Michigan Department of Environmental Quality
Water Bureau
August 2005

Total Maximum Daily Load for Biota for an Unnamed Tributary to the Grand River Kent 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 reductions 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 management actions that target maintenance and support of the Unnamed Tributary's trout stream coldwater designation (MDNR, 1997). A summer 2004 biological survey of the Unnamed Tributary, including a fish community assessment, indicated that the coldwater designation (based on the presence of a brook trout population) is currently supported; therefore, meeting Michigan's WQS. It appears that the previously impaired trout community has recovered due to improved conditions in the watershed that have resulted in more stable habitat conditions conducive to the support of trout. However, increasing urbanization threaten the biota use support of the Unnamed Tributary.

PROBLEM STATEMENT

The TMDL reach of the Unnamed Tributary, a coldwater designated water body tributary to the Grand River, is located in Kent County in the vicinity of Grand Rapids (Figure 1). The headwaters begin on an escarpment in the vicinity of Route 44 that contains highly urbanized and developed acres where runoff from impervious surfaces is quite prevalent. The stream flows easterly for about 3.2 miles to the Grand River confluence. A high gradient (56 feet per mile) characterizes this stream based on an elevation drop of about 180 feet (elevation change from 800 feet (Route 44) to 620 feet at the Grand River confluence within in a distance of about 3.0 miles). The designated use (Rule 100 (R 323.1100) of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Agency, 1994 PA 451, as amended (Act 451)) identified as impaired was the support of indigenous aquatic life, in this case, the coldwater fish community (trout). The reduced numbers of trout collected during a Michigan Department of Natural Resources (MDNR) survey in December 1990 (Wuycheck, 1991), and a Michigan Department of Environmental Quality (MDEQ) biological assessment in 1992 (Cooper, 1998), along with the extreme flashiness of the stream flow due to direct diversion of storm water runoff to the stream and resulting impaired habitat, served as the original basis for placing the Unnamed Tributary on Michigan's Section 303(d) list of threatened water bodies requiring the development of a TMDL. The TMDL reach is about three miles in length and is identified on the Section 303(d) list (Wolf and Wuycheck, 2004) as follows:

UNNAMED TRIBUTARY TO GRAND RIVER WBID#: **082805K**
County: KENT HUC: 04050006 Size: 3 M
Location: Grand River confluence from vicinity of Grand River Drive u/s to M-44 (E. Belt Line) u/s to Ellsworth Road. Stream located just north of Leonard Street.
Problem: **Fish community rated poor.**
TMDL YEAR(s): 2005 RF3RchID: 40500061133

This biota TMDL focuses on the stabilization and attenuation of extremes in existing flow regimes to improve and maintain a coldwater designated fish community within the Unnamed Tributary to ensure continued attainment of Michigan's WQS designated uses.

Within the approximately 1,221 acre watershed, the flow of the entire reach of the stream, upstream of the Grand River confluence, is classified by the United States Geological Survey (topographic map) as intermittent (Figure 1). However, observations in 1990, 1992, and 2004 indicate sustained flow (perennial flow), in general, is maintained throughout the year in the lower 1.5 mile reach. This reach extends downstream from the vicinity of the Winterwood Subdivision access road to the Grand River confluence. It appears that the stream is largely dependent on ground water input to sustain flow during dry periods and is often overwhelmed by wet-weather runoff events. Within the three-mile TMDL reach, previous impairment to the fish community was attributed to degraded water quality, upland erosion, unstable and flashy flow regimes, reduced bank stability (bank erosion), sediment resuspension sedimentation, unstable substrate, dry channel, and reduced stream habitat quality. Excessive runoff sources throughout this highly urbanized and developing watershed (from headwaters downstream) currently results in a threatened biological community. Groundwater withdrawals (i.e., lawn watering) from the watershed may influence groundwater venting rates and maintenance of an acceptable base flow sufficient to support coldwater aquatic life in the upper, intermittent reach of the stream.

The determination of impairment within the TMDL reach was initially based on the December 1990, MDNR biological community survey findings for the Unnamed Tributary (Wuycheck, 1991). This survey demonstrated the absence of fish in the reach upstream of the Winterwood Subdivision Drive. Nine trout individuals, including an overall, reduced total number of fish individuals (31), were found within a 400-foot reach at the Grand River Drive site. The habitat substrate consisted of 90 to 95 percent sand, primarily attributed to excessive construction site runoff from upstream sites and severe in-stream bank erosion due to flashy flow conditions associated with consolidated effects of storm water runoff events from impervious surfaces at the Forest Hills Northern High School complex and other upstream development sites.

An MDEQ reassessment in June 1992, of the Unnamed Tributary at Grand River Drive was conducted using the Great Lakes and Environmental Assessment Section (GLEAS), Procedure 51 (MDEQ, 1990) as reported by Cooper (1998). The fish community consisted of a total of four individuals of one taxon (not trout), within a 150-foot reach. Therefore, the stream, with an absence of trout and reduced diversity of fish taxa, was defined as not supporting its coldwater designated use.

A July 2004 reassessment of the Unnamed Tributary (Rockafellow, 2005), used a revised version of the Procedure 51 (MDEQ, 1990). As with the older version, the updated Procedure 51 requires a minimum collection of 50 to 100 individual fish as an adequate number to determine WQS attainment. In the case of a coldwater designated stream, such as the

Unnamed Tributary, the presence of at least one percent or more trout, and collection of 50 to 100 individuals is required to indicate that the stream is supporting its designated use as a coldwater stream, therefore, meeting WQS. The fish community assessed during the July 2004 survey at Grand River Drive consisted of 68 individuals comprised of eight taxa, including seven trout (one brown trout and six brook trout). The fish community assessed was comprised of ten percent trout and was, therefore, determined to meet the coldwater designated use. Procedure 51 scoring and rating of the macroinvertebrate community of either a coldwater or warmwater designated stream is based on the assessment of nine metrics with total numeric score ranges of 5 to 9, 4 to -4, and -5 to -9 with corresponding ratings of excellent, acceptable, and poor, respectively. An acceptable macroinvertebrate community characterized the lower reach of the stream at Grand River Drive in June 1992 (Cooper, 1998), and July 2004 (Rockafellow, 2005).

Impaired habitat directly correlates to an impaired biological community. Habitat quality of the Unnamed Tributary was assessed in June 1992 and July 2004, at Grand River Drive, using two different Procedure 51 protocols (MDEQ, 1990). The June 1992, Procedure 51 habitat assessment protocol used score ranges of less than 35, 35 to 70, 71 to 106, and 107 to 135 that represented ratings of poor, fair, good, and excellent, respectively. The June 1992 habitat score was 62, indicating an overall fair rating. The July 2004, Procedure 51 habitat assessment protocol used score ranges of less than 56, 56 to 104, 105 to 154, and 155 to 200 that represented ratings of poor, marginal, good, and excellent, respectively. The July 2004 habitat score was 108, indicating an overall good rating. However, scores for the individual metric categories of Available Substrate, Embeddedness, and Bottom Deposition for both the June 1992 and July 2004 assessments were all 50 percent or less of their respective maximum potential scores. The July 2004 assessment also indicated that the Flow Flashiness metric score was less than 50 percent of its maximum potential score indicating flow instability. Such scores indicate unstable flow and habitat conditions in the Unnamed Tributary that contribute to stream habitat impairment due to bank erosion and sedimentation. However, improvements in habitat and the biological community have occurred since the December 1990 biological assessment as evidenced by the presence of a fish community at levels that indicate support of the coldwater designated use.

A total suspended solids (TSS) and flow monitoring study of the Unnamed Tributary at Grand River Drive was conducted during the months of June, July, and August 2004 (Cadmus Group, 2005). The monitoring was under the direction of Dr. Rick Rediske of Grand Valley State University's Annis Water Research Institute (Muskegon, Michigan) as part of a 2004, USEPA grant awarded to the Cadmus Group, Inc. (USEPA Contract: 68-C8-0010). The project design, defined by the MDEQ, required monitoring three times during dry-weather periods to characterize dry-weather, stable flow conditions and associated TSS concentrations. Monitoring during three wet-weather runoff events was also required to assess increases in stream TSS and flow in response to wet-weather events of 0.1 inches or greater. During the wet-weather runoff events, hourly sampling for TSS was conducted during both the rise and fall of the stream's hydrograph at two sites (UT-1 and UT-2, Figure 2). Results from the study indicated a TSS range of 4 to 8 milligrams per liter (mg/l) during stable, base flows between 2.12 and 2.47 cubic feet per second (cfs) for the sampling dates of July 1, July 14, and July 27, 2004.

Wet-weather runoff event monitoring was conducted at the most downstream site of the Unnamed Tributary, at Grand River Drive, in response to precipitation events of 0.1, 1.1, and 1.4 inches on August 25, August 2, and October 23, 2004, respectively. The results showed event average (event maximum) TSS concentrations of 20 mg/l (23 mg/l), 209 mg/l (375 mg/l),

and 407 mg/l (600 mg/l), respectively. This information indicates that the precipitation runoff events in the watershed of approximately 1.0 inches or greater substantially increase the amount of TSS in transport in the Unnamed Tributary, thereby, destabilizing habitat conditions due to excessive sedimentation. In-stream flows measured at Grand River Drive during the three wet-weather event monitoring dates of August 25, August 2, and October 23, 2004, experienced increases from 2.5 to 2.8 cfs, 2.5 to 5.3 cfs, and 3.18 to 7.8 cfs, respectively.

The December 1990, biological survey of the Unnamed Tributary concluded that excessive, instantaneous storm water runoff volumes to the stream from highway, educational, municipal, residential, and commercial construction site surfaces in the watershed were the primary cause of biological community and habitat impairment. Observations during the 2004 survey indicate substantive changes in the upper watershed since the 1990 survey, including the fact that the stream reach upstream of the Winterwood Subdivision Drive is dry during the summer. The following activities appear to have substantially reduced the instantaneous discharge volume to the Unnamed Tributary subsequent to the observations made in 1990: use of vegetative stabilization and runoff detention of highway M-44 (post-construction) and similar measures at the Eagle Crest Condominium and business-related construction sites (1990), the use of grassy runoff catchment areas and pockets of reestablished riparian wetlands in the current storm water runoff drainage systems in the upper watershed, and the development of the artificial wetland basins that appear to attenuate storm water runoff rates to the stream from the impervious surfaces (roof, parking lots) of the Forest Hills Northern High School complex. The result of what appears to be efforts to attenuate storm water-related flows and impacts on the stream has been to restore the coldwater designated use support of trout (brook and brown trout present) in the vicinity of the Grand River Drive site.

Impervious areas in the watershed are of concern since they are most commonly designed to divert precipitation runoff directly to nearby water bodies to facilitate rapid drainage. Increases in impervious surface runoff in a watershed substantially degrade biological communities and is demonstrated to occur in watersheds containing 10 to 20 percent impervious surface areas that directly discharge to a water body (WPT, 1994).

NUMERIC TARGETS

The previously impaired designated use for the Unnamed Tributary is related to coldwater fish species, primarily trout. Michigan's WQS require the protection of a variety of designated uses, including designated coldwater fisheries [R 323.1100(7)]. Continued attainment of WQS for the coldwater designated use support is the primary target, which will be demonstrated based on assessments of the fish community to determine the presence of trout in acceptable numbers.

To reduce the effects of sedimentation, a secondary numeric target based on TSS will be used to further assess progress due to implementation of best management practices (BMPs), which will be necessary as development continues in the Unnamed Tributary watershed. The secondary target goal is a mean annual, in-stream TSS concentration of 80 mg/l for wet-weather runoff events. This secondary numeric target may be overridden by continued achievement and maintenance of the fish community target. 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 volume discharge rates and instantaneous runoff volumes that increase stream flow instability, excessive stream bank erosion, suspended solids concentrations, and sedimentation of habitat. In addition, efforts to improve Procedure 51 individual habitat metric scores that are indicative of unstable habitat and flow conditions will be made.

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 (EIFAC) stated that in the absence of other pollution, a fishery would not be harmed at suspended solids concentrations less than 25 mg/l (EIFAC, 1980).

Alabaster (1972) provided the following water quality goals for suspended solids (finely divided solids) for the protection of fish communities:

Optimum	= $\leq$ 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 maintain and protect the biological community at an acceptable level, thereby, attaining WQS, a value of 80 mg/l as a mean annual TSS target for wet-weather events was chosen for the Unnamed Tributary as a secondary target.

Overall, the secondary target of 80 mg/l TSS is intended to evaluate solids load effects and assist in orienting, focusing, and maintaining corrective and preventative actions for source reductions. Additional TSS targets, based on flow-related considerations, may be developed as additional data on the Unnamed Tributary 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, if necessary, to continue meeting the coldwater fisheries designated use, this TMDL is established as a phased TMDL.

SOURCE ASSESSMENT

In the early 1990's, observed sources of solids and runoff loads to the Unnamed Tributary were associated with the highway and a housing complex construction, the consolidated effects of storm water runoff events from impervious surfaces of the Forest Hills Northern High School complex and other upstream development sites.

There are no individual storm water or non storm water NPDES permitted point source facilities in the Unnamed Tributary watershed (NMS, 2005). There are four agencies that regulate storm water discharges under the Phase II MS4 storm water general NPDES permit (Table 1). These agencies are Ada Township, Grand Rapids Township, the Kent County Road Commission, and the Kent County Drain Commission. Phase I of the federal Storm Water Regulations required owners or operators of Municipal Separate Storm Sewer Systems (MS4) with a service population of greater than 100,000 to obtain a permit. Michigan's Phase II Rules expanded Phase I coverage by requiring public entities (county, city, village, township, institutions) with the power and authority to control storm water discharges to an MS4 within the federally defined urbanized area to obtain coverage.

From the Grand River confluence upstream, land use in the Unnamed Tributary watershed is dominated by forested, agriculture, residential, commercial, and transportation uses (Table 2). Such development within a watershed alters its hydrologic characteristics because increased areas of impervious surface drainage and nonvegetated soils result in increased runoff of solids and pollutant loads being discharged to stream reaches within the watershed (Fongers and Fulcher, 2001; Schueler and Holland, 2000). Substantial reductions in vegetative riparian zones and pervious areas throughout the watershed of the Unnamed Tributary 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 the Unnamed Tributary. However, some BMPs in the Unnamed Tributary watershed have been employed to reduce direct runoff impacts to the stream, including vegetated, upland drainage ways; reestablished in-stream wetland vegetated reaches (upper watershed); and artificial wetland runoff detention areas (Forest Hills Northern High School complex area).

Estimates of the current annual TSS loads to the Unnamed Tributary watershed from the various land use categories in the watershed (Table 2) were made based on the acres of each land use category in the watershed (Cadmus Group, 2005), a mean annual rainfall of 32 inches (Purdue, 2005), and the USEPA's Simple Method model approach (USEPA, 2001). The model estimates also involved the use of specific land use, TSS export coefficients derived from the Rouge River Project (Cave et al., 1994). The modeling was used to compare current annual TSS load (by land use) estimates with projected TSS load reduction estimates that would achieve a mean annual, runoff-to-stream TSS concentration of 80 mg/l.

LINKAGE ANALYSIS

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

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

TMDL DEVELOPMENT

A TMDL represents the maximum loading of a pollutant that can be assimilated by a water body while still achieving WQS. The Unnamed Tributary fish community was impaired by excessive runoff, unstable flow conditions, bank erosion, and excessive sedimentation; however, as of 2004, the Unnamed Tributary is meeting the WQS coldwater designated use. Therefore, the TMDL is based on continued minimization of solids loads and excessive wet-weather flows throughout the watershed to a level that maintains and protects the coldwater designated fish community. Using the metrics from Procedure 51, a minimum, sustained numeric target is the presence of at least 1 percent trout and at least 50 or more individuals of any fish species

collected from each survey reach. This target represents an acceptable fishery that meets the WQS designated use for coldwater streams. A secondary target of 80 mg/L TSS as an instream annual average will also be used as a goal to develop and maintain stable runoff load for TSS and flow during wet-weather runoff events.

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 a 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 R 323.1082 (mixing zones) and R 323.1090 (applicability of WQS) of the WQS. In general, the lowest monthly 95 percent exceedance flow for a stream is used to establish effluent limits for point sources. However, excessive flows to the Unnamed Tributary are attributable to wet-weather driven discharges. As such, there is no single condition that is protective for all conditions, but efforts are to be directed towards control of excess flows and associated suspended solids in wet-weather runoff events.

ALLOCATIONS

TMDLs are comprised of the sum of individual waste load allocations (WLAs) for permitted point sources and load allocations (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:

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

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 2) since there are no individual, point source permittees in the watershed at this time.

Based on acres of land use categories listed under the “Urban/Built-Up” heading (Table 2) and TSS export coefficients derived from the Rouge River Project (Cave et al., 1994), a total annual TSS load estimate of approximately 160,366 pounds is attributable to the NPDES municipal permitted storm water runoff discharges to the Unnamed Tributary watershed (Table 2). However, all permitted storm water categories are predicted to be meeting the 80 mg/L target secondary target (Cave et al., 1994).

As deemed necessary to ensure protection of the designated uses of the Unnamed Tributary, TSS limits and/or flow volume limitations will be established based on available treatment technology that applies to the discharge type. Such an approach makes it unnecessary to consider mixing zone scenarios and would include permitted storm water point source contributions to the WLA, which are considered controllable through the existing NPDES permit

requirements, including the Phase I and Phase II MS4 programs. The intent of any limitations would be to attenuate the runoff delivery rates and volume inputs to the Unnamed Tributary in order to reduce flashiness, better stabilize and normalize flow conditions, and minimize stream bank erosion, TSS resuspension, and sedimentation impacts on habitat and biological communities.

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 2). An estimated annual TSS load of 10,764 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 potentially targeted load reduction is from agricultural sources, which has a runoff average TSS concentration of 149 mg/l (Cave et al., 1994). A 55 percent annual reduction (from 451 to 202 pounds) from the agricultural areas in the watershed is indicated based on model estimates resulting in an estimated annual LA, TSS target load of 202 pounds. This estimate is based on achieving a runoff mean annual average concentration of 80 mg/l TSS, the target concentration during wet-weather runoff events.

In summary, the proposed accumulative annual TSS load estimate to the Unnamed Tributary (WLA + LA) is 170,881 pounds per year, an overall <1 percent reduction from existing estimated loads. With the absence of any individual NPDES non-storm water permitted point source discharges in the Unnamed Tributary watershed, 0 percent of the annual load is attributed to individual NPDES permitted point sources, 94 percent (160,366 pounds per year) is attributed to the general NPDES permitted MS4 storm water outfalls covered under the Phase II MS4 Storm Water Programs, and 6 percent (10,515 pounds per year) attributed to the LA.

Suspended solids data from the 2004 assessment (Cadmus Group, 2005) study indicated that there are sources either unaccounted for, and/or under estimated, in terms of suspended solids contributions to the Unnamed Tributary. Land use data used to develop the LA and WLA projections for suspended solids do not predict elevated TSS loadings in the TMDL reach attributable to the defined land use categories within the watershed (Table 2).

The observed wet-weather related in-stream TSS concentration increases (375 and 600 mg/L TSS during the 1.1 and 1.4 inch wet-weather events, respectively) reported by the Cadmus Group (2005) appear to be originating from in-stream flow responses (e.g., resuspension and/or stream bank erosion during wet-weather events). The gradient of the stream is suspected to contribute to increased flow velocity, associated bank erosion, and resuspension of existing sediment deposits. The modeled WLA/LA TSS contributions indicate a questionable need for further reductions in TSS loads from the upland land uses through a WLA or LA, but may indicate the need for improved flow attenuation from the WLA and LA sources. This goal will require employment of BMPs that attenuate the runoff delivery rates and volume inputs to the Unnamed Tributary in order to minimize 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.

To determine progress in meeting the fish community score, follow-up biological and habitat quality assessments will be conducted during the appropriate five-year rotating basin year during stable flow conditions during the months of June through September. The results will reflect an MOS that is implicit and express 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, future sampling will be conducted during June through September during stable, low flow conditions. For assessing TSS loads and flow delivery volumes and rates to the Unnamed Tributary, seasonal event monitoring will be conducted as necessary to define and characterize both hydraulic and TSS loads from the Unnamed Tributary watershed that influences the biota TMDL reach.

MONITORING PLAN

Monitoring will be conducted by the MDEQ to assure maintenance of an acceptable biota community in the TMDL reach. Monitoring will be conducted every five years as part of the MDEQ's rotating basin cycle. For comparative purposes, follow-up biological and habitat assessments will be conducted in a June to September time frame, during stable, base flow conditions. Every effort will be made to sample during similar stream conditions and assess the same sampling locations as conducted during previous biomonitoring surveys.

REASONABLE ASSURANCE

The focus of the actions to protect the Unnamed Tributary is primarily directed toward continued and increased use of effective BMPs and other control measures to reduce the excessive peak flows that substantially increase TSS concentrations resulting from resuspension and bank erosion. Control measures potentially include industrial and municipal storm water discharge volume restrictions, chemical-specific permit limits, and approved BMPs for areas currently not under any permit.

R 323.2161a(8), of the Part 21, Wastewater Discharge Permits, of Act 451, states 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 TMDL or equivalent analysis." In addition, R 323.2161a(10) provides that the department may establish monitoring requirements in accordance with state- or watershed-specific monitoring plans as needed for a permittee to demonstrate the pollution reduction achieved by implementing applicable BMPs. 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 the Unnamed Tributary. Where the necessary data are available, permit requirements will be established in the NPDES permits as required to achieve

the goals of the TMDL. 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 MS4 storm water permits require the development of a watershed management plan by October 1, 2005, 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 Unnamed Tributary watershed) of their individual storm water prevention plans. Grand Rapids Township, Ada Township, the Kent County Drain Commissioner, and the Kent County Road Commission have NPDES certificates of coverage that apply to the Unnamed Tributary.

A lower Grand River Watershed (LGRW) Planning Project watershed management plan outlines strategies and recommendations to effectively reduce nonpoint source pollution (Grand Valley Metropolitan Council, 2004). Several interactive tools and two guidebooks were created in addition to the management plan to assist subwatersheds in their individual watershed planning efforts. A strategy was also developed for a LGRW provisional organization that will provide basin-wide oversight, implement regional and watershed-wide initiatives, and prioritize water quality concerns.

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

Recommended actions include:

- Thorough monitoring of point source discharges, identify sources of excessive wet-weather TSS loadings and flow volumes to Unnamed Tributary through NPDES permit conditions as necessary. Establish permit conditions as necessary.

- Upgrade and maintain the current vegetative riparian zone to reduce soil erosion and loadings to the Unnamed Tributary 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, thereby minimizing habitat impairment of the Unnamed Tributary.

- Implementation of BMPs in the areas covered by the MS4 storm water permits that minimizes sediment loadings and moderates runoff release rates and excessive runoff to the Unnamed Tributary watershed 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 use attainment is maintained or improved. Available guidance regarding runoff detention and stream protection is provided by Fongers and Fulcher, 2001; and Schueler and Holland, 2000.

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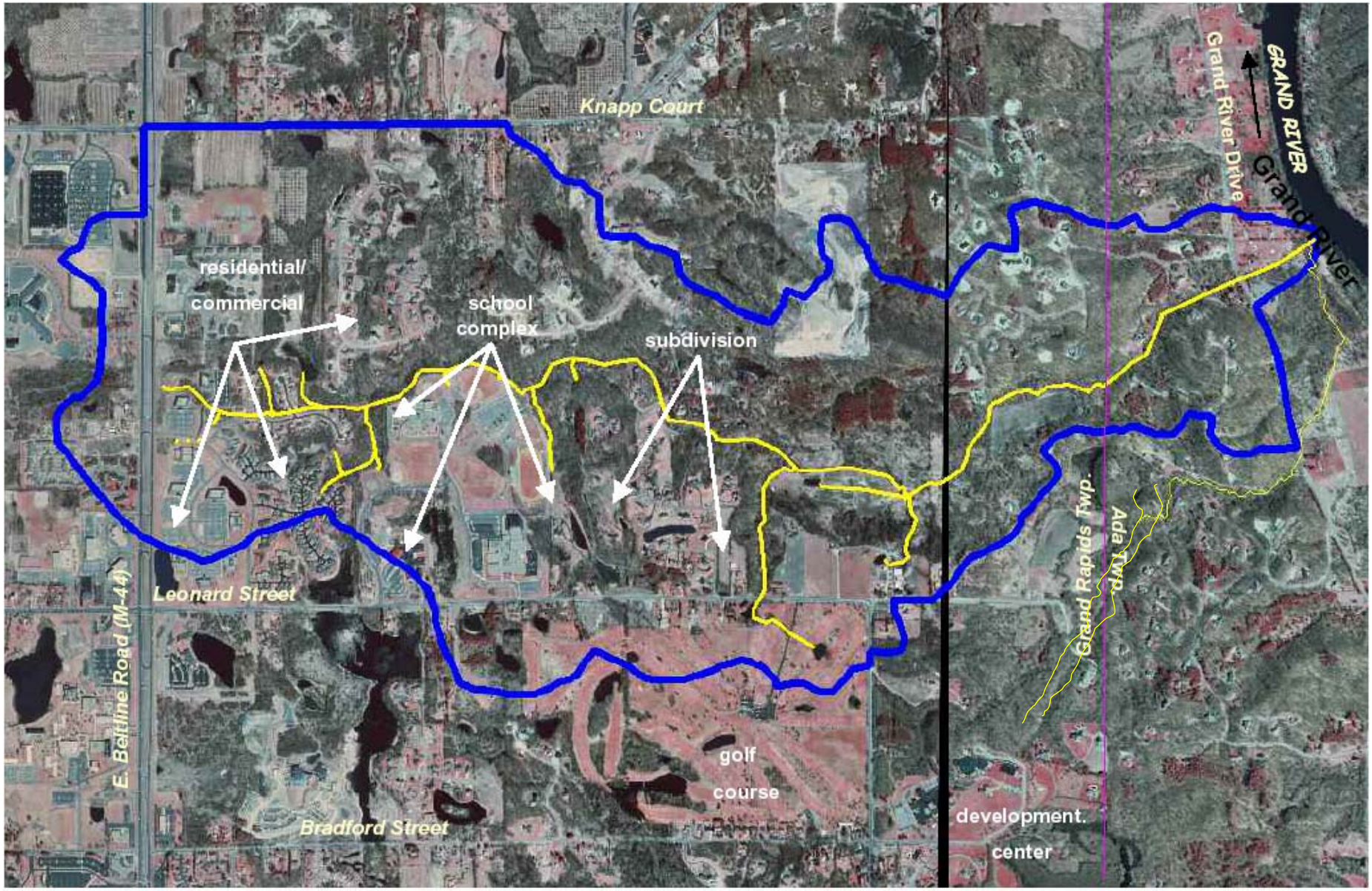

Figure 1. Unnamed Tributary Biota TMDL Reach and Watershed, Kent County, Michigan (1998 aerial).

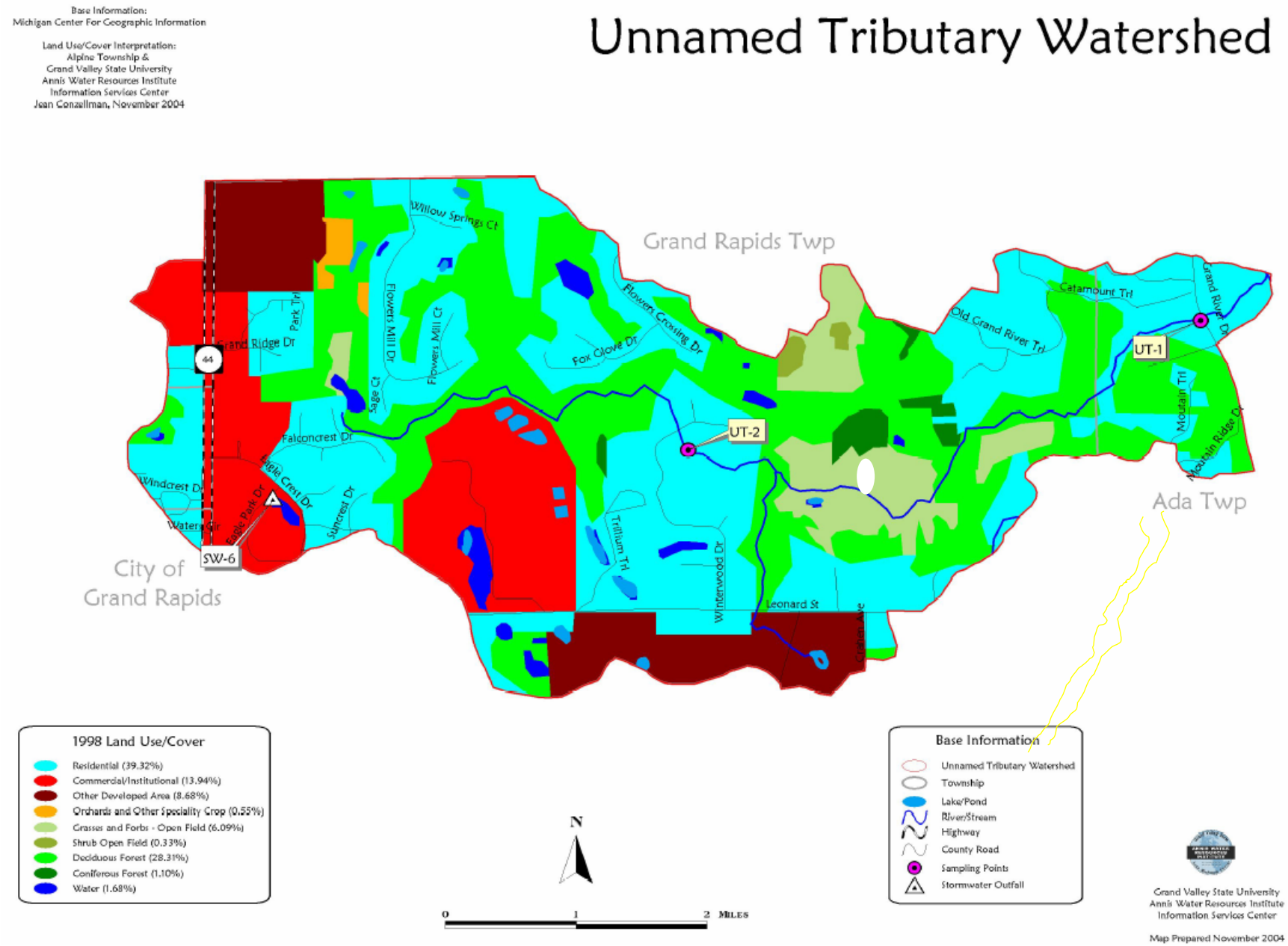

Figure 2. Unnamed Tributary to the Grand River watershed land use (1998 database).

Table 1. Phase II MS4 Program storm sewer outfalls in the Unnamed Tributary watershed managed by the city of Grand Rapids and Kent County (NMS, 2005).

Storm Water NPDES Permits (Phase II MS4 Program):

- Ada Township MS4-Kent – MIG610118
- Grand Rapids Township MS4-Kent – MIG610128
- Kent CRC MS4 (Kent County Road Commission) – MIG610129
- Kent CDC MS4 (Kent County Drain Commissioner) – MIG610130

Table 2. Land use categories and TSS loads in the Unnamed Tributary watershed, Kent County, Michigan (Source: Cadmus Group, 2005)

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	None
Urban/Industrial/Built-Up			
Residential	480	92,581	92,581
Commercial and Service	170	47,340	47340
Other Urban Buildup	106	20,445	20,445
Transportation/Comm/Util.	0	?	?
Subtotal:		160,366	160,366
WLA Total:	756	160,366	160,366 **(WLA)**
LA Components:			
Agricultural Land			
Orchards	7	451	202 (55% reduction)
(Background Sources)			
Forested/Shrub/Open Land			
Open Land/Shrub/Range Land	78	1,766	1,766
Forested (Deciduous/Conifer)	359	8,128	8,128
Water Body			
Streams/Wetlands	21	419	419
LA Subtotal:	465	10,764	10,515 **(LA)**
Overall Totals:	1221	171,130	170,881 (tenth of 1% reduction)

**TSS load estimates based on PLoad Version 3 model (USEPA, 2001), land use acres derives from 1998 land use database coverage and a mean annual rainfall value of 32 inches.*