Appendix F1. The Middle Huron River Watershed Management Plan: Section 2.

Michigan Department of Environmental Quality

Water Bureau

November 2004

Total Maximum Daily Load for Biota for Swift Run Creek
Washtenaw County

INTRODUCTION

Section 303(d) of the federal Clean Water Act and the United States Environmental Protection Agency's (USEPA's) Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations, Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for water bodies that are not meeting water quality standards (WQS). The TMDL process establishes the allowable loadings of a pollutant to a water body based on the relationship between pollutant sources and in-stream water quality conditions. TMDLs provide states a basis for determining the pollutant reduction necessary from both point and nonpoint sources (NPS) to restore and maintain the quality of their water resources. The purpose of this TMDL is to identify appropriate actions to achieve the fish and macroinvertebrate community targets and habitat quality targets, specifically a reduction in sediment loadings from sources in the Swift Run Creek watershed that will result in WQS attainment. This TMDL follows the phased approach due to inherent uncertainties in deriving numeric targets and estimating loading from NPS. Under the phased approach, load allocations (LAs) and waste load allocations (WLAs) are calculated using the best available data and information, recognizing the need for additional monitoring data to determine if the load reductions required by the TMDL lead to attainment of WQS. The phased approach provides for the implementation of the TMDL while additional data are collected to reduce uncertainty.

PROBLEM STATEMENT

The TMDL reach of Swift Run Creek, a warmwater designated water body tributary to the Huron River at South Pond Park, is located in Washtenaw County in the vicinity of Ann Arbor (Figure 1). The watershed drains portions of Pittsfield Township, the city of Ann Arbor and Ann Arbor Township. The designated use (Michigan's WQS Rule 100) identified as impaired was the support of indigenous aquatic life, in this case, the macroinvertebrate communities. This condition served as the original basis for placing Swift Run Creek on Michigan's Section 303(d) list of impaired water bodies requiring the development of a TMDL. The TMDL reach is about 3.7 miles in length and is identified on the Section 303(d) list (MDEQ, 2004) as follows:

SWIFT RUN CREEK WBID#: **061203IL**
County: WASHTENAW HUC: 04090005 Size: 3.7 M
Location: Huron River confluence u/s to Ellsworth Road. Southeast of Ann Arbor.
Problem: **Macroinvertebrate community rated poor.**
TMDL YEAR(s): 2004 RF3RchID: 4090005 25

This document represents the basis for the development of a biota TMDL that focuses on the restoration of the biological communities within the impacted perennial reach of Swift Run Creek to meet Michigan's WQS designated uses.

Within the approximately 2994-acre watershed, the flow in the headwater reach of Swift Run Creek upstream of Creek Drive (Pittsfield Township - Section 11, R6E, and T3S) is classified by the United States Geological Survey (USGS) as intermittent. Flow in the Swift Run Creek TMDL reach is classified by the USGS as perennial from Creek Drive downstream (Figure 1) to the Huron River confluence. Within the 3.7-mile perennial reach, impairment is attributed to degraded water quality, unstable and flashy flow regimes, reduced bank stability (bank erosion), sedimentation, and reduced stream habitat quality. Excessive runoff/washoff sources throughout this highly urbanized watershed (from headwaters downstream) results in an impaired biological community.

The determination of impairment within the TMDL reach was based on the August 1997 Michigan Department of Environmental Quality (MDEQ) Procedure 51 biological community assessment findings for Swift Run Creek (unpublished). A Procedure 51 macroinvertebrate community assessment involves the collection of representative taxa from each available habitat type in the stream survey reach (woody debris, cobble, gravel, sand, etc.). Of the numbers of organisms collected and representative of a given survey reach, the relative percent of each taxon is derived. The Procedure 51 scoring and rating of macroinvertebrate communities is based on the assessment of 9 metrics with total score ranges of 5 to 9, 4 to -4, and -5 to -9 that have corresponding ratings of excellent, acceptable, and poor, respectively. A poor (score of -8) macroinvertebrate community characterized the lower reach of the stream at Hogback Road in August 1997 (Wuycheck, 2003). An additional assessment conducted in September 2003 at Shetland Drive (located north of Clark Road) also indicated poor macroinvertebrate communities based on the Procedure 51 community assessment score of -6 (Wuycheck, 2003).

Habitat quality was assessed in August 1997 at Hogback Road and in September 2003 at Shetland Drive, using Procedure 51 protocols (Figure 2). The Hogback Road site was assessed in August 1997 using the MDEQ (1997) habitat assessment protocol, and the September 2003 habitat assessment used the updated MDEQ (2002) protocol. The Procedure 51 habitat assessment protocol used in August 1997 involved score ranges of less than 35, 35 to 70, 71 to 106, and 107 to a maximum of 135 points representing habitat quality ratings of poor, fair, good, and excellent, respectively. The August 1997 habitat score and rating at the Hogback Road site was 66 (out of a possible score of 135) indicating overall fair (moderately impaired) conditions. The total point score ranges using the updated MDEQ (2002) habitat assessment protocol are less than 56, 56 to 104, 105 to 154, and greater than 154 to a maximum of 200 points with ratings of poor, marginal, good, and excellent, respectively. The September 2003 habitat score and rating at the Shetland Drive site (using the May 2002 updated Procedure 51 habitat assessment protocol) was 114 (out of a possible score of 200) indicating overall good conditions. However, scores for the individual metric categories of Embeddedness, Flow Stability, and Bank Stability of both the August 1997 and September 2003 assessments indicated 50% or less than their maximum potential scores. These scores indicate unstable habitat conditions in Swift Run Creek.

Volunteer biological community assessments by the Huron River Watershed Council characterize the macroinvertebrate communities as stable but poor (Huron River Watershed Council, 2003).

Total suspended solids (TSS) and flow monitoring in the Swift Run Creek watershed was conducted during the months of June, July, and August 2003 by Limno-Tech, Incorporated (LTI) as part of a Clean Michigan Initiative (Contract 071B1001643) funded monitoring program. The project, requested by the MDEQ, required monitoring three times (two completed) during the survey period to characterize background TSS concentrations during dry-weather, stable flow conditions and to monitor at least three wet-weather runoff events to assess increases in stream TSS and flow during a response to wet-weather events of 0.1 inches or greater. Effort was directed towards sampling TSS and flow during the rise and fall of the Swift Run Creek hydrograph. Results from the study indicated an average background TSS concentration of 13.0 milligrams per liter (mg/l) and 14.5 mg/l during stable, base flow conditions of June 23, 2003, and August 1, 2003, respectively (LTI, 2003b).

Wet-weather event monitoring at the most downstream site at Thornoak Road, during 24-hour precipitation accumulations of 1.22, 0.61, and 1.02 inches on July 21, August 1-2, and August 12, 2003, showed in event maximum (event average) TSS concentrations of 1,115 mg/l (662 mg/l), 689 mg/l (211 mg/l), and 1,032 mg/l (378 mg/l), respectively. This information indicates that precipitation runoff/washoff events in the watershed substantially increase the amount of TSS in transport in Swift Run Creek. In-stream flows measured at the most downstream station at Huron River Drive, vicinity of Thornoak Drive, during the three wet-weather event monitoring dates of July 21, August 1-2, and August 12 showed increases from 11 to 127 cubic feet per second (cfs), <0.1 to 19 cfs, and 5 to 14 cfs, respectively, demonstrating substantial flow responses to precipitation events.

Excessive storm water runoff to Swift Run Creek from the municipal and commercial sites in the watershed is considered the most probable cause of the biological community impairment. There are a minimum of 26 National Pollutant Discharge Elimination System (NPDES) permitted storm water outfalls throughout the Swift Run Creek watershed, the flow from which contributes to unstable habitat conditions. Approximately 425 acres or 14.5% of the Swift Run Creek watershed (2,994 acres) is impervious; e.g., parking lots and buildings (Purdue, 2003). Such areas are commonly designed to divert and direct precipitation directly to nearby water bodies to facilitate rapid drainage. Substantial degradation in biological communities has been demonstrated to occur in watersheds containing 10% to 20% impervious surface areas that directly discharge to a water body (WPT, 1994).

The primary contributor to poor stream quality is excessive runoff/washoff volumes resulting in flashy, destabilizing extremes in stream flow conditions in this highly urbanized/commercialized watershed. This condition results in substantial stream bank erosion and sediment induced erosivity of both habitat and colonizing organisms, siltation, and sedimentation impacts on biologically important and desirable habitat. Reductions in storm sewer runoff rates, resulting flashy stream conditions, and reduced stream bank erosion through more stable flow management are necessary to reduce impacts on the aquatic life and meet WQS.

NUMERIC TARGETS

The impaired designated use for Swift Run Creek relates to indigenous aquatic life. Michigan's WQS require, as a minimum, the protection of a variety of designated uses, including indigenous aquatic life [Rule 100(1)(f)]. Attainment of WQS for the indigenous aquatic life designated use will be demonstrated based on assessments of macroinvertebrate community integrity and habitat quality.

The primary numeric targets are based upon Michigan's biological community and habitat quality assessment Procedure 51 (MDEQ, 1997, 1998, and 2002). The biota TMDL target is to establish a macroinvertebrate community with acceptable, reproducible scores equal to or greater than -4. Macroinvertebrate communities will be evaluated based on a minimum of two Procedure 51 biological assessments conducted in successive years, following the implementation of Best Management Practices (BMPs) to stabilize runoff/washoff discharges and extremes in stream flow conditions, minimize bank erosion, and sediment loadings to the subject TMDL reach.

A target habitat score of equal to or greater than 110 will be used to demonstrate restoration of acceptable habitat quality. This score is consistent with the most recent habitat assessment score (114 for September 2003) for the acceptable habitats assessed at Shetland Drive. This level of conservation is appropriately high enough to account for both temporal and spatial variability within the watershed and provide a buffer for the variability within the macroinvertebrate and habitat assessment protocol.

A secondary numeric target based on TSS will be used to further assess improvements in Swift Run Creek. The secondary target goal is a mean annual, in-stream TSS concentration of 80 mg/l for wet-weather runoff/washoff events. This secondary numeric target may be overridden by achievement of the biological and habitat numeric targets. However, if the TSS numeric target is achieved but the biota or habitat numeric targets are not achieved, then the TSS target may have to be reevaluated. The secondary numeric target is intended to help guide proper control over NPS of excessive suspended solids loads from runoff, as well as the runoff discharge rates and instantaneous runoff volumes that affect increased stream flow instability, stream bank erosion, and increased suspended solids concentrations.

The mean annual target concentration of 80 mg/l TSS is based on a review of existing conditions and published literature on the effects of TSS to aquatic life. Vohs et al. (1993) indicated that a chemically inert suspended solids concentration of 100 mg/l appears to separate those streams with a fish population from those without. Gammon (1970) demonstrated decreases in the standing crop of both fishes and macroinvertebrates in river reaches continuously receiving suspended solids loadings of less than 40 mg/l. The European Inland Fisheries Advisory Commission stated that in the absence of other pollution, a fishery would not be harmed at suspended solids concentrations less than 25 mg/l. Good to moderate fisheries can be found at 25 to 80 mg/l suspended solids, good fisheries were unlikely to be found at 80 to 400 mg/l, while only poor fisheries are typically found at 400 mg/l (Alabaster, 1972).

Water quality goals for suspended solids (finely divided solids) may be represented by the following categories:

Optimum	= ≤ 25 mg/l
Good to Moderate	= >25 to 80 mg/l
Less than moderate	= >80 to 400 mg/l
Poor	= >400 mg/l

Since the TMDL purpose is to restore the biological community to an acceptable condition and attain WQS, a value of 80 mg/l as a mean annual TSS target for wet-weather events was chosen for Swift Run Creek as a secondary target.

Overall, the secondary target of 80 mg/l TSS is intended to evaluate solids load affects and assist in orienting and focusing corrective actions for source reductions. Additional TSS targets, based on flow-related considerations, may be developed as additional data on Swift Run Creek become available. At this time, sufficient, site-specific data are unavailable regarding the flow and TSS concentration relationship associated with storm water sources during wet weather runoff periods to establish specific numeric targets. Therefore, to allow for additional data collection, this TMDL is established as a phased TMDL.

SOURCE ASSESSMENT

Stream flow conditions of Swift Run Creek can best be described as unstable and flashy in response to storm events as characterized by the flow extremes recorded during the June, July, and August 2003 surveys conducted by LTI.

From the Huron River confluence upstream, land use in the Swift Run Creek watershed is dominated by residential, commercial, and transportation uses (Table 3). Such development within a watershed alters its hydrologic characteristics because increased areas of impervious surface result in increased runoff and washoff of solids and pollutant loads being discharged to stream reaches within the watershed (Fonger and Fulcher, 2001; and Schueler and Holland, 2000). Substantial reductions in vegetative riparian zones and pervious areas throughout the watershed of Swift Run Creek and the extensive use of structural features, including paved impervious surface areas (e.g., roads and parking lots), curb and gutter, and numerous direct storm sewer discharges, dominate the landscape and contribute to rapid precipitation runoff rates to Swift Run Creek.

There is one NPDES permitted industrial storm water outfall in the Swift Run Creek watershed: Ann Arbor Manufacturing - Permit Number MIS410029 (Table 1, Figure 2). This facility discharges an undetermined volume of storm water to the headwaters of the stream in the vicinity of Ellsworth Road and is subject to the provisions of the general permit No. MIS510000 that requires identifying the level of control necessary to comply with this TMDL. LTI (2003a) identified one Washtenaw County storm water outfall to Swift Run Creek and at least 25 storm water outfalls that are covered under the city of Ann Arbor's Phase 1 Municipal Separate Storm Sewer System (MS4) program (Table 2, Figure 2). The MS4 permitted outfalls require plan development to achieve the TMDL by minimizing pollutant loads to the "maximum extent practicable."

Determination of the annual TSS loads to the Swift Run Creek watershed from the various land use categories involved estimates of the acres of each land use category (LTI, 2003a), a mean annual rainfall of 34 inches, and USEPA's Simple Method model approach (USEPA, 2001). These aspects were used in conjunction with TSS export coefficients derived from the Rouge River Project (Cave et al., 1994). The estimated annual TSS load from the point sources (WLA) versus the NPS land use categories (LA) in the Swift Run Creek watershed is about 511,844 pounds and 40,945 pounds, respectively (Table 3). The percentage of the total estimated annual TSS load to the Swift Run Creek from NPDES non-storm water point sources (WLA), NPDES storm water sources (WLA), and nonpoint sources (LA) is approximately 552,789 pounds, representing 0%, 93%, and 7% of current contributions, respectively. The use of annual load estimates for TSS is used for comparative purposes to better express the potential magnitude of the TSS loads to Swift Run Creek. Also, this load estimate relates to the 80 mg/l TSS target, a mean annual concentration.

LINKAGE ANALYSIS

A suitable method used to develop a TMDL that addresses the severity of the impacts of sedimentation to a biological community is to measure sediment impacts on stable, colonizable substrates in the stream channel and the associated changes in the biological community.

Increased siltation and embeddedness of colonizable substrates resulting from excessive bank erosion and sedimentation has been demonstrated to impair the biological integrity of rivers (Waters, 1995) by obscuring or reducing the suitability of colonizable or useable substrate by stream biota. With improved habitat through the reduction in sedimentation, both fish and macroinvertebrate communities respond with an increase in species diversity and an increase in the number of individuals of each species. As a result, the Procedure 51 assessment scores and ratings for quality of the fish and macroinvertebrate communities and habitat are expected to increase as sedimentation rates decline, embeddedness decreases, and habitat diversity increases. These latter characteristics will serve to demonstrate improvement in habitat conditions, WQS attainment, and overall stream quality as expressed through an acceptably rated biological community.

TMDL DEVELOPMENT

The TMDL represents the maximum loading that can be assimilated by a water body while still achieving WQS. The Swift Run Creek biotic community has been impaired by unstable flow conditions, bank erosion, and excessive sedimentation. Therefore, the TMDL is based on reducing sediment loads throughout the watershed to a level that supports a biological community that meets WQS. Using the metrics from Procedure 51, a minimum numeric score of -4 for macroinvertebrate communities and a habitat score of 110 or greater will serve as primary targets for this biota TMDL.

Concurrent with the selection of numeric endpoints, this TMDL also defines the environmental conditions that will be used when defining allowable levels. Some TMDLs are designed around the concept of critical condition. A critical condition is defined as the set of environmental conditions that, if controls are designed to protect, will ensure attainment of objectives for all other important conditions. For example, the critical conditions for the control of point sources in Michigan are provided in Rules 323.1082 and 323.1090 of Michigan's WQS. In general, the lowest monthly 95% exceedance flow for a stream is used to establish effluent limits for point sources. However, the excessive flows to Swift Run Creek are attributable to wet-weather driven discharges. As such, there is no single condition that is protective for all conditions, but efforts are directed towards wet-weather runoff/washoff events.

The secondary target of 80 mg/l TSS is used to develop a TMDL load goal for TSS during wet-weather runoff/washoff events, especially from storm water discharges from the area 1,918 total acres) of urban/industrial/built-up land use category that represents about 66% of the land use area in the Swift Run Creek watershed.

ALLOCATIONS

TMDLs are comprised of the sum of individual WLAs for permitted point sources and LAs for NPS and natural background levels. A margin of safety (MOS), either implicit or explicit, accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waters. Conceptually, this relationship is defined by the equation:

$$\text{TMDL} = \Sigma^{\text{WLAs}} + \Sigma^{\text{LAs}} + \text{MOS}$$

The TMDL represents a maximum load of a pollutant or stressor that can be discharged to a receiving water and still meet WQS. The overall TMDL load capacity is allocated among the three TMDL components: WLA for point sources, LA for NPS and background loads, and the MOS.

WLA

The estimated total annual TSS load from all non-storm water NPDES permitted point sources is zero (Table 1) since there are none in the watershed.

Based on acres of land use categories listed under "Urban/Industrial/Built-Up" of Table 3 and TSS export coefficients derived from the Rouge River Project (Cave et al., 1994), a total annual TSS load estimate of approximately 511,844 pounds is attributable to NPDES industrial and municipal permitted storm water runoff/washoff discharges to the Swift Run Creek watershed (Table 3). All categories are predicted to be meeting the 80 mg/L target secondary target, with the exception of the industrial category, which is predicted to be contributing an average of 149 mg/L TSS to Swift Run Creek (Cave et al., 1994). To achieve the goal of 80 mg/L as an annual average during wet weather events from all point sources, a reduction of only 1% in TSS loads would be necessary from all permitted point sources, resulting in a projected annual WLA of 507,278 pounds of TSS (Table 3).

For individual and general NPDES permitted point source discharges, the receiving stream design flow equals the lowest 95% exceedance flow. However, it is proposed that any TSS limits in NPDES point source permits be established at an effluent limit based on best available treatment (BAT) so as to minimize TSS loads to Swift Run Creek, which then makes it unnecessary to consider mixing zone scenarios. The permitted storm water point source contributions to the WLA are also considered controllable through the existing NPDES permit requirements and storm water through the Phase I and Phase II MS4 programs.

To achieve the primary (biota) and secondary (TSS) TMDL targets, NPDES permitted individual, general, and storm water runoff flows from current or future point sources will need to be managed throughout the watershed to minimize stream bank erosion and habitat impairment that causes a poor macroinvertebrate community within the TMDL reach. It will be necessary to employ BAT (applied to individual or general point sources) or "maximum extent practicable" treatment (storm water point sources) that will attenuate the runoff delivery rates and volume inputs to Swift Run Creek in order to reduce flashiness, better stabilize and normalize stream flow conditions, and minimize stream bank erosion, TSS resuspension, and sedimentation impacts.

LA

The LA component of the TMDL defines the load capacity for a pollutant that is nonpoint in origin that includes the following land use categories: agricultural, forested/shrub/open land, and/or water bodies (Table 1). An estimated annual TSS load of 40,945 pounds (LA) is attributed to these categories of NPS in the watershed. All but the agricultural land uses are treated as background load sources because runoff concentrations of TSS are typically less than 80 mg/l. Therefore, the only targeted load reduction source is from agricultural sources, which has a runoff average TSS concentration of 149 mg/l (Cave et al., 1994). A 46% annual reduction (from 23,868 to 13,168 pounds) from agricultural areas in the watershed is recommended resulting in the annual LA, TSS load target of 30,245 pounds, based on achieving a runoff mean annual average concentration of 80 mg/l TSS, the target concentration during wet-weather runoff/washoff events.

In summary, the proposed accumulative annual TSS load estimate to Swift Run Creek (WLA + LA) is 537,523 pounds/year, an overall 3% reduction from existing estimated loads. With the absence of any individual or general NPDES non-storm water permitted point source discharges in the Swift Run Creek watershed, 0% of the annual load is allocated to individual or general NPDES permitted point sources, 94% (507,278 pounds/year) is allocated to the NPDES permitted industrial storm water and the municipal storm water outfalls covered under the Phase I and Phase II MS4 Storm Water Programs, and 6% (30,245 pounds/year) attributed to the LA.

Suspended solids data from the 2003 LTI study indicate that there are sources either unaccounted for, and/or underestimated, in terms of suspended solids contributions to Swift Run Creek. Land use data used to develop the LA and WLA projections for suspended solids do not predict the elevated TSS concentrations observed during the 2003 wet-weather events; e.g., up to 1115 mg/L TSS. Possibilities for the inconsistency between the modeled WLA/LA TSS contributions and the observed TSS concentrations are underestimated contributions from land use practices and/or sources of TSS originating in-stream (e.g. resuspension and/or stream bank erosion during wet-weather events). The latter is likely the most probable cause for the elevated TSS concentrations observed as evidenced by the increases in both TSS concentrations and flow during wet-weather events.

To achieve the primary and secondary TMDL targets, a reduction in the wet-weather runoff/washoff of TSS load through controls in the runoff rates and volume discharges are necessary. It will require employing BMPs that attenuate the runoff delivery rates and volume inputs to Swift Run Creek in order to reduce flashiness, better stabilize and normalize stream flow conditions, and minimize stream bank erosion, TSS resuspension and excessive sedimentation that impacts habitat quality.

MOS

The MOS in a TMDL is used, in part, to account for variability of source inputs to the system and is either implicit or explicit. An MOS is implicit for a biota TMDL because the quality of the biological community, its integrity, and overall composition represent an integration of the effects of the spatial and temporal variability in sediment loads to the aquatic environment.

The habitat score of equal to or greater than 110 will be used to demonstrate acceptable stream quality conditions and represent adequate control of anthropogenic sediment sources to assure improved habitat quality and the biological communities. This targeted score is closely associated with macroinvertebrate community scores of -3 or greater, potentially providing better results than a minimally acceptable value of -4.

For comparison of survey assessment with results from 2003, follow-up biological and habitat quality assessments will be conducted during stable flow conditions during the months of June through September. The results will best reflect an MOS that is implicit and expresses integration of the effects of the variability in sediment loads in the aquatic environment and minimize seasonal variability.

SEASONALITY

Seasonality is addressed in the TMDL in terms of sampling periods for fish and macroinvertebrate communities. To minimize temporal variability in the biological community, sampling will be conducted during June through September of each year during stable, low flow conditions. For assessing TSS loads to Swift Run Creek, seasonal event monitoring will be conducted to define and characterize both hydraulic and TSS loads from the Swift Run Creek watershed that influences the biota TMDL reach.

MONITORING PLAN

Monitoring will be conducted by the MDEQ to assess progress towards meeting the biota and habitat TMDL targets following implementation of applicable BMPs and control measures. Subsequently, annual sampling of the macroinvertebrate community and habitat quality at locations in the vicinity of Hogback Road and Shetland Drive, as a minimum, will be conducted until assessment results from two consecutive years demonstrate attainment of TMDL targets at these sites. For best comparative purposes, follow-up biological and habitat assessments will be conducted in a June to September time frame, during stable flow conditions. Every effort will be made to sample during similar stream conditions and assess the same sampling locations.

In-stream monitoring of TSS, stream flow, and representative land use runoff/washoff characteristics for a variety of stable flow and wet-weather events will be necessary to refine the TSS loadings estimates for the Swift Run Creek watershed. This information will further define the level of TSS load reduction necessary, seasonally, climatologically, and annually.

Once the BMPs are in place to minimize the effects of runoff and flashy conditions that exist in Swift Run Creek, stream flow and TSS sampling can be implemented so as to measure progress towards the secondary numeric target of 80 mg/l as a mean annual TSS value during wet-weather runoff events. Multiple sampling during critical high flow events, as well as low flow events, needs to be conducted to estimate future TSS loads in Swift Run Creek.

REASONABLE ASSURANCE

The focus of the actions to protect Swift Run Creek is primarily directed towards installing BMPs and other control measures to reduce and minimize solids loads with primary emphasis on reducing runoff peak flows that result in increased flow flashiness in the stream that substantially increases TSS concentrations resulting from resuspension and bank erosion. Control measures potentially include industrial and municipal storm water discharge volume, chemical-specific permit limits, and approved BMPs for areas currently not under any permit.

Rule 323.2161a(8), adopted pursuant to Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), allows that "A permittee shall comply with any more stringent effluent limitations in the national permit, including permit requirements that modify or are in addition to, the minimum measure based on a total maximum daily load (TMDL) or equivalent analysis." In addition, Rule 323.2161a(10) allows that the "department may establish monitoring requirements in accordance with state or watershed specific monitoring plans ar as needed for a permitte to demonstrate the pollution reduction achieved by implementing best management practices." For sites of new construction, the rules specifically require development of a program to evaluate the post-construction storm water runoff from projects, including an ordinance designed to prevent or minimize water quality impacts including extreme flow volumes and conditions.

The regulatory mechanisms are available to reduce the storm water impacts of the urban/industrial/built-up sources on Swift Run Creek. Where the necessary data are available, permit requirements will be established in the NPDES permits. Where necessary, additional data to determine specific loadings and flow volumes associated with these sources will be collected through the NPDES permit requirements.

In addition to establishment of permit requirements, the NPDES storm water permittees in the watershed (industrial, Phase I, or Phase II) are required to collectively develop a watershed management plan that includes the detailing of short- and long-term goals and attainment actions, public education plans, illicit discharge elimination plans, and the development (by each local unit of government within the Swift Run Creek watershed) of their individual storm water prevention plans. The Ann Arbor Township and Pittsfield Township master plans acknowledge that proposed actions for the Swift Run Creek watershed are needed to manage both quality and quantity issues to be consistent with Phase I and II water practices for construction and postconstruction activities (Ann Arbor Township Planning Commission, 2001 and Pittsfield Township, 2001).

The MDEQ district staff will continue to work with and assist interest groups in the Swift Run Creek watershed to assist in defining and designing approvable actions and programs that assess, develop, plan, and implement BMPs and control measures that best minimize or prevent soil erosion and excessive runoff rates to the Swift Run Creek watershed.

Recommended actions include:

- Through monitoring of point source discharges, identify sources of excessive wet-weather TSS loadings and flow volumes to Swift Run Creek through NPDES permit conditions. Establish permit conditions as necessary.

- Upgrade and maintain the current vegetative riparian zone to reduce soil erosion and loadings to Swift Run Creek from sources within the watershed. BMPs need to be employed within the riparian zone adjacent to the urbanized, residential, industrialized, and commercial areas to minimize the loss through erosion and direct runoff/washoff, thereby minimizing habitat impairment of Swift Run Creek.

- Implementation of BMPs in the storm water permits program that reduces sediment loadings and moderate runoff release rates and excessive runoff/washoff to the Swift Run Creek watershed are expected to improve and protect designated use support throughout the watershed. The goals are for reduced solids loadings and greater flow stability throughout the watershed so that WQS are restored and protected. Available guidance regarding runoff detention and stream protection is provided by Fongers and Fulcher, 2001; and Schueler and Holland, 2000.

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November 29, 2004

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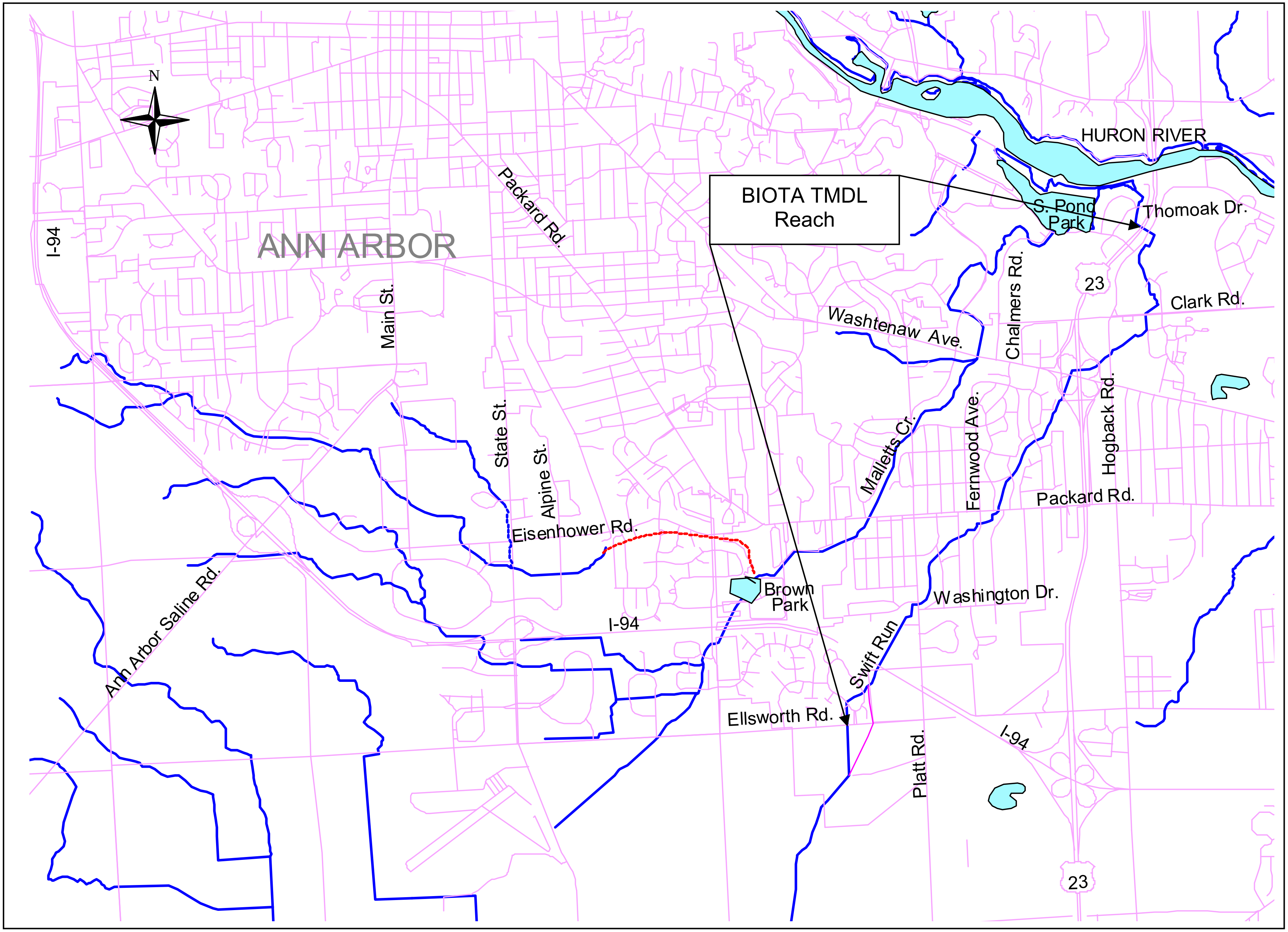

Figure 1. Swift Run Creek Biota TMDL Reach, Washtenaw County, Michigan (MIRIS, 2003).

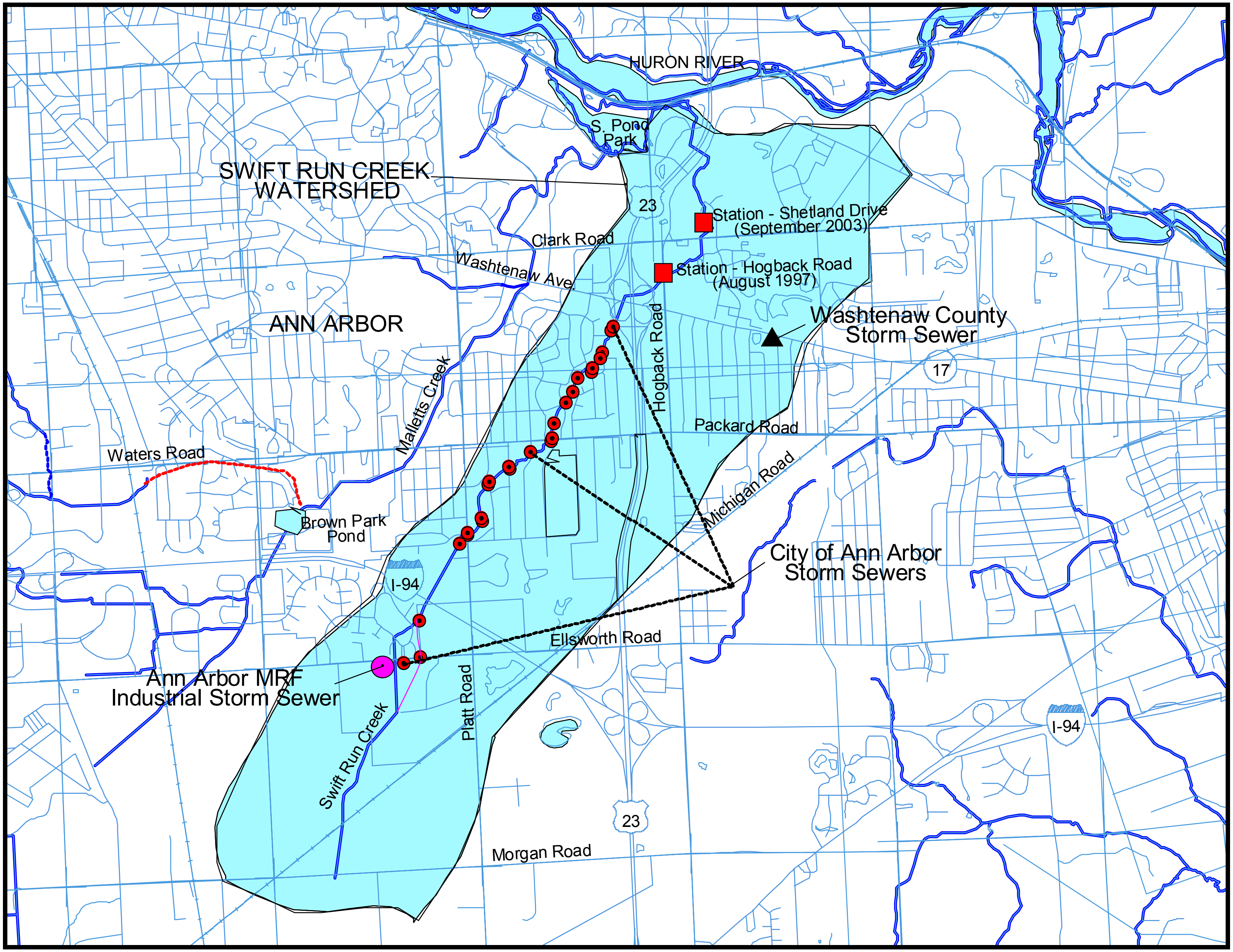

Figure 2. Washtenaw County Phase I storm sewer outfall, city of Ann Arbor managed storm sewers, industrial storm sewer, and biological community assessment sites (August 1997 and September 2003). Source: Scott Wade – (LTI. 2003a).

Table 1. Industrial storm water NPDES permitted outfall tributary to the Swift Run Creek watershed (Source: MDEQ/WB NPDES permit Management System).

FACILITY NAME	PERMIT NUMBER	DESIGN FLOW	LATITUDE (decimal degrees)	LONGITUDE (decimal degrees)
Ann Arbor MRF	MIS410029	unknown	42.2275	-83.7147

Table 2. Washtenaw County Phase I – MS4 Program storm sewer outfalls in the Swift Run Creek watershed managed by the city of Ann Arbor and Washtenaw County (Source: Scott Wade – LTI. 2003a).

Storm Water NPDES Permits (Phase 1 – MS4 Program):

- Washtenaw County **(1 outfall)**
- City of Ann Arbor **(25 outfalls)**

Table 3. Land use categories and TSS loads in the Swift Run Creek watershed, Washtenaw County, Michigan (Source: Scott Wade – LTI [2003a] using 2002 [Ann Arbor] and 1998 [Township] land use coverages).

Source Category	Acres	Estimate Current TSS (pounds/year)*	TMDL TSS Target Load TSS (pounds/year)
WLA Components:			
NPDES Non-Storm Water TSS Load		None	None
Urban/Industrial/Built-Up			
Residential	678	138,943	138,943
Commercial and Service	627	185,514	185,514
Industrial	13	9,861	5,295 (46% reduction)
Transportation/Comm/Util.	600	177,526	177,526
Subtotal:		511,844	507,278 (<1% reduction)
WLA Total:	1,918	511,844	507,278 **(WLA)**
LA Components:			
Agricultural Land			
Cropland	349	23,868	13,168 (45% reduction)
(Background Sources)			
Forested/Shrub/Open Land			
Open Land/Shrub/Range Land	702	16,886	16,886
Water Body			
Lake/Reservoir	9	191	191
LA Subtotal:	1,541	40,945	30,245 **(LA)**
Overall Totals:	2,978	552,789	537,523 (overall 3% reduction)

**TSS load estimates based on PLoad Version 3 model (USEPA, 2001), land use acres derives from 2002 land use database coverage for Ann Arbor, 1998 land use coverage for the townships, and a mean annual rainfall value of 34 inches,*