cleanup alternative and establish the level of cleanup expected to be achieved through implementation of selected remedy selected in the ROD. The ROD will address both background load (contaminated sediments) and point source load (effluent released through Hercules's NPDES discharge). This information will be critical to potential future revisions of this TMDL.

Allocation of Responsibility and Recommendations

As the facility, Hercules Incorporated, works with U.S. EPA Waste Management Division personnel to further delineate contamination and assess risk to humans and other living organisms, the facility's permit should be revisited regarding the developing science associated with toxaphene measuring and reporting techniques. As detection limits become lower with developing and emerging technologies to measure and define toxaphene contamination, the role of the discharge limit will increase in importance. The facility should continue monthly monitoring until such a time as the State permitting agency determines that the facility no longer poses a risk for release of toxaphene into the environment above the aquatic life criterion concentration of 0.0002 ug/l.

Background concentrations of toxaphene in the environment may exist in the watershed from other sources such as legacy loads. Toxaphene was a widely used pesticide in the 1970s. As data is developed, attempts to quantify the background loading may require revision to the TMDL.

The ongoing Superfund RI/FS will provide information that can help to quantify the toxaphene load being released into Dupree and Terry Creeks. The Superfund ROD will then identify the selected cleanup alternative and establish the level of cleanup expected to be achieved through implementation of the remedy selected in the ROD. The ROD will address both background load (contaminated sediments) and point source load (effluent released through Hercules's NPDES discharge). This information will be critical to potential future revisions of this TMDL.

EPA anticipates that future Superfund activities will result in Dupree and Terry Creeks attaining water quality standards for toxaphene through reductions in both point source and nonpoint source toxaphene loadings to the waterbodies. CERCLA provides that the remedy selected in the ROD achieve all applicable and relevant and appropriate requirements, including water quality standards EPA expects necessary load reductions can be achieved through implementation of the ROD for the Terry Creek Site. Ongoing Superfund activities related to the Site provide reasonable assurance that the necessary reductions in toxaphene can be achieved in this system. Therefore, Phase 1 of this TMDL establishes the TMDL target at concentrations consistent with the most protective water quality criterion. Follow-up monitoring conducted in relation to ongoing Superfund activities and any other necessary monitoring will determine the necessity for additional reductions.

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