ACHIEVING MULTIPLE OBJECTIVES THROUGH A SINGLE WATERSHED PLAN

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ABSTRACT

The prevalence and effectiveness of using a watershed approach to water resource management has resulted in "watershed planning" requirements or recommendations in a wide range of individual Federal, State, and local programs to restore and protect water resources. Many of these individual programs envision the same basic elements to a watershed plan. However, achieving the particular goals and objectives of each individual program through a watershed plan may not result in a plan that meets requirements of other programs. The Rouge River National Wet Weather Demonstration Project (Rouge Project) has attempted to identify the requirements of a generic comprehensive watershed management plan to meet multiple program objectives. Those program requirements need to be balanced with stakeholder goals, objectives, and available resources.

The Rouge Project in Southeast Michigan is a working example of how a systematic watershed approach to pollution management can result in cost-effective and ultimately greater and faster achievement of designated uses in a waterbody. In addition, multiple program objectives are being achieved through the development of comprehensive watershed management plans. The Rouge Project has expanded from a program to build and evaluate alternative approaches to control combined sewer overflows (CSOs) to a comprehensive watershed-based pollution abatement initiative. The Rouge River Watershed is largely urbanized, spans approximately 438 square miles, and is home to over 1.5 million people in 48 communities and 3 counties.

The Rouge Project has spent considerable effort to build institutional and regulatory frameworks necessary to accommodate a watershed approach to wet weather pollution management. Part of this framework is a watershed-based general permit for municipal storm water discharges issued under the National Pollutant Discharge Elimination System (NPDES) program. This storm water permit program was developed jointly by the Rouge communities and the Michigan Department of Environmental Quality (MDEQ) and is based on the concept of cooperative, locally-based watershed management. Communities and agencies in over 95 percent of the watershed have applied for coverage under this innovative, watershed-based permit program. The MDEQ permit requires permittees to participate in watershed management planning for a self-determined subwatershed unit. The subwatershed management plans form the basis for implementing watershed goals and objectives that will result in improved water quality and

pollution control. The Rouge communities will also use these watershed management plans to achieve other program objectives, such as those under the federal TMDL program and the state Clean Michigan Initiative.

The paper identifies what the Rouge Project has found to be the elements of a "comprehensive watershed management plan" which will achieve multiple program objectives, such as the reissuance of NPDES permits on a watershed basis, implementation of the water quality trading programs that are currently under development, implementation of the Section 319 non-point source program, development and implementation of Watershed Restoration Action Strategies envisioned under the Clean Water Action Plan, implementation of monitoring programs and for addressing the requirements of the TMDL program. The paper presents information on the implementation of the comprehensive watershed management plans to meet the elements of individual water resource management programs. It discusses challenges and successes of the overall effort. Finally, the paper presents information on lessons learned that will be useful to other geographic areas in their development and implementation of comprehensive watershed management plans.

KEYWORDS

Watershed, watershed management, watershed management plan, storm water, storm water general permit, CSO controls, Rouge River National Wet Weather Demonstration Project

INTRODUCTION

The Rouge River National Wet Weather Demonstration Project (Rouge Project) in Southeast Michigan has learned a great deal on what it takes to restore an urban waterway to its beneficial uses. The purpose of this document is to present an overview of the Rouge Project, to summarize the watershed approach being utilized in the Rouge Project including the use of a general storm water permit, and to present an approach on achieving objectives of multiple federal, state, and local programs through a single watershed management plan.

Background on the Rouge Project

The Rouge Project was initiated in 1992 by the Wayne County (Michigan) Department of Environment. The Project is a U.S. Environmental Protection Agency (USEPA) grant funded comprehensive program to manage wet weather pollution to restore the water quality of the Rouge River, a tributary of the Detroit River in Southeast Michigan. The Rouge River had been designated as a significant source of pollution to the Great Lakes system. The Rouge River Watershed is largely urbanized, spans approximately 438 square miles, and is home to over 1.5 million people in 48 communities and 3 counties.

The watershed contains seven subwatersheds that range in size between 19 and 89 square miles **(See Figure 1 "Location Map of the Rouge and Seven Subwatersheds and Location of Rouge Watershed in Michigan").** Older communities served by combined sewers dominate downstream portions of the Rouge River Watershed, while the headwater areas are typically open space, agricultural land, or low density residential developments that are undergoing rapid

change due to growth pressures. Fully developed areas, typical of the middle portions of the Rouge Watershed have separated storm sewers and limited opportunities to address storm water problems with structural solutions.

The early focus of the Rouge Project was on the control of CSOs in the older urban core portion of the downstream areas of the Rouge Watershed. As a finite number of point source CSO discharges could be identified and responsibility for each defined, the traditional regulatory approach of issuing NPDES permits mandating corrective action worked relatively well. Additional monitoring of the river showed that the other sources of pollution such as industrial and municipal point sources, storm water runoff, interflow from abandoned dumps, discharges from illicit connections, discharges from failed on-site septic systems, and resuspension of contaminated sediment, needed to be controlled before full restoration of the river would be achieved throughout the watershed.

Based upon what was learned, the focus of the Rouge Project became more holistic to consider the impacts from all sources of pollution and use impairments in receiving waters. The historic implementation of water quality management programs in the United States at the federal and state levels has been to focus on point sources, which are the most obvious sources of pollution to waterbodies. This program has worked well to control pollution from most point sources but has also left a patchwork of regulated and unregulated discharges of storm water and nonpoint source pollution to surface waters. This patchwork is especially true in most urbanized areas where multiple local jurisdictions are located in the same watershed. The challenge for the Rouge Project became to develop innovative solutions to achieve water quality objectives that may be: 1) more cost-effective, 2) implemented in a more timely fashion and 3) better able meet local needs. It has also become clear that water resources management must have the support of the general public in order to be effective and to become self-sustaining. The Rouge Project has provided a unique opportunity for a watershed-wide approach to restoring and protecting an urban river system by using a cooperative, locally based approach to pollution control.

Summary of Rouge Project Accomplishments

The Rouge Project is designed to identify the most efficient and cost effective controls of wet weather pollution, while assuring maximum use of the resource. A great deal has been accomplished along these lines. The following summarizes some of those accomplishments, focusing on CSO controls first. Approximately 50 percent of the watershed is served by separate sewer systems, with an additional 20 percent of the watershed served by combined sewers (157 overflow points) and the remaining area served by on-site sewage disposal systems. CSO controls are being implemented in phases. Under the first phase, six communities have separated their sewers and eight communities have constructed or are constructing 10 retention treatment basins. Each of these basins is sized for different design storms and several employ innovative technology. A two-year evaluation study of the CSO control basins is nearing completion. The results from the evaluation study coupled with efforts to control storm water and other pollution sources in the watershed will provide the basis for the second phase CSO control program on the remaining CSO sources in the watershed. The information gained from the evaluation of design storms and control technologies will be useful nationwide on determining cost effective CSO controls to meet water quality standards.

Innovative storm water control and watershed management technologies are also being evaluated under the Rouge Project. Twenty-five (25) different communities and agencies throughout the watershed are implementing over 100 pilot projects. Categories of pilot management projects currently underway include wetlands creation and restoration, structural storm water practices such as grassed swales and detention ponds, erosion controls, streambank stabilization and habitat restoration, to name a few.

The Rouge Project has learned that illicit connections and failing septic systems are major sources of pollution problems in the Detroit urban area. Creative ways to deal with these sources of pollution have been initiated.

A suite of computer models has been developed by the Rouge Project to simulate the water quality and quantity response of the Rouge River during wet weather events for existing and future conditions under various CSO and storm water runoff management alternatives. This effort has resulted in a very useful public communication tool on water quality indices tied to actions needed to restore the Rouge River. A comprehensive geographic information system (GIS) and relational databases were designed and implemented to manage the wealth of data collected under the Project. In addition, a special data exploration tool, DataView, was developed to support routine analyses of large time series data sets. DataView is user-friendly and readily transferable to other locations. Related to DataView is the Rouge Information Manager, also a user-friendly, readily transferable tool (an "electronic file cabinet") for accessing multi-media information about the Rouge River restoration effort. In addition to these computer-based management and education tools, the Rouge Project has spent considerable resources on other public education and involvement activities since its inception.

Additional information on the Rouge Project can be obtained at the web site http://www.rougeriver.com.

THE MICHIGAN NPDES GENERAL PERMIT FOR MUNICIPAL STORM WATER DISCHARGES

Although the early focus of the Rouge Project was on the control of CSOs in the older urban core portion of the watershed, monitoring data collected by the Project showed that many pollution problems stem from a lack of coordinated storm water management and non-point source pollution upstream of CSO discharges. As the concerns expanded to sources of pollution in the upper portion of the watershed above the CSO discharges and the water quality improvement focused more on watershed-wide approaches, the lack of a defined regulatory framework to address storm water pollution and diffuse sources of non-point pollution became a major obstacle to further progress in improving water quality and restoring beneficial uses to the Rouge River. Rouge communities believed that a general storm water permit would be an alternative regulatory mechanism that would provide incentives for watershed management and improve water quality.

Beginning in 1995, the Michigan Department of Environmental Quality (MDEQ), the Rouge Project and the communities in the Rouge Watershed jointly developed an innovative, watershed-based NPDES general permit ("General Permit") for municipal storm water discharges which was issued on July 31, 1997 (MDEQ, 1997). This collaborative process was outlined in a report "Adapting Regulatory Frameworks to Accommodating Watershed Approaches to Storm Water Management" (Fredericks, et al., 1997). The General Permit incorporates the following elements:

General:

- Coverage will be voluntary until the permits under the USEPA Phase II storm water are required (note that USEPA has endorsed Michigan's proposal to use the Voluntary General Storm Water Permit in lieu of permits that would otherwise be required by the Phase II regulations)
- Only public agencies who own, operate, or control storm water are provided the opportunity for coverage;
- Subwatershed size is established by the potential permitees during the application process;
- Application and permit process have limited required actions, the focus is to establish desired outcomes.

Requires permittee to develop:

- *Illicit Discharge Elimination Plan* (IDEP) that has the goal of eliminating raw sewage discharges and includes addressing failing septic systems and improper connections of sanitary sewers to storm drains and open waterways. The IDEP is due at the time of permit application.
- *Public Education Plan* (PEP) designed to inform residents and businesses what actions they should take to protect the river. The PEP is due at the time of permit application.
- In cooperation with others, a *Watershed Management Plan* to resolve water quality concerns which includes: short and long-term goals for the watershed, delineation of actions needed to achieve the goals, estimated benefits and costs of management options, an opportunity for all stakeholders to participate in the process. The Watershed Management Plan is due two years after the certificate of coverage is issued to the applicant.
- *Storm Water Pollution Prevention Initiative* (SWPII) which includes evaluation and implementation of pollution prevention and good housekeeping practices and the evaluation and implementation of BMPs to minimize impacts of new development and redevelopment. The SWPII is a subset of the Watershed Management Plan and is due 2.5 years after the certificate of coverage is issued to the applicant.
- *Monitoring and Reporting Plan* including schedule for revisions to the Watershed Management Plan.

The subwatershed storm water management plans developed by the communities and other public agencies do not require state approval; however, the individual pollution prevention initiatives emanating from the watershed planning process require state approval as the activities specified in the initiatives become permit requirements upon approval.

Rouge Community/Agencies Approach To Application And Permit Requirements

A total of 44 communities and agencies who own, operate, or control storm water systems in the Rouge River Watershed have coverage under Michigan's watershed-based General Permit for municipal storm water discharges. The document "Implementing a Model Watershed Approach Through a State General Storm Water NPDES Permit" (Cave, et al., 1998) outlines key issues discussed and decisions reached by the communities as they developed their General Permit applications.

The Michigan General Storm Water Permit is quite flexible and allows those seeking coverage under the permit to use a wide variety of approaches to meet the public education, illicit connection/illegal discharge, and public involvement requirements. The document "Will the New Federal Phase 2 Storm Water Program Work?: Test Case with Michigan's Voluntary General Storm Water Permit" (Cave, et al., 1999) summarizes the various storm water management activities being undertaken by Rouge Watershed communities and agencies. This flexible framework has allowed communities to experiment with various approaches that recognize local constraints and seizes upon unique opportunities to meet the desired outcomes.

Rouge communities are now working together to develop the required subwatershed management plans. While the basic requirements for what must be in the watershed plan are detailed in the regulations, the permitees within a hydrologic or subwatershed unit are allowed considerable freedom in deciding upon their own priorities, remedial actions and schedules. Pollution prevention initiatives that are expected to be proposed by the communities will likely involve a commitment to continue or expand current activities like soil erosion and sedimentation control; implement new activities to address priority issues such as failing septic systems; and, implement regional projects to reduce the frequency and velocity of storm flows in the river.

THE ROUGE PROJECT – A LOCAL WATERSHED EXAMPLE FOR ACHIEVING MULTIPLE PROGRAM OBJECTIVES

As stated above, one of the primary goals of the Rouge Project is to demonstrate that an urban river system can be restored and protected using a watershed approach. Currently, Rouge Project activities are a combination of regulatory requirements and other voluntary activities that are being coordinated by subwatershed. The Project has learned that the use of the watershed approach has emerged as the most cost-effective and logical approach to water resource management. There is a clear inter-relationship of the pollution sources within a watershed that demands an inter-related approach to a solution. Therefore, the heart of the success of a watershed protection and/or restoration effort is the development of a sound watershed management plan for a specific watershed.

Summary of Federal and State Watershed-Based Programs

The State of Michigan has incorporated watershed planning components into a number of water resource management programs. Four such programs are summarized below.

- **TMDL Program:** Various segments of the Rouge River are listed on the federal Clean Water Act Section 303(d) list for various parameters. The Total Maximum Daily Loads (TMDLs) for these segments are not scheduled for completion until approximately 2005. The river will require multiple TMDLs that may result in conflicting implementation strategies in the watershed as a whole. Under the USEPA's proposed TMDL regulations (USEPA, 1999a; USEPA, 1999b), use of the watershed approach is encouraged, an approach already being implemented in the Rouge Project.

- **Storm Water General Permit:** Almost all of the communities within the Rouge River Watershed have obtained their Certificates of Coverage (CoC) under Michigan's NPDES General Permit for municipal storm water discharges. One requirement of the storm water General Permit is for each CoC holder to participate in the development of a long-term,

  comprehensive watershed management plan for a self-determined hydrologic unit. Among other programmatic elements, this plan must identify specific activities each community or agency will undertake during the first permit term toward meeting the goals of the watershed management plan.

- **Clean Michigan Initiative:** In July 1998, the State of Michigan passed and began implementing its Clean Michigan Initiative (CMI), a $675 million general obligation bond dedicated to fund projects for "Clean Water, Clean Parks, and Clean Communities." (State of Michigan, 1998). Funding awards under two categories of grants, the Nonpoint Source Pollution Control Grants and the Clean Water Fund, are based on an "approved" watershed management plan.

- **Water Quality Trading Program:** The State of Michigan is in the process of completing its Water Quality Trading Program rules (MDEQ, 1999). Through this program, the trading of nutrients in impaired water bodies (for which TMDLs have not yet been developed) can only occur where an approved watershed management plan has been developed. Unlike other "approvable" watershed plans, the watershed management plan for the trading program must include a "cap" and allocations.

As described in the previous section, the seven subwatershed advisory groups in the Rouge Watershed are developing watershed management plans as required under the Michigan storm water General Permit. Obviously it is desirable to develop only one "comprehensive watershed management plan" that will meet stakeholder goals and objectives as well as all applicable program requirements for the above listed four programs and any other programs that emerge. Therefore, the Rouge Project subwatershed management plans have a goal of being comprehensive watershed management plans that will meet objectives of multiple programs. By doing so, both the watershed communities and regulatory agencies will save time, money and effort by having one plan that fulfills multiple objectives. In addition, these comprehensive plans will provide much needed certainty to the communities, counties and other stakeholders in planning for watershed management activities and expenditures.

Discussion

To be a comprehensive watershed management plan it must address all sources of pollution (i.e. CSO, sanitary sewer overflows (SSO), storm water, illicit connections, failed on-site sewage disposal systems, various non-point sources, etc.) reaching the river as well as all of the other stressors that adversely impact the achievement of water quality standards (i.e. lack of habitat, flow variability, increasing imperviousness, etc.). A comprehensive watershed management plan can specify the amount of pollution *or other stressors* that need to be reduced/addressed to meet water quality standards, and the plan can allocate pollution control *or management responsibilities* among sources in a watershed. This appears to be the thrust of the national watershed approach.

At the heart of the Clean Water Act and its subset programs is undertaking those actions necessary to meet water quality standards and the related designated uses. The most important water quality standard is meeting public health protection criteria. Instituting the control programs needed to meet public health criteria is technologically fairly straightforward. However, meeting the aquatic life designated use is more complex. This requires some discussion because of the tie between use of the watershed approach and achieving water quality standards.

At present the State designates an aquatic life use, usually expressed as a fishery use. In almost all cases that designation is established as the endpoint of the final water quality standard to be met. It assumes that if the designated water quality is met, the full range of aquatic life will be achieved. Often that is not a valid assumption.

The quality and quantity of aquatic life, especially any freshwater fishery, is closely tied to the environmental conditions of the waterbody in question and the surrounding lands that drain into it (i.e., the watershed). For these reasons, maintaining a suitable fishery requires management of both a waterbody and its watershed. Management of any natural resource has two components-protection and restoration. Watershed protection- those actions which prevent degradation of the physical, chemical, and biological components of the watershed-is the most cost-effective and long-term approach to watershed management. Maintaining a sustainable fishery in many watersheds, however, often involves restoring some degraded or missing attribute important to fish survival. These could include a specific habitat important at some point in a fish's lifecycle, or some aspect of water quality or water quantity such as dissolved oxygen or the seasonal water flow regime.

In summary, the designated uses assigned to a waterbody must not ignore the balance between the physical, chemical, or biological conditions needed for the specific species of fish to be protected, i.e., warm water or cold-water. A comprehensive watershed management plan will do more than just meet water quality standards. It will delineate those measures needed to restore the ecological health of the waterway.

The water quality standards and related designated uses are not being met in the Rouge Watershed. The reasons for this are multiple, such as point sources (CSOs, industrial), storm water runoff, illicit connections and failed on-site systems. Equally important factors to the non-

attainment of water quality standards are other contributing problems such as flow variability in the streams, lack of instream habitat for all kinds of aquatic life needed in a health ecosystem, lack of wetlands adjacent to the river, and increased imperviousness in the watershed to name a few. In an urban environment addressing all of these factors is extremely complex.

Elements of a Comprehensive Watershed Management Plan

In numerous documents and policy statements, the most comprehensive of those being the Clean Water Action Plan (U.S. EPA, 1998a), the USEPA has stressed using new initiatives to promote water resource management on a watershed basis. The heart of the success of a watershed protection and/or restoration effort would be the development of a sound watershed management plan for a specific watershed. As stated earlier, there is a clear inter-relationship of the pollution sources within a watershed that demands an inter-related approach to a solution. A piecemeal approach of focusing only on sources of pollution or a group of sources will not achieve the desired results nor will it achieve the acceptance of the residents of the watershed. It is mandatory to analyze all of the various sources of stressors to the water quality problems in a watershed–physical, chemical and biological–and decide how to get a handle on the priority of dealing with those problems. It is critical to establish a hierarchy of pollution sources in a watershed-point sources and nonpoint sources-based upon the adverse water quality impacts of those sources. It is equally important to keep reinforcing, at a watershed level, the concept of prioritizing the control of those sources and the other stressors to get desired environmental protection. It may take a long time to correct some of these pollution sources or other physical, chemical or biological stressors so it is important to prioritize the control programs to get the maximum environmental improvement as soon as possible. It also is critical to assess the cumulative watershed impacts to quantitatively assess the physical, chemical and biological processes and then fashion the watershed-based solutions. Before river restoration can be completed, it is critical to understand the cause of stream disturbance and disequilibrium conditions. Without this understanding, the restoration often treats the symptoms rather than effecting a cure. The tools needed to solve water quality problems in a watershed must be geared to that watershed. The management plan that is developed must be tailored to address watershed specific problems.

Nationally, the minimum elements of a watershed management plan have not been defined through any consensus fashion to date. Those elements may emerge over time as more experience is gained in implementing the watershed approach. As stated earlier, many of the individual programs being implemented under the Clean Water Act envision the same basic elements to a watershed plan. However, achieving the particular goals and objectives of each individual program through a watershed plan may not result in a plan that meets requirements of other programs. In order to address this problem, the Rouge Project has attempted to identify the requirements of a generic comprehensive watershed management plan which will then meet multiple program objectives. Those program requirements need to be balanced with stakeholder goals, objectives, and available resources. Those elements are listed and described below.

It is very important to note there is no one methodology to follow in developing watershed management plans. Instead, there are a series of choices to reach the desired endpoint. A watershed plan is a framework for how, where and when management tools will be applied.

Innovation is encouraged to reach the goals for restoring/protecting watersheds. Note that the terms "watershed" and "subwatershed" can be used interchangeably.

The elements listed below can be done in sequence or in parallel because they are interrelated and support each other. Implementing a comprehensive watershed management plan and can be done in phases whereby certain action implementation steps are accomplished, progress assessed and then additional actions undertaken as needed to achieve the desired outcome. Use of an iterative approach to setting goals and implementing actions to achieve standards is an integral part of all of the following elements.

In defining the elements of a watershed management plan it must always be kept in mind the need to address all sources of pollution and all of the other stressors (i.e. lack of habitat, flow variability, etc.) that prevent the attainment of water quality standards.

1. Establish the subwatershed baseline of necessary information.

a. Describe the nature and status of the subwatershed ecosystem.
It is important to note that this description should only be done to the extent required to achieve the purposes of the watershed management plan.

The following items should be addressed in the description:

- The chemical characteristics of the waters based upon historical monitoring data.
- The biological characteristics of the waters based upon historical monitoring data
- The physical characteristics (morphology) of the watershed based upon data.
- The hydrologic characteristics of the watershed based upon historical data.
- Information (as appropriate) on the sediment characteristics in the watershed.
- The applicable water quality standards and related designated uses for the waters.
- The delineation of the watershed and subwatershed boundaries
- Current adverse impacts on the stream resulting from the current level of environmental stressors to the river ecosystem

b. Describe the synergistic and antagonistic relationships of the chemical, physical and biological characteristics of the watershed as they impact the achievement of water quality standards and associated designated uses. It is important to note that this will be an iterative analysis as the development of the watershed management plan and progresses.

c. Describe other important elements of the watershed important to the development of a watershed management plan such as:

- Identify possible stakeholders that will be involved in the development and implementation of the watershed management plan.
- Measure or gauge (by sound estimation) the existing subwatershed land uses and impervious cover due to its direct link to quality of water resources
- Assess the local capability to implement needed watershed protection tools by examining existing local programs, regulations/ordinances and staff and other resources.

- Evaluate the existing mapping resources in the watershed including geographic information systems (GIS) systems

2. Define the short-term and long-term goals for the watershed.

a. Define the vision and goals for the water quality and designated uses to be achieved in the watershed. The short-term goals must be defined in the context of long-term goals.

The goals should, to the greatest extent possible, be measurable environmental end points. They must include achievement of water quality standards and their designated uses. The purpose of identifying short-term and long-term goals is to recognize the phasing of activities that will be needed in order to achieve the end point of meeting water quality standards and designated uses. These interim or short-term goals should reflect the progress in the development and implementation of actions undertaken to meet the long-term goals.

It may be appropriate to use surrogate goals to use as measures on the path to achieve the desired water quality goals. These surrogate goals may be management objectives for the subwatershed. For example, "add 150 acres of wetlands in the subwatershed to mitigate flow variability" may be an acceptable surrogate goal for reducing flooding. These surrogate goals must be supported by the appropriate modeling or quantitative rigor.

b. Short term and long term goals should be considered for at least the following categories:
   - pollutant/stressor reduction from all sources
   - habitat restoration/enhancement
   - flow control to prevent flow variability and to reduce flooding
   - desired uses of the waters
   - the related chemical, physical and biological endpoints to be achieved.

3. Identify deviations from goals/target levels.

- Characterization the extent to which baseline conditions in the waterbody deviate from the target levels. This characterization should include the identification of deviations from all of the target levels with particular attention being paid to the chemical, physical and biological target levels and their interrelationship. For example, if the long-term goal is the attainment of water quality standards to meet the designated use of a warm water fishery, the physical and biological constraints should be identified if they are factors in the non-attainment of the fishery use.

Those factors that directly impact the achievement of the short term and long term goals need to be explained and addressed in the watershed management plan. Any data/information gaps must be identified and addressed in the implementation plans discussed later.

4. Identification of sources of problems.

The purpose of developing the watershed management plan and is to restore the river so as to meet appropriate water quality standards and designated uses. It is very important to clearly identify the responsible sources or categories of sources of problems that are adversely impacting

the achievement of the watershed goals, short term and long term. It is also critical to quantify the degree to which each source (or source category) contributes to the problem. In developing the watershed management plan and, it is critical that all categories of sources of problems be identified including physical, chemical and biological. Without this full identification the watershed management plan will not be the holistic plan needed to fulfill the overall goals.

a. Point Sources

The following is a list of categories that must be addressed in the identification of the point sources that must be considered in the development of the watershed management plan: CSO discharges; storm water runoff; SSO discharges; illicit connections; on-site systems failures; and other point sources as appropriate.

b. Nonpoint Sources

Historically, nonpoint sources have not been regulated as comprehensively as point sources and water quality programs for point and nonpoint sources differ in a number of ways. Some of the more obvious nonpoint source considerations that must be considered in the development of the watershed management plan are: excess fertilizers (phosphorus and nitrogen), herbicides, and insecticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff; sediment from improperly managed construction sites, crop lands, and eroding streambanks; bacteria and nutrients from livestock, pet wastes, and faulty septic systems; and atmospheric deposition .

c. Other Items to be Considered

The above two categories of sources list represents the more classic sources of pollution that would be associated with the development of a watershed management plan and/or TMDL. When combining the development of a watershed management plan and the fulfilling of the TMDL requirements, a broader list of sources of problems must be addressed. The additional "sources " may have impacts on the achievement of the desired goals and therefore must be addressed. A partial list of those other items to consider are: erosion controls; flow management; changing land use patterns affecting imperviousness; ground water issues; loss of habitat; and stream morphology and related impacts on habitat

5. Allocation of pollution/stressor reduction responsibilities to ensure allocations will lead to the attainment of the watershed management plan goals including water quality standards.

Allocation decisions determine implementation responsibilities and their related costs. It is very important to note that in order for a watershed management plan and to be approvable, the pollution/stressor reduction allocation approach/system must be designed to result in the achievement of water quality standards at some point in time. The details of the pollution/stressor reduction allocation will be directly tied to what is needed to address the mix of physical, chemical and biological stressors that are causing the nonattainment of water quality standards and designated uses. Implementation of the pollution/stressor reduction allocation approach/system may be done in phases or in an iterative fashion with appropriate monitoring/modeling in order to assess progress all of which will be addressed in the details of the implementation plan.

Future growth is a critical item to be considered in the allocation of pollution/stressor reduction responsibilities and the implementation of the watershed management plan. Growth issues are very important to consider when addressing the achievement of short-term goals and their relationship to the established long-term goals.

Modeling will play a critical role in the allocation of pollution/stressor reduction. Developing the perfect model is not necessary. An adequate model (versus a perfect model) may well suit the purposes trying to be achieved recognizing the dynamic nature of improvements that will be occurring in the subwatershed as pollution controls are being implemented. The concept of phasing of controls ties directly with using tiered models as progress is being achieved. All of this can be specified in the implementation schedule for the watershed management plan.

In some cases it may be appropriate to have a narrative description of the allocation of pollution/stressor reduction responsibilities versus a quantified load allocation. The key is innovative thinking in making the subwatershed management plan and a viable process for achieving the water quality standards and designated uses.

6. Implementation plan for achieving the goals of the watershed management plan and the TMDL.

The implementation plan should contain certain minimums as summarized below. These are not listed in any special order of importance.

a. Describe commitments by the permittees and others to implement the specific actions to achieve the short-term and long-term goals in the following categories of problems (see detailed listing in item 4 above): point sources; nonpoint sources; and other stressors

b. Present an implementable plan to achieve public health protection, water quality standards and designated uses in the shortest possible time.

c. Delineate specific actions to be taken achieve public health protection, water quality standards and designated uses in the shortest possible time.

d. Delineate who will take those actions to be taken achieve public health protection, water quality standards and designated uses in the shortest possible time.
e. Delineate a time schedule to accomplish those actions to be taken achieve public health protection, water quality standards and designated uses in the shortest possible time
f. Delineate a priority of actions that reflect the specific water quality problems in a sub-watershed. The priority will be based on public health protection first, achievement of designated uses second and achieving water quality standards third. This implies a phasing of those actions over time.

g. Delineate the process for assessing and reporting on progress.

h. Delineate the plans for reviewing and updating the subwatershed management plans.

i. Delineate the legal authorities under which the control actions will be carried out by the specified implementing agencies/entities.

j. Estimate the time required to attain applicable water quality standards given the overall elements of the subwatershed management plan including phasing of controls and management practices.

7. Define the process for evaluating/assessing the effectiveness of the achievement of the water quality standards and designated uses.

This process should include at least the following components:

- a plan for assessing whether management measures/control actions and other milestones are being implemented as planned.
- a plan for assessing whether allocations are sufficient to attain water quality standard
- a plan for assessing the improvement in water quality conditions and the progress towards achieving the water quality goals.
- a plan for assessing the effectiveness of management measures/control actions.

8. A description of the process for modifying and/or revising the watershed management plan based on the evaluation/assessing of the effectiveness of the plan in achieving water quality standards and designated uses.

This is self-explanatory. Included in this process should be the timetable that will be followed in the periodic revisions.

9. Description of the long-term water quality monitoring program to support the watershed management plan.

This is self-explanatory. Included in this process should be the timetable that will be followed in establishing the monitoring program.

10. Description of the financial and institutional options and arrangements that will be in place to assist in the success of implementing the subwatershed management plans.

This is self-explanatory. Included in this process should be the timetable that will be followed in the periodic revisions to the arrangements established.

A critical part of developing and implementing a comprehensive watershed management plan is using the concept of the "hierarchy approach**"** and the principle of **"**inverse proportionality**"** as proposed by the TMDL Federal Advisory Committee final report (U.S. EPA, 1998b). These two items help in the delineation of action steps to achieve ecosystem health which include such items as flow issues, erosion and sedimentation, habitat restoration which may be separate from water quality standards issues, etc. These topics are all tied in with the achievement of designated uses. These two concepts also recognize that a series of steps may be needed, over a period of time, to fully protect or restore the designated uses.

Logic says that watershed plans will need to have a mix of regulatory controls and management actions to manage and control the sources that are impacting the watershed. If these impacts are successfully controlled it is likely to result in attainment of designated uses. The balancing of targeted management actions and controls can direct the combined efforts of point source dischargers, nonpoint sources, and stakeholders to the most serious watershed impacts to effectively manage and control and provide the most favorable basis for considering options. The approach to such prioritization will need to be addressed in a watershed management plan.

Concepts and approaches to phasing of needed controls will need to be explored. For example, as part of a watershed plan, it is feasible to allow the existing NPDES permit limits to remain in place (marking time) while other watershed items take place. This is justified/allowed under present policy and regulations. The key is to use the watershed approach to delineate the full set of items that will occur in the holistic watershed approach that will, if done, achieve designated uses. This includes management actions and controls beyond the chemical-specific effluent limits. The approach that compliance schedules can provide time to develop sufficient information to warrant alternative water quality based effluent limits for a particular permittee can be addressed in a watershed management plan. There may be a need for sequencing of actions/management controls to achieve the designated uses. Issues relating to present water quality standards remaining in full force and effect with full recognition that interim water quality standards are being used in decision making need to be explored in any watershed management plan.

SUMMARY

Watershed management plans provide an excellent framework to coordinate the numerous regulatory and non-regulatory programs associated with water resources management. Some of the multiple program requirements which can be coordinated through use of a single watershed management plan include (but are not limited to): reissuance of NPDES permits on a watershed basis, implementation of the water quality trading programs, implementation of the Section 319 non-point source program, development and implementation of Watershed Restoration Action Strategies envisioned under the federal Clean Water Action Plan, implementation of monitoring programs, and addressing the requirements of the TMDL program. This latter program provides some unique opportunities for using a watershed management plan to meet desired objectives.

The TMDL program is used to address violations of specific chemical standards in specific reaches of rivers. The prevailing TMDL program often will not result in the attainment of water quality standards for that river. As currently defined, a TMDL should address what is causing a non-attainment of a water quality standard and then establish the maximum load of a specific parameter that is causing the nonattainment. TMDLs are site specific and parameter specific. If more than one parameter is in violation of a water quality standard on a reach of river, more than one TMDL must be developed. TMDLs often do not adequately address the physical and biological aspects of restoring the river. A watershed management plan creates an opportunity to bundle TMDLs, to strike an appropriate balance between controls over discharges and polluted runoff, and to consider other water-related problems in the watershed, including wetland loss, sediment contamination, aquatic species habitat degradation, drinking water protection, and

health of riparian areas. By having a completed comprehensive watershed management plan with its attendant specification of the amount of pollution *or other stressors* that needs to be reduced/addressed to meet water quality standards, the plan in effect becomes a TMDL to allocate pollution control *or management responsibilities* among sources in a watershed. Therefore, upon approval of the watershed management plan by the State and EPA, the plan will constitute an approved TMDL thus preventing the need to do a TMDL on each river segment.

By taking a more comprehensive approach to restoring the health of the aquatic system in the watershed, a comprehensive watershed management plan can result in improvements in environmental conditions that are mutually reinforcing, with higher long-term success rates. Water bodies impaired by polluted runoff in most instances will require a watershed-wide effort to achieve the necessary restoration and clean water goals. Development of multiple objective comprehensive watershed management plan is also an opportunity to identify and demonstrate innovative approaches to restoring water quality and protecting public health and the environment.

Development of aquatic system restoration strategies on a watershed basis is a chance to meet the existing obligations of the current Clean Water Act and other federal laws in a cost-effective and common sense manner. Nothing in the current law requires a watershed approach to addressing water quality problems, but federal agencies want to offer incentives to develop such watershed management plans.

A water quality restoration effort on a watershed scale, rather than river segment scale, also offers citizens and other stakeholders better opportunities to participate in a water management process that is understandable and meaningful. Achieving multiple objectives through a single watershed plan is very important to the stakeholders in the Rouge River Watershed for four main reasons. First, virtually all of the over 50 communities and agencies in the Rouge River Watershed that own, operate, or control storm water discharges have volunteered for coverage under the General Storm Water Permit; development of watershed management plans is a requirement of the permit. Those plans should be as complete as possible so they will be able to serve may purposes as discussed above. Second, use of the watershed approach is the direction being taken by the water program. Nationally, the minimum elements of a watershed management plan have not been defined through any consensus fashion to date. Those elements may emerge over time as more experience is gained nationally in implementing the watershed approach. As discussed above, the Rouge Project has defined those minimum elements. These elements build on the pioneering effort of the Michigan General Storm Water Permit. Third, large portions of the Rouge River do not meet water quality standards and therefore will be faced with the need to develop TMDLs in the very near future. The Rouge Project is showing how a comprehensive watershed management plan will completely fulfill the needs of the TMDL program. Fourth, a successful comprehensive watershed management plan as envisioned will result in the restoring the Rouge River much faster.

The Rouge Project envisions the comprehensive watershed management plan (tied to the TMDL) to set pollution reduction responsibilities among the identified stressors that are causing or contributing to the nonattainment of water quality standards. This goes beyond doing just a load allocation but addresses <u>all</u> of the stressors causing the nonattainment. The Rouge Project sees

this as being on the cutting edge. The Rouge Project will demonstrate to others the advantages and workability of the watershed management approach, its relationship to the TMDL program and the advantages of using this comprehensive approach to restoring water quality.

CONCLUSIONS AND RECOMMENDATIONS

The Rouge Project and others have shown that by holistically addressing all sources of pollution, an effective action plan can be implemented to address impairments and restore river uses. An overall integrated solution that addresses the physical, chemical and biological stressors in a waterway is the most cost effective way to proceed. Without this integration, there is a series of "add on" programs that miss an opportunity to encourage an integrated program that addresses all sources of ecosystem stress in a cost effective, prioritized manner. An integrated aproach also facilitates achieving multiple program objectives through a single watershed management plan.

The watershed approach is a new way of doing business by the States and EPA. A locally driven approach requires a sharing of power with the regulatory agencies. Overcoming the command and control philosophy is not easy.

It is important to note that watershed planning and implementation does not just happen. It takes time and effort. One of the main issues the Rouge Project has faced is forging a new regulatory framework and building new institutional relationships. The Rouge Project has learned that local units of government want meaningful self-determination in deciding how to achieve water quality objectives. Increased local accountability garners local support and generates peer pressure. It is also critical to have flexibility and at the same time accountability. It is important to look at the resource, beyond individual dischargers, using a range of indicators.

What does the future hold for the Rouge Project? The Project anticipates there being a comprehensive process to truly bring together programs dealing with pollutants such as storm water, CSO, and other sources other impediments such as flow and habitat destruction and aesthetics. These processes will require innovative regulatory approaches, workable institutional arrangements and use of the holistic approach. A key item will be to build in accountability for water quality/ ecosystem health at the local level.

In conclusion, local communities in southeast Michigan and the state regulatory agency are attempting, for the first time, a consensus, cooperative approach to watershed management. The watershed management plan will form the basis for implementing watershed goals and objectives that will result in improved water quality and pollution control. This program implements the watershed approach endorsed by USEPA and others and should facilitate watershed-based integration of control programs for different pollution sources such as storm water and CSOs which may be present with a large, urban watershed. This program empowers local government and their stakeholders in identifying problems, choosing from alternative solutions, establishing priorities and schedules, and developing common strategies with neighbors. Communities and others involved in this new program are also addressing issues such as coordination of subwatershed efforts within larger subwatersheds.

Flexibility and innovation must be encouraged in water resources management. Communities should actively use the watershed approach. The Rouge Project is a working demonstration of the watershed approach to restoring a urban river system. Tangible benefits of this approach are faster environmental improvements and cost savings. A major benefit achieving multiple objectives through a single watershed plan. And finally, the Rouge River is being restored.

Use of the watershed approach and the development of watershed management plans provide a perfect vehicle to tie together many aspects of the water program. Achieving multiple objectives through a single watershed plan is very important to the stakeholders in the Rouge River Watershed. It is hoped that this effort and the work of the Rouge River National Wet Weather Demonstration Project will continue to identify and quantify the benefits of cooperative, watershed-based efforts to protect and restore our nations water resources.

ACKNOWLEDGMENTS

This paper represents a summary of select elements from the ongoing efforts of many individuals and organizations who are involved in the restoration of the Rouge River. The authors also gratefully acknowledge the assistance of Ms. Sandra Kiser and Mr. Jonathan Kleinman for their assistance in the preparation of this manuscript.

The Rouge River National Wet Weather Demonstration Project is funded, in part, by the United States Environmental Protection Agency (EPA) Grant #X995743-01, 02, 03, 04 and 05 and #C995743-01. The views expressed by individual authors are their own and do not necessarily reflect those of EPA. Mention of trade names, products, or services does not convey, and should not be interpreted as conveying, official EPA approval, endorsement, or recommendation.

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ATTACHMENT 1
RECOMMENDED ELEMENTS OF A
COMPREHENSIVE WATERSHED MANAGEMENT PLAN

A. SUMMARY

B. STATE OF THE SUBWATERSHED

- Land Use
- Urbanization
- Imperviousness
- Soils
- Parks & Recreation/Public Access
- Hydrology & Water Quality
- Indicators (WQ Criteria, others)
- Habitat and Biological Communities
- Aesthetic/Special Resources

C. GOALS

1. Watershed Vision (Narrative statement)
2. Short Term Goals: 3-5 years
   - Attainment of certain desired uses of the waters (e.g., wading, canoeing)
   - Habitat restoration/enhancement
   - Reduction in flooding
   - Targeted chemical, physical and biological endpoints to be achieved.
   - Greater awareness of water body and watershed
   - Greater interaction between watershed residents and the river
   - Affordability and sustainability of actions

3. Long Term Goals: 5+ years
   - Attainment of more desired uses of the water (e.g., fishing, potential for swimming), with a minimum target of attaining Water Quality Standards
   - Further habitat restoration/enhancement
   - Elimination of flooding except in extreme circumstances
   - Targeted chemical, physical and biological endpoints to be achieved.
   - Greater awareness of water body and watershed
   - Established and regular interaction and stewardship between watershed residents and the river
   - Affordability and sustainability of actions

D. EXISTING IMPAIRMENTS, POLLUTION SOURCES, AND OBSTACLES

1. Identification of Existing Problems
   (i.e., ways in which the State of the watershed does not match the Goals of the watershed)
   - Concentrations of various water quality parameters
   - Streambank erosion
   - Sedimentation/Contaminated sediments
   - Highly variable flow regime

- Channelization
- Reduction in riparian vegetation buffer zones
- Impoundments
- Lack of public access to the tributary or branch
- Lack of recreational or educational opportunities along the tributary or branch
- Lack of aesthetic value along the tributary or branch
- Wetland loss or degradation
- Algae or other nuisance aquatic vegetation
- Riparian vegetation loss or lack of adequate covering vegetation

2. Identification of Sources of Problems

a. Point Sources

- CSO discharges
- Storm water runoff
- SSO discharges
- Illicit connections
- On-site systems failures
- Other point sources as appropriate

b. Nonpoint Sources

- Excess fertilizers (phosphorus and nitrogen), herbicides, and insecticides from agricultural lands and residential areas
- Sediment from improperly managed construction sites, crop lands, and eroding streambanks;
- Atmospheric deposition

c. Other Physical Sources

- Erosion
- Excessive Flows
- Changing land use patterns affecting imperviousness
- Ground water issues
- Loss of habitat
- Stream morphology and related impacts on habitat

d. “Public” Sources preventing “Public” goals

- Lack of public rights-of-way for parks
- Need to integrate school curricula with the river or other water body
- Lack of public access to water body

3. Quantifying deviations from goals

a. Deviations from Short Term Goals: 3-5 years

- Deviations from desired uses of the waters
- needed pollutant/stressor reduction from all sources to meet goals
- habitat restoration/enhancement needed to meet goals
- flow control to prevent flow variability and to reduce flooding

- what needs to happen for the related chemical, physical and biological endpoints to be achieved.
- What needs to happen for the related "public" endpoints to be achieved.

b. Deviations from Long Term Goals: 5+ years
- deviations from desired uses of the waters
- needed pollutant/stressor reduction from all sources to meet goals
- habitat restoration/enhancement needed to meet goals
- flow control to prevent flow variability and to reduce flooding
- what needs to happen for the related chemical, physical and biological endpoints to be achieved.
- What needs to happen for the related "public" endpoints to be achieved.

E. MANAGEMENT ALTERNATIVES

1. General Description of Process
   a. Range of management alternatives considered
   b. Phasing of implementation
   c. Use of models or other quantification processes
   d. Accounting for future growth

2. Priorities for Action

3. General Responsibilities
   a. Municipalities
   b. Industries
   c. Agencies
   d. Individuals
   e. Others

F. ACTION PLAN

1. General Description of the Action Plan

2. Priorities for Action

3. Specific Responsibilities to Meet Short-Term Goals

   a. Municipalities
      1) Point Sources
      2) Nonpoint sources
      3) Other Actions

   b. Industries
      1) Point Sources
      2) Nonpoint sources
      3) Other Actions
   c. Agencies

1) Point Sources
2) Nonpoint sources
3) Other Actions

d. Individuals
1) Point Sources
2) Nonpoint sources
3) Other Actions

e. Others
1) Point Sources
2) Nonpoint sources
3) Other Actions

4. Responsibilities to Meet Long-Term Goals
a. Municipalities
1) Point Sources
2) Nonpoint sources
3) Other Actions

b. Industries
1) Point Sources
2) Nonpoint sources
3) Other Actions

c. Agencies
1) Point Sources
2) Nonpoint sources
3) Other Actions

d. Individuals
1) Point Sources
2) Nonpoint sources
3) Other Actions

e. Others
1) Point Sources
2) Nonpoint sources
3) Other Actions

5. Implementation Schedule to Meet Short-Term Goals
a. Municipalities
1) Point Sources
2) Nonpoint sources
3) Other Actions
b. Industries

1) Point Sources
2) Nonpoint sources
3) Other Actions

c. Agencies
1) Point Sources
2) Nonpoint sources
3) Other Actions

d. Individuals
1) Point Sources
2) Nonpoint sources
3) Other Actions

e. Others
1) Point Sources
2) Nonpoint sources
3) Other Actions

6. Implementation Schedule to Meet Long-Term Goals
(1) Municipalities
a. Point Sources
b. Nonpoint sources
c. Other Actions

(2) Industries
a. Point Sources
b. Nonpoint sources
c. Other Actions

(3) Agencies
a. Point Sources
b. Nonpoint sources
c. Other Actions

(4) Individuals
a. Point Sources
b. Nonpoint sources
c. Other Actions

(5) Others
a. Point Sources
b. Nonpoint sources
c. Other Actions

7. Institutional Arrangements

G. ANTICIPATED BENEFITS

H. PROPOSED PROGRAM TO MEASURE PROGRESS

1. Description of the Process for Assessing the Plan
   - Assessing effectiveness of implemented control measures
   - Assessing environmental improvements
   - Assessing achievement of established Goals

2. Time Schedule for Assessing the Plan

I. PROCESS FOR UPDATING THE PLAN

APPENDICES

- PUBLIC PARTICIPATION PROGRAM
- RESPONSE TO PUBLIC COMMENTS
- REFERENCES