

ROUGE RIVER WATERSHED MANAGEMENT PLANNING THE MAIN 3-4 SUBWATERSHED PLAN

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ABSTRACT

In 1992, the EPA provided \$46 million to Wayne County, Michigan to fund the development of a watershed-wide approach to addressing the problems of an urban river. In May 2001, seven Subwatershed Management Plans were submitted to the Michigan Department of Environmental Quality. This paper describes the most urban of those plans: The Rouge River Main 3-4 Subwatershed Plan.

The residents of the Main 3-4 Subwatershed have accomplished a great deal of water pollution control over the past 30 years. In the 1960s the Lower portion of the Rouge River was an example of the worst river stretches in the nation. It flooded regularly and was oil-covered and sludge-laden, with offensive odors. This watershed plan is a key component of proceeding in a coordinated manner. For the past three years, the communities that comprise the Main 3-4 Subwatershed Advisory Group (SWAG) have met monthly to determine what actions must be taken to address impairments in their section of the Rouge River Watershed. The work of the Main 3-4 SWAG was done both to support the communities' applications for voluntary general storm water permits from the State of Michigan and to address storm water pollution to the Rouge River.

The high percentage of impervious surfaces in the Main 3-4 has contributed to the large variations in the River's flow. In addition to erratic flows, which cause stream bank erosion, sedimentation and reduction in wildlife habitat, this subwatershed is plagued by the same problems that degrade the Rouge River as a whole. These problems include high bacteria counts from untreated sewage entering the river and low dissolved oxygen. In addition, a portion of the Rouge River below Michigan Avenue has been channelized to control flooding and trees and shrubs on the streambank have been eliminated.

In the past, combined sewage systems contributed untreated sewage to the River when the systems overflowed. By 1998, four retention/treatment facilities were constructed in the subwatershed at a cost of \$106 million to address these combined sewer overflows (CSOs). In addition, a \$1 billion Long Term CSO Control Plan spearheaded by the City of Detroit will further reduce CSOs discharging to the Rouge River.

The Main 3-4 SWAG established the following long-term goals:

- Improve water quality in the Rouge River and restore impaired uses.
- Remove sources of pollution that threaten public health.
- Educate the public regarding their impact on the River and the River's existing and future potential as a community asset and recreational resource.
- Improve the water quality of the river to increase recreational opportunities and remove fish consumption advisories.
- Enhance and preserve habitat, especially next to the river, for fish and wildlife compatible with subwatershed land uses.

- Reduce water volumes and velocities in the river during a storm event to minimize bank erosion and flooding.

Each community then developed a list of long-term and short-term actions to address these goals. The Rouge Program Office has provided pilot project funding, public involvement assistance, extensive monitoring data, expertise on Best Management Practices and technical advice.

Communities are now developing Subwatershed Pollution Protection Initiatives that will identify specific actions, with timeframes and cost estimates, to implement the Subwatershed Plan.

INTRODUCTION & BACKGROUND

The communities that share the most downstream portions of the Rouge River have experienced the worst aspects of environmental damage as a result of urbanization and industrialization. As a result they have paid the price with lost recreational opportunity. More importantly, they have paid the tremendous financial costs associated with retrofitting their older urban infrastructure into a system that fulfills the goals of the federal Clean Water Act. The costs to date have been substantial but the anticipated costs over the next ten years will be staggering.

The Main 3-4 communities are all committed to complying with the Clean Water Act. Their efforts alone, however, will not restore the uses of the Rouge River. They must rely on their upstream neighbors to also commit to restoring the river. Thus, with the Rouge Remedial Action Plan (RAP) serving as the framework, the communities of the Main 3-4 have prepared this watershed plan as a tool to coordinate and guide the water quality management effort in their communities.

The Main 3-4 communities have chosen to work cooperatively with the regulatory authorities to develop a watershed specific plan for improving the water resource with an ultimate goal of achieving water quality standards. This approach was facilitated by the introduction of the Michigan Voluntary General Storm Water Permit process. The communities' leaders sought coverage under this permit and have committed to addressing the broad range of sources that negatively impacts the river. Each community has recognized their individual contribution to the problem and has outlined a program to address their contribution. These individual programs will be formulated through the Storm Water Pollution Prevention Initiative (SWPPI) process.

The Rouge River, a tributary to the Detroit River in southeastern Michigan, has been documented as a significant source of pollution to the Great Lakes system. The Rouge River Watershed covers 438 square miles of southeast Michigan (metropolitan Detroit) (see Figure 1-1) and is home to more than 1.5 million people in parts of three counties – Wayne, Oakland and Washtenaw. All of this area drains through the Main 3-4. Unlike its neighboring subwatershed to the north and subwatersheds to the west that include Rouge River headwater areas, a high proportion of the Main 3-4 Subwatershed is covered by impervious surfaces such as roads, rooftops and parking lots. Impervious surfaces impede groundwater recharge and precipitation on these surfaces and often drains directly into storm sewers and then quickly into the nearest surface water. This subwatershed is completely built out and has been developed into residential (56%) and commercial and industrial (15%) land uses.

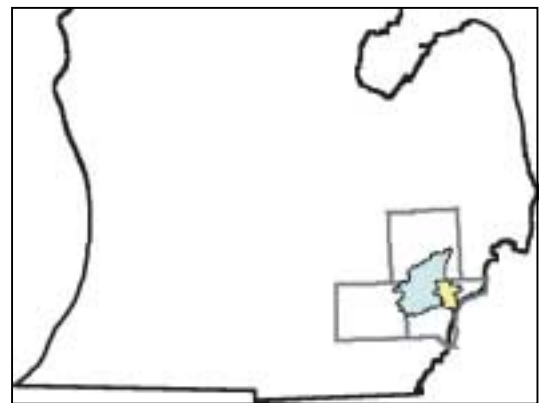


Figure 1: Location within Southeast Michigan

BACKGROUND

Due to public outcry about the condition of the Rouge River in 1985, the State of Michigan adopted the Rouge River Basin Strategy. A key element in this strategy was the development of a plan to clean up the river – the Rouge River Remedial Action Plan (Rouge River RAP). The original RAP was completed in 1989 consistent with the commitments made by the states, Canadian provinces and two federal governments as part of a Great Lakes Water Quality Agreement. This international

agreement signed by the United States and Canada identified 42 Areas of Concern (AOCs) in the Great Lakes Basin that needed attention. The Rouge River was one AOC listed.

The original Rouge River RAP, a nine-volume document, defined an ambitious 20-year program of actions needed to protect the public health and to make substantial progress to restore the impaired uses of the river. Since most of the large industrial and municipal wastewater treatment plant discharges were either in compliance or under corrective action plans, the RAP placed the major emphasis for corrective actions on CSOs and storm water discharges. At the time, the full cost of clean up was estimated at \$900 million. Subsequent updates of the original RAP indicate that the full cost to restore the river is much higher.

In 1993, the state reorganized the committee originally established to prepare the Rouge River RAP and expanded its membership to include a broad range of citizen, government and business stakeholders. The new organization was called the Rouge RAP Advisory Council (RRAC). In 1994, under the guidance of the RRAC, a revised 1994 Rouge River Remedial Action Plan was published. This 136-page-report outlined the considerable progress that had been made in addressing major pollution sources in the river and outlined the additional steps needed to restore uses that were still impaired. The 1994 report documented the contributions of the Rouge River National Wet Weather Demonstration Project (Rouge Project) in accomplishing many of the objectives outlined in the original 1989 Rouge River RAP.

In 1992, The U.S. Environmental Protection Agency (EPA) provided \$46 million to Wayne County to fund the (Rouge Project) with a primary goal of establishing a watershed-wide approach to addressing the problems of an urban river. This meant looking beyond the obvious impacts (i.e., CSOs) to matters of recreational use and habitat restoration. While final design decisions for the major civil structures remained with the local communities, the Rouge Project provided overall coordination to encourage substantial differences among the designs commensurate with the intent of the demonstration project.

In the Main 3-4 Subwatershed, several significant CSOs have been controlled at tremendous expense to the communities. Under the coordination of the Wayne County Department of Environment, several CSO retention/treatment basins were constructed:

- Hubbell Southfield
- Puritan/Fenkell
- 7 Mile
- River Rouge
- Dearborn Tunnel (Under Design)

In addition to providing several million dollars in grants to communities to help separate sewers and/or construct retention basins to address CSOs, the Rouge Project has funded local community pilot projects that demonstrate how other sources of pollution can be controlled. A part of the Rouge Project has also included extensive monitoring of the water quality and related aquatic habitat of the river to measure progress and pinpoint areas that need further attention.

Within the first few years of monitoring, the Rouge Project documented problems in the river unrelated to CSOs. It became clear as the water quality monitoring results were analyzed throughout the watershed that without a comprehensive, watershed approach, the investments made to address CSOs would not restore the designated uses identified in the RAP. Contaminated storm water discharges, sanitary sewer overflows, illicit discharges, failing septic systems, excessive run-off

from developed areas, bank erosion, construction activities and a number of other sources and activities were degrading the water quality.

THE U.S. FEDERAL COURT

Since the 1970s, the United States District Court for the Eastern District of Michigan has been involved in overseeing compliance with the federal Clean Water Act with respect to the City of Detroit Wastewater Treatment Plant collection system and the suburban customers of the Detroit Water and Sewage Department. The federal court initially became involved through enforcement actions brought by the state and federal regulatory agencies concerning the operation of the Detroit wastewater treatment facility. Through this initial involvement, the federal court has continued to play an active role in the restoration of the Rouge River Watershed.

In the early 1990s, under the oversight of the federal court, the MDEQ facilitated a resolution to the state-directed correction of CSOs that resulted in a phased approach in which the responsible local agencies would be allowed to demonstrate various alternatives to capture and treat these CSO discharges, or eliminate them through sewer separation projects.

With early reports from the Rouge Project indicating that the control of CSOs alone would not address all the pollution problems in the river, the federal court urged the 48 local public agencies within the Rouge River Watershed to adopt a more comprehensive approach to solving these problems. In response to the court's concerns, a group of local agencies working within the Rouge Project, and the MDEQ, proposed a unique watershed-based approach that involved development of a new regulatory framework for the management of storm water and certain other pollution sources. The federal court encouraged the communities to pursue this approach, which was subsequently implemented by the MDEQ through adoption of the voluntary watershed-based General Storm Water Permit in 1997.

VOLUNTARY GENERAL STORM WATER PERMIT

This unique regulatory approach requires the formation of subwatershed groups where communities and other public agencies work cooperatively to develop and implement plans to address sources of pollution.

The permit requires the subwatershed communities to work cooperatively to draft a subwatershed plan. This document fulfills that requirement for the Main 3-4 communities. After the plan is adopted and submitted to the MDEQ, each public agency must submit a Storm Water Pollution Prevention Initiative (SWPPI) to the MDEQ that commits the public agency to specific actions that it intends to undertake consistent with the cooperatively developed Subwatershed Management Plan. While voluntary for most public agencies now, new federal storm water regulations will require all communities within the Rouge River Watershed to apply for a permit to discharge storm water by March of 2003. The U.S. EPA has committed to accepting the Michigan watershed-based general permit for at least the first permitting round under the federal Phase 2 storm water program.

STATE OF THE SUBWATERSHED

According to 2000 census data, approximately 593,324 people live in the subwatershed. SEMCOG has developed a regional development forecast and has projected this subwatershed to decrease slightly in population by the year 2025. This change can be attributed to a decline in persons per household.

LAND USE

The Rouge River watershed includes the Upper, Lower, Middle and Main Branches and drains an area of 438 square miles. The Main Branch of the Rouge River flows through the Main 3-4 Subwatershed which has a drainage area of 91.37 square miles as shown in Figure 2. This subwatershed includes portions of the cities of Detroit, Highland Park, Dearborn, Dearborn Heights, Redford Township, Melvindale, Allen Park and River Rouge.

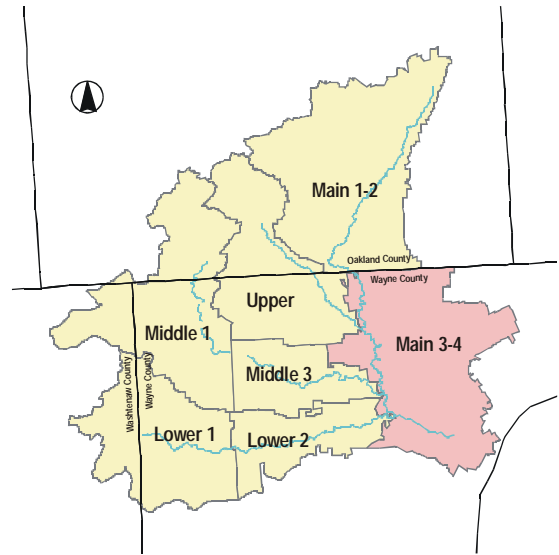
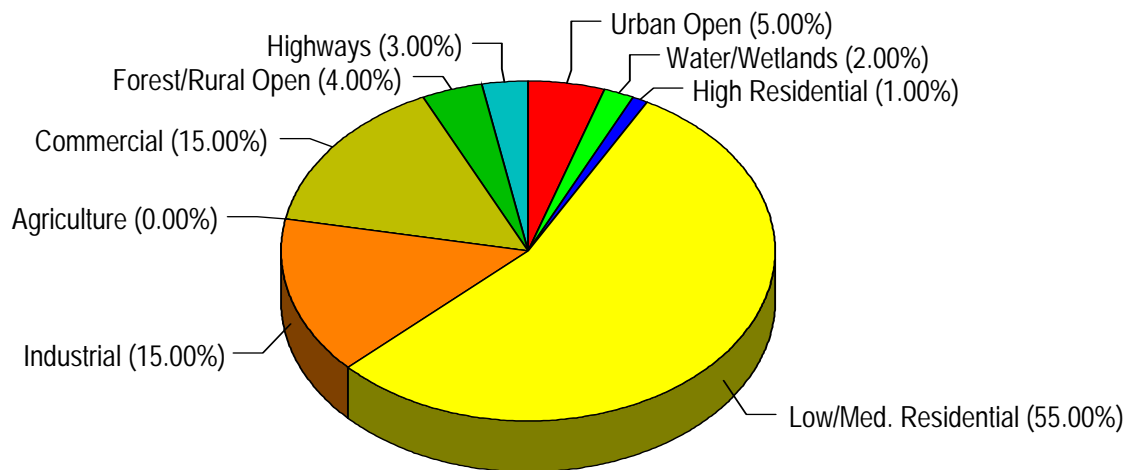


Figure 2: Subwatershed location

The current land use in the watershed is shown in Figure 3. The land use map indicates that there is little to no open space left in the watershed. This watershed is completely developed with the largest land use category being residential housing. Parkland in the Main 3-4 subwatershed includes the City of Detroit's largest park, Rouge Park, Eliza Howell Park, Rouge Valley Parkway, University of Michigan-Dearborn Environmental Study Area, and the Henry Ford Estate.

Based on 1995 land use data, a high proportion of the subwatershed is covered by impervious surfaces such as roads, rooftops, and parking lots. This subwatershed is completely built out and has been developed into residential (56%) and commercial and industrial (30%) land uses.

Figure 3: Main 3-4 Land Use



WATER QUALITY CHARACTERISTICS

Since 1993, approximately 17,000 water quality samples have been analyzed in the Rouge River watershed for bacteria and chemicals related to water quality standards. Data has been collected throughout the watershed to build a baseline of information to help determine where actions have been successful in addressing water quality concerns, and where additional work is needed to restore designated uses as identified in the Rouge RAP.

Dissolved Oxygen And Temperature Data

DO and temperature sampling began in 1993 and continued through 2001 at various sites throughout the Main 3-4 Subwatershed. DO and temperature measurements were taken during dry weather; wet weather and some stations were monitored continuously.

Several significant changes have occurred in the subwatershed in recent years:

- Three new CSO basins in Detroit became operational in 1999. DO has improved significantly since 1998 with 2000 being the best year on record. Mean DO has increased from 5.4 mg/l in 1998 to 6.9 mg/l in 2000. The percent of DO readings below the 5 mg/l State Standard dropped from 40 percent in 1998 to 5 percent in 2000.
- CSO control projects were implemented before 1998 on each of the 4 major subwatersheds upstream of the Main 3-4: the Lower, Middle, Upper, and Main 1-2.

Dissolved Oxygen and temperature measurements taken during dry weather in 2000 found:

- DO has improved significantly since 1998 with 2000 being the best year on record for the Main 3-4 Subwatershed in Detroit.
- Mean DO has increased from 5.4 mg/l in 1998 to 6.9 mg/l in 2000 in the Main 3-4 Subwatershed in Detroit.
- The percent of DO readings below the 5 mg/l State standard dropped from 40 percent in 1998 to 5 percent in 2000.

AQUATIC HABITAT QUALITY

In 1996, RPO staff evaluated aquatic habitat quality at 12 locations in the Main 3-4, using the MDEQ's GLEAS 51 protocol. Two of the locations were determined to have "Fair" aquatic habitat quality; and the remaining 10 locations had "Poor" habitat.

Identified habitat problems included excessive flow variation, excessive siltation, lack of streamside vegetation and cover, and a lack of pool and riffle habitat. In addition, in stream habitat downstream of Michigan Avenue to the river mouth is extremely poor, due to a concrete-lined channel, poor water quality, contaminated sediments, and loss of riparian wetlands and forests. These conditions greatly inhibit the movement of fish between the Rouge River and the Detroit River.

The size and diversity of the fish community is constrained by the limited connection of the subwatershed to the Detroit River and the Great Lakes, due to the channelized, concrete-lined streambed downstream of Michigan Avenue. Historically this lower portion of the river contained the best game fish habitat in the watershed. Presently, however, poor water quality and limited in stream and riparian habitat severely limit fish populations and fish passage. The fish community is also constrained by the dam at the Henry Ford Estate, which currently prevents fish passage between the Upper and Lower portions of the Main Branch.

Increasing populations of almost any fish (except exotic rough fish like carp or goldfish) would be an indication of improving environmental conditions in the river. Certain species, however, are especially useful for demonstrating improving conditions. These species tend to be sensitive to turbidity, prefer cleaner, cooler water, and their distribution in the Rouge Watershed is currently quite limited. Only one of these species, rock bass, has been found in the Main 3-4 subwatershed.

SUBWATERSHED IMPAIRMENTS

The Michigan Department of Natural Resources and the Michigan Department of Community Health (MDCH) have established fish consumption advisories for the fish listed in Table 1. MDCH defines “general population” as men, boys older than 15, and women beyond childbearing years. “Women and children” are defined as women who are pregnant or breastfeeding, women who intend to have children, girls older than 15, and all children under 15.

Table 1: MDEQ Fish Consumption Advisories

LOCATION	FISH SPECIES	CONTAMINANT(S)	SPECIFICS OF ADVISORY
Downstream of M-153/Ford Road	Carp, catfish, suckers	PCBs	For fish of any size: no consumption by women, children, or the general population.
	Largemouth and smallmouth bass	PCBs	No consumption of fish between 14" and 30" by women, children, or the general population.
	Northern pike	PCBs	No consumption of fish longer than 22" by women, children, or the general population.
	All other species	PCBs	For fish of any size: no consumption by women and children; one meal per week for the general population.

TOXIC CHEMICALS IN WATER AND SEDIMENT

Toxic chemicals were found in four recent studies of the Main Branch of the Rouge River. In 1996, RPO measured the concentrations of potentially toxic metals and organic compounds in water and sediment at two locations in the Main 3-4, and performed water and sediment toxicity tests.

Significant zinc was found in the water upstream of the University of Michigan-Dearborn Dam as well as significant lead & zinc in the sediment. Downstream at Rotunda Drive significant amounts of PCBs were found in the water and significant PAHs were found in sediment.

The MDEQ collected and analyzed 84 sediment grab and core samples in the lower portion of the Main 3-4 in 1997-98. They found elevated concentrations of PCBs (maximum concentration = 24.6 mg/kg), total PAHs (max=2,500 mg/kg), and many metals.

ROUGE RIVER REPORT CARD INDICATORS

The Rouge Remedial Action Plan Advisory Council (RRAC) has written a Rouge River Watershed Report Card, which summarizes data and objectives for 18 indicators of watershed conditions,

ranging from water quality to government stewardship. Eight of these indicators address factors that biological and ecological conditions in the watershed. The report card takes a watershed-wide perspective on these indicators. Table 2 summarizes these eight indicators for the Main 3-4 subwatershed.

Table 2: Selected Rouge River Report Card Indicators

INDICATOR (Main 3-4 Subwatershed)	STATUS (Main 3-4 Subwatershed)	ENTIRE WATERSHED TREND*
Toxic Chemicals & Fish Consumption Advisories	- Sediments in lower portion of subwatershed are contaminated - Fish consumption advisory still in effect	↑
Water Quality – Aquatic Life	- Concerns = low DO and high ammonia concentrations in water during summer, d/s of Michigan Avenue - DO was continuously monitored at 1 location in 1998, and was below 5 mg/L 39.2 % of the time (see 1998 Baseline Data Summary Report for additional data).	↔
Riparian Zone	Existing parks provide good habitat	↓
Wetlands, Woodlands, & Meadows	Existing parks provide good habitat	↓
Wildlife	Existing parks provide good habitat	↓
Stream Flow & Habitat	Excessive flow variability = in stream habitat loss, bank erosion, etc.	↓
Fish	Habitat loss due to stream degradation, especially in concrete channel	↔
Benthos	Habitat loss due to stream degradation, especially in concrete channel	↓

* ↑ = condition improving; ↓ = condition deteriorating; ↔ = condition unchanged; ? = insufficient data to evaluate recent trend

EXISTING IMPAIRMENTS

Impaired Uses

The Main 3-4 subwatershed is the downstream branch of the Rouge River. As such, this portion of the River receives the flow, and impacts, from the Lower, Middle and Upper Branches of the Rouge River. Therefore, the communities in this subwatershed cannot solve all of the impairments without the assistance of their upstream neighbors.

This subwatershed is typical of an urban setting and consists of impervious surfaces such as roofs, parking lots, roadways and sidewalks. Land use has resulted in a high proportion of the land being covered by impervious surfaces.

The high percentage of impervious surfaces has contributed to the large variations in flow in the river. In addition, a portion of the Rouge River below Michigan Avenue has been channelized to control flooding and trees/shrubs on the streambank have been eliminated.

The river's most important use in the subwatershed is its potential for providing recreational activities and increasing public access to the water.

The Rouge Remedial Action Plan Advisory Council (RRAC) summarized the impaired uses of the Main 3-4 as impaired or severely impaired for water contact, warm water fisheries, habitat degradation, aesthetics degradation, aquatic life and wildlife degradation and navigation. Table 3 lists the watershed impairments, known pollutants and sources of the pollutants.

Table 3: Watershed Impairments, Known Pollutants and Sources

IMPAIRMENTS	KNOWN POLLUTANTS	SOURCES
Warm water recreation (Restrictions on swimming)	<i>E.coli</i> , fecal coliform	CSOs, SSOs, illicit connections, animal waste runoff
Loss of fish and wildlife habitat	Channelization Phosphorus Sediment Increased Temperature Hydrologic flow and velocities	<u>Concrete channel</u> <u>Fertilizer use, Sanitary sewage runoff</u> <u>Stream bank erosion, runoff</u> <u>Low flow, lack of riparian vegetation not enough trees and vegetation along the banks</u> <u>Impervious surfaces with insufficient or no storm water controls</u>
Degradation of fish populations and benthos	Sediment Phosphorus	<u>Soil erosion, upstream runoff</u> <u>Residential fertilizer use, sanitary sewage Runoff</u>

IMPAIRMENTS	KNOWN POLLUTANTS	SOURCES
	Hazardous Materials Increased Temperature Hydrologic flow and velocities	Illegal discharges and point source Atmospheric deposition of mercury <hr/> Low flow, not enough vegetation <hr/> Impervious surfaces with insufficient or no storm water controls
Degradation of aesthetics	Phosphorus & Nitrogen Sewage Garbage & oils Sediment	Fertilizer use Sanitary sewage Runoff from impervious surfaces <hr/> SSOs, CSOs <hr/> Impervious surfaces such as parking lots Improper disposal of household products <hr/> Upstream runoff
Restrictions on fish consumption	PCBs and mercury	Contaminated sediments Industrial and point source discharges Atmospheric deposition
Restrictions of dredging activities	Hazardous Materials (metals, mercury, PAHs)	Contaminated sediments Industrial and point source discharges Atmospheric deposition
Fish tumors or other deformities	Organic & inorganic chemicals Viruses	Contaminated sediments Point source discharges Illegal discharges Atmospheric deposition
Restrictions to navigation (only affects upper part of Main 3-4)	Log jams Sediments Low flow	Stream flow variation <hr/> Stream bank erosion Upstream runoff

PROGRESS TO DATE

CSO Control Efforts

In 1992, The U.S. Environmental Protection Agency (EPA) provided \$46 million to Wayne County to fund the Rouge Project with a primary goal of establishing a watershed-wide approach to addressing the problems of an urban river. This meant looking beyond the obvious impacts (i.e., Combined Sewer Overflows) to matters of recreational use and habitat restoration. While final design decisions for the major civil structures remained with the local communities, the Rouge Project provided overall coordination to encourage substantial differences among the designs commensurate with the intent of the demonstration project.

As a result of this effort, many Combined Sewer Overflows (CSOs) have been controlled in the Main 3-4 Subwatershed. Two CSO retention/treatment basins were constructed in Detroit and one each in the City of River Rouge and in the City of Dearborn. Another CSO facility is planned in the City of Dearborn. The four constructed basins alone serve an area over 16,000 acres. An added benefit is that the areas surrounding the basins have been enhanced with tennis courts, basketball courts, play areas, native plants, trees and landscaping.

In addition to providing several million dollars in grants to communities to help separate combined sewers and/or construct retention basins to store and treat CSOs, the Rouge Project has funded local community pilot projects that demonstrate how other sources of pollution can be controlled. A part of the Rouge Project has also included extensive monitoring of the water quality and related aquatic habitat of the river to measure progress and pinpoint areas that need further attention.

GATEWAY PROJECT

The Rouge River Gateway project is exploring solutions to restore the area's natural landscape with riverfront parks and removal of portions of the concrete channel. If successful, the re-naturalization of the river's banks will enhance aquatic life, habitat and aesthetics.

The Gateway Project is initiating a detailed master plan in coordination with the Rouge Program Office. Funding is being made available through stakeholder donations and the Rouge Project. Proposals for improvements include:

- **The Rouge Heritage 2000 Visitor Center**
- **Riverfront Park in Melvindale**
- **Oxbow Restoration**
- **Non-Motorized Trail**
- **Channelized River Restoration**

WATER FESTIVAL

Since 1998, the Wayne County Rouge Program Office and the University of Michigan/Dearborn have sponsored a Water Festival for fifth-graders from schools around the watershed. The Water Festival is a one-day event designed to teach students about the numerous ways in which water affects their daily lives. Presentation topics include municipal, agricultural and industrial uses, the hydrologic cycle including weather, water and wastewater treatment, soil erosion, wetlands, and wildlife. Presenters are encouraged to develop hands-on presentations that will keep students interest while communicating knowledge of our most precious resource – water. Some 1500 students attended the 2001 Water Festival.

NATIVE WILD FLOWERS AND GRASSES

Through its storm water grant program, The Rouge Program Office has funded two projects in Detroit parks in the Main 3-4 Subwatershed. Nearly three acres of wildflowers such as Purple Coneflower, Blackeyed Susan, Wild Lupine and Butterfly Weed were planted at Eliza Howell Park in the fall of 2000. In nearby Rouge Park, the largest park in the City of Detroit, nearly 15 acres of wet meadow plants, prairie grasses and wild flowers were planted.



Figure 5: Conceptual drawing of the Rouge Park Improvement Project

DESIGNATED USES & GOALS

Main 3-4 Subwatershed Designated Uses

The State of Michigan and Federal water quality programs establish designated uses for all surface waters. The MDEQ has determined that ten uses are impaired throughout most of the watershed and eight uses are impaired in the Main 3-4 Subwatershed. The use impairments are ranked in order of importance to restoring the river, as determined by the MDEQ and the RRAC in 1994. They are as follows:

- Rank 1 - Restrictions on swimming and other water-related activities
- Rank 2 - Loss of fish and wildlife habitat
- Rank 3 - Degradation of fish populations
 - Degradation of benthos
 - Degradation of Wildlife Populations (impairment unknown; further study needed)
- Rank 4 - Eutrophication or growth of undesirable algae
 - Degradation of aesthetics
- Rank 5 - Restrictions on fish consumption
- Rank 6 – Bird or Animal Deformities or Reproductive Problems (impairment unknown; further study needed)
- Rank 7 - Restrictions on dredging activities
- Rank 8 - Fish tumors or other deformities
- Rank 9 – Tainting of Fish and Wildlife Flavor (impairment unknown; further study needed)
- Rank 10 - Restrictions to navigation

To create an effective watershed management plan, watershed concerns must be identified and linked to one or more designated uses. Various stakeholders have noted watershed concerns since 1989 when the first Rouge River Remedial Action Plan (RAP) was published. The RAP is considered a living document and updates have been made in 1994 and 1998 as significant progress has been made in some areas. The 1998 RAP report summarizes the watershed concerns and progress that has been made by members of the Main 3-4 Subwatershed Advisory Group.

PRIORITIZE POLLUTANTS

In order to reach goals on a subwatershed basis, it is important to identify the pollutants or threats that are detrimental to designated and desired uses. To restore the subwatershed, we also need a good understanding of the sources and causes of the pollutants or threats. Table 3 shows the prioritized pollutants, or threats to river quality, in the Main 3-4 Subwatershed, relates the pollutants or threats to the affected designated or desired uses, and lists their prioritized sources and causes. This prioritization is based on various factors such as the SWAG prioritization, a consideration of the magnitude of the source in the subwatershed, as well as review of past studies that indicate which source may be contributing the most problems in the subwatershed. This prioritization has assisted the SWAG in identifying and prioritizing which pollutant should be addressed first and with which best management practices.

Table 4: Prioritized Pollutants or Threats to River Quality, in the Main 3-4 Subwatershed

PRIORITIZED POLLUTANTS OR THREATS TO RIVER QUALITY	DESIGNATED (OR DESIRED USES) AFFECTED	SOURCES (K=KNOWN, S=SUSPECTED)	CAUSES (K=KNOWN, S=SUSPECTED)
1. <i>E. coli</i> bacteria	<ol style="list-style-type: none"> 1. Partial body contact recreation 2. Total body contact recreation 	<ol style="list-style-type: none"> 1. Human waste from failing septic systems (k) 2. Illicit connection to the storm sewer (s) 3. Sanitary Sewer overflows (k) 4. Combined sewer overflows(s) 	<ol style="list-style-type: none"> 1. Need for septic system maintenance education, inspection, correction (k) 2. Need for illicit connection investigation, correction (s) 3. Need for education about disposing of pet waste (s) 4. Need for education about controlling waterfowl waste (s) 5. Complete SSO control program 6. Complete CSO control program
2. Total suspended solids (sediment)	<ol style="list-style-type: none"> 1. Warmwater fishery 2. Indigenous aquatic life and wildlife 3. (Developing and enhancing recreational uses in and along the river system; enhancing aesthetics) 	<ol style="list-style-type: none"> 1. Construction sites (k) 2. Roads/streets/highways (k) 3. Eroding stream banks (s) 4. Agricultural land (s) 5. Livestock in streams (s) 	<ol style="list-style-type: none"> 1. Need for aggressive soil erosion and sedimentation controls or enforcement (k) 2. Need for enhanced street sweeping/cleaning program (s) 3. Need for riparian vegetation (k) 4. High wet weather flows (k) 5. Need for agricultural best management practices to reduce soil erosion (s) 6. Livestock access to streams (s)
3. Nutrients	<ol style="list-style-type: none"> 1. Warmwater fishery 2. Indigenous aquatic life and wildlife 3. Partial body contact recreation 	<ol style="list-style-type: none"> 1. Residential lawns (k) 2. Failing septic systems (s) 3. Illegal connection to the storm sewer (s) 4. Golf courses (k) 5. Streets (k) 6. Agricultural fertilizers 	<ol style="list-style-type: none"> 1. Need for education about proper fertilization and soil testing practices for residents, golf courses, agricultural landowners (k) 2. Need for improved street sweeping (s)

PRIORITIZED POLLUTANTS OR THREATS TO RIVER QUALITY	DESIGNATED (OR DESIRED USES) AFFECTED	SOURCES (K=KNOWN, S=SUSPECTED)	CAUSES (K=KNOWN, S=SUSPECTED)
	4. Total body contact recreation 5. (Developing and enhancing recreational uses in and along the river system; enhancing aesthetics)	and livestock waste (s) 7. Waterfowl and pet waste (s)	3. Need for septic system maintenance education, inspection, correction (s) 4. Need for illicit connection inspection, correction (s) 5. Need for proper manure management of livestock (s) Need for education about waterfowl and pet waste (s)
4. Land Use Change/Loss of natural features (especially the riparian corridor)	1. Warmwater fishery 2. Indigenous aquatic life and wildlife 3. (Developing and enhancing recreational uses in and along the river system; enhancing aesthetics)	1. New development (k) 2. Older, urban development/redevelopment (k)	1. High development pressures (k) 2. Need for master plans and zoning ordinances that reflect conservation planning (k) 3. Need for protective ordinances/enforcement (k) 4. Need for education about innovative options for developers, local officials, judges (k) 5. Lack of public awareness (s) 6. Need for recreation planning (s) 7. Need for restoration in older, urban areas (k)
5. Flow variability	1. Warmwater fishery 2. Indigenous aquatic life and wildlife 3. (Developing and enhancing recreational uses in and along the river system;	1. Urban storm water (k)	1. Loss of wetlands and other natural features (k) 2. Urban areas with no on-site detention (k) 3. Directly connected impervious surfaces (k) 4. Detention ponds not functioning to highest standard (s)

PRIORITIZED POLLUTANTS OR THREATS TO RIVER QUALITY	DESIGNATED (OR DESIRED USES) AFFECTED	SOURCES (K=KNOWN, S=SUSPECTED)	CAUSES (K=KNOWN, S=SUSPECTED)
	enhancing aesthetics)		
6. Temperature increase (decreasing dissolved oxygen, decreasing habitat for fish and insects)	1. Warmwater fishery 2. Indigenous aquatic life and wildlife 3. (Developing and enhancing recreational uses in and along the river system; enhancing aesthetics)	1. Impervious surfaces (s) 2. Lack of riparian vegetation (k)	1. Need for incentives and regulations to decrease impacts of impervious surfaces in new developments (k) 2. Need for education and support for disconnecting impervious surfaces in urban areas (k) 3. Need for regulations, incentives, education, and support for preserving or restoring riparian vegetative cover (trees, overhanging vegetation for shade) (k)
7. Toxics/Heavy metals	1. Warmwater fishery 2. Indigenous aquatic life and wildlife 3. (Developing and enhancing recreational uses in and along the river system; enhancing aesthetics)	1. Atmospheric deposition (s) 2. Construction materials (s) 3. Automobile break linings and tires (k) 4. Household Hazardous Waste (s)	5. Need for air quality control (k) 6. Need for education regarding best construction practices (s) 7. Need for “ultra urban” underground storm water treatment devices (s) 8. Need for education and support for business and household hazardous waste disposal (s)

LONG TERM GOALS FOR THE MAIN 3-4 SUBWATERSHED

The Main 3-4 SWAG has considered public comment, the results of a public survey, and the watershed impairments and has created the following goals and objectives.

1. Improve water quality in the Rouge River and restore impaired uses.
 - Reduce pollutant loading in storm water.
 - Reduce solids loading to the river.
 - Reduce contribution of nutrients.
 - Increase dissolved oxygen.
2. Remove sources of pollution that threaten public health
 - Finalize plans and schedules for addressing remaining CSOs.
 - Develop detailed plans and approved schedules for satisfactorily addressing known SSOs.
 - Identify and remove illicit discharges and illicit connections.
3. Educate the public regarding their impact on the River and the River's existing and future potential as a community asset and recreational resource.
 - Conduct public education and public participation programs.
 - Encourage riparian landowners to manage their waterfront as an asset to enhance property values.
 - Encourage use of parklands adjacent to the river.
 - Inform residents of the costs and benefits involved in restoring the river.
4. Improve the water quality of the river to increase recreational opportunities and remove fish consumption advisories.
 - Address concrete channel (as much as possible) to improve habitat for fish and wildlife.
 - Reduce flood and bank erosion damage to riparian properties and destruction of fish and wildlife habitat.
5. Enhance and preserve habitat, especially next to the river, for fish and wildlife compatible with subwatershed land uses.
 - Continue to seek grants to implement projects such as:
 - U of M Dearborn Environmental Interpretive Center and Programs
 - Melvindale park and trail
 - Henry Ford Museum Oxbow restoration
 - Provide more fishing opportunities as water quality and habitat improves
 - Maintain and protect identified meadows and wildlife corridors
 - Establish a vegetative buffer to protect riparian habitat along the River and its tributaries.
 - Protect wetlands and other natural features that serve to store water during storm events.
 - Stabilize banks that are significant sources of sediment loading to the river.
6. Reduce water volumes and velocities in the river during a storm event to minimize bank erosion and flooding.
 - Reduce flood and bank erosion damage.
 - Require on-site detention/retention of storm water and snow melt for new commercial, multi-family residential and industrial developments and redevelopments. (where possible)
 - Encourage innovative site designs for new developments to reduce impermeable surfaces and encourage infiltration of water.

MANAGEMENT ALTERNATIVES

Action Plans By Main 3-4 Communities

Individual action plans were established on a community-by-community basis. These proposed actions were tabulated and became the foundation of the subwatershed plan. These proposed actions are also the basis on which each community will develop a SWPPI. The SWPPI will be the responsibility of each permittee.

To establish an action plan, each community evaluated the water quality concerns in its community and proposed a series of actions to address these concerns. These actions were then grouped with the actions of other communities and matched with the management alternative. This allowed the SWAG members to estimate the level of improvement that would be expected should all of the actions be implemented.

In general SWAG members developed a list of management actions that included actions currently being carried out, planned actions and new initiatives. Short term actions are defined as those to be completed by 2005. These actions will likely become part of the SWPPI for each community. These lists were developed by a team that usually included the Director of Public Works, the City Engineer, and the Director of Parks and Recreation. Where possible both the cost and the completion date were estimated for each management action. Table 5 shows an example of a Management Action List prepared by the City of Dearborn, which makes up nearly a quarter of the subwatershed.

Table 5: Management Action Lists

NUMBER	ACTION	SHORT TERM	LONG TERM	NEW INITIATIVE?
D1	Ford Field bridge replacement	7/01		X
D2	Streambank stabilization/Ford Field multiple sections Brady to Military	10/03		X
D3	Ford Field pond restoration	10/03		X
D4	Storm dispersion at Military spread out southwest through woods	4/02		X
D5	Mailing to riparian land owners on BMPs with Rouge Repair Kit, 1,000 mailings at \$3	4/01		X
D6	IDEP testing/study	11/01	X	
D7	H/H modeling for bank stabilization	12/00		
D8	TV inspection for storm drain	12/05	X	X
D9	GIS – storm sewer database	10/02	X	X
D10	Public education Web site	4/01	X	X
D11	Increase Infiltration in Ford Field	7/01	X	X
D12	Study of Streambank in city-owned golf course			X
D13	-Buy/rent/Menzie muck -In-house manpower with volunteers	11/03 11/03		X
D14	Repair/restore erosion at major drainage structures	10/05	X	
D15	Catch basin cleaning/repair	X	X	
D16	Street sweeping	X	X	
D17	Leaf removal	X	X	
D18	HHW program	X	X	
D19	Build new salt storage facility	Complete		X
D20	Yard waste composting program	X	X	
D21	Rain barrel project FOTR grant	Current		X
D22	Maintain green roof on city hall	X	X	
D23	CSO -Cured in place lining (in situ form)	X		
D24	TV inspection of CSO	X	X	X
D25	CSO – A, B and Roulo Creek			
D26	Dearborn share of DWSD – CSO			
D27	Down spout disconnection program/ordinance	X	X	X
D28	SSO identification	X	X	

BEST MANAGEMENT PRACTICES (BMPs)

BMPs are a vital component of a storm water management program. BMPs address specific storm water pollution issues and can be implemented individually or in series. Some are better suited to newly developed communities, while others will work as retrofits on existing systems. The following is a brief summary of each BMP that is included in this management plan and will consequently be used in the community Storm Water Pollution Prevention Initiatives. The BMPs are organized in the following categories: reduce peak flows, reduce sediment loads, reduce sanitary wastewater pollution, preserve/increase habitat, enhance recreational activities, reduce chemical pollutants and educate the public.

Following the development of subwatershed goals, the SWAG identified and selected the BMPs that would address these rather broad goals. The BMPs, selected by the Main 3-4 SWAG to address the known impairments, were categorized broadly in Table 6.

MATRIX OF ACTIONS VERSUS GOALS

The next challenge was to compare the list of proposed actions identified by each SWAG community with the short- and long-term goals identified by the SWAG as a whole, as well as the Best Management Practices. Questions that needed to be addressed included:

- Have all the goals been addressed at some level?
- Collectively, will the actions identified “solve” the problem?
- Should additional goals be included?
- What other actions can be accomplished through collaboration among communities?
- What actions can/should be accomplished by others such as Michigan Department of Transportation, Wayne County Parks and the Michigan Department of Environmental Quality, etc?
- Have the communities controlled their storm water to the maximum extent practicable?
- Are water quality standards going to be met?

Table 6 presents in relation to both goals and BMPs. The alphanumeric actions designated from each community were then placed within a matrix of the subwatershed goals to depict which goal and BMP best corresponds to a particular action.

Table 6: Main 3-4 BMP Categories

BMP CATEGORIES	
REDUCE PEAK FLOWS	
<ul style="list-style-type: none"> • Reduce directly connected impervious surfaces • Slow storm water runoff draining to river • Install retention/infiltration basins 	<ul style="list-style-type: none"> • Construct/maintain storm water infiltration devices • Construct/maintain wet detention ponds
REDUCE SEDIMENT LOADS	
<ul style="list-style-type: none"> • Control soil erosion • Perform sewer system cleaning • Perform catch basin cleaning • Construct/maintain detention and/or retention ponds • Construct/maintain media filters 	<ul style="list-style-type: none"> • Utilize soil stabilization measures for construction activities • Install/maintain sediment trapping devices • Utilize streambank stabilization measures • Prevent and remove stream obstructions • Install/Maintain in-line sewer treatment devices
REDUCE SEWAGE ENTERING THE RIVER	
<ul style="list-style-type: none"> • Identify and control untreated CSOs • Identify and control SSOs w/o causing basement flooding • Identify and eliminate illicit discharges 	<ul style="list-style-type: none"> • Identify and eliminate failing OSDS • Perform septic system/sanitary sewer maintenance • Maintain infrastructure
PRESERVE/INCREASE HABITAT	
<ul style="list-style-type: none"> • Preserve and enhance existing wetlands • Preserve, enhance, and support wetland banking program 	<ul style="list-style-type: none"> • Construct wetlands • Use habitat restoration techniques
ENHANCE RECREATIONAL ACTIVITIES	
<ul style="list-style-type: none"> • Reduce geese populations • Land Use Planning and Management 	<ul style="list-style-type: none"> • Continue/expand litter and debris clean up
REDUCE CHEMICAL POLLUTANTS (INCLUDING NUTRIENTS)	
<ul style="list-style-type: none"> • Street Sweeping • Reduce fertilizer and phosphorous discharging to river • Household hazardous materials management programs 	<ul style="list-style-type: none"> • Support environmentally friendly lawn and garden maintenance • Install/maintain oil and grease trap devices
EDUCATE THE PUBLIC	
<ul style="list-style-type: none"> • Develop and implement public participation program 	

EVALUATION OF PROPOSED ALTERNATIVES

The following is an example of how some of the City of Dearborn’s actions previously discussed, fit into a BMP Category.

REDUCE PEAK FLOWS

Reduce Directly Connected Impervious Surfaces

Utilizing a Low Impact Development Plan can reduce directly connected impervious surfaces. Low Impact Development Plans combine a hydrologically functional site design with pollution prevention measures to compensate for land development impacts on hydrology and water quality. The result will be a reduction in storm water peak discharge, a reduction in runoff volume and the removal of storm water pollutants. This can apply to new residential, commercial and industrial developments and sites that are undergoing major redevelopment.

NUMBER	ACTION	SHORT TERM	LONG TERM	NEW INITIATIVE?
D21	Rain barrel project FOTR grant	Current		X
D27	Down spout disconnection program/ordinance	X	X	X

Slow Storm Water Runoff (Storm water Storage Facilities)

Storm water storage facilities are source control devices designed to retard flow sufficiently to reduce sewer overflows, prevent downstream flooding and/or reduce erosive velocities. These facilities consist of storage tanks connected to the existing drainage system, street storage and parking lot storage. Retrofitting storage into existing drainage systems can be very expensive and rarely recommended. Improperly sized and sited storage facilities can also cause localized parking lot and street flooding, icing in winter months and increased downstream flooding.

NUMBER	ACTION	SHORT TERM	LONG TERM	NEW INITIATIVE?
D4	Storm dispersion at Military spread out southwest through woods	4/02		X
D11	Increase Infiltration in Ford Field	7/01	X	X
D21	Rain barrel project FOTR grant	Current		X
D27	Down spout disconnection program/ordinance	X	X	X

Construct/Maintain Wet Detention Ponds

Wet detention ponds are small man-made lakes with emergent wetland vegetation around the banks designed to capture and remove particulate and certain dissolved constituents. Wet ponds are ideal for large, regional tributary areas (10 to 300 acres) where there is a need to achieve high levels of particulate and some dissolved nutrient removal. The pond should be sized to treat runoff, accumulate sediment and route floods. The outlet should be sized based on the design method. The pond should be configured for aesthetics, safety and maintenance.

Construct/Maintain Storm Water Infiltration Devices

Storm water infiltration basins are any storm water device or system, which causes the majority of runoff from small storms to infiltrate into the ground rather than be discharged to a stream. Most infiltration devices also remove waterborne pollutants by filtering the water through the soil. Storm water infiltration can provide a means of maintaining the hydrologic balance by reducing impervious areas. Infiltration devices could include any of the following: basins, trenches, permeable pavement, modular pavement or other systems that collect runoff and discharge it into the ground. Infiltration devices should only be used on locations with gentle slopes, permeable soils and relatively deep water tables and bedrock levels. Typical long-term pollutant removal rates for infiltration basins and trenches range from 75 to 90% for sediment, metals, bacteria and BOD, 50 to 70% for phosphorus, and 45 to 60% for nitrogen. The removal rates for porous pavement range from 80 to 99% for sediment, nitrogen, organic matter, zinc, and lead, and 65% for phosphorus.

NUMBER	ACTION	SHORT TERM	LONG TERM	NEW INITIATIVE?
D3	Ford Field pond restoration	10/03		X

METHODS TO MEASURE PROCESS

Measuring the ultimate effectiveness of the Subwatershed Management Plan in meeting the 6 goals that have been established will take years if not decades and presents a significant challenge. Each Storm Water Pollution Prevention Initiative (SWPPI) developed by communities under the Voluntary Permit will include a set of actions with implementation schedules and corresponding methods to measure progress. In some cases this will entail reporting on completion of projects & studies, implementation of BMPs, development of ordinances and/or public involvement programs. In other cases water quality standards such as dissolved oxygen, bacteria counts, suspended solids, and phosphorus concentrations will be monitored and evaluated. To evaluate the long-term progress, the Main 3-4 SWAG, the RPO and the USGS have worked cooperatively to establish a long-term water quality monitoring program at the current USGS gauging stations. This data coupled with the associated flow information will allow the SWAG to evaluate the cumulative affect of the actions taken by each community. The measurement program presented below is intended to be a low-cost means of evaluating incremental progress toward achieving water quality standards on a subwatershed basis. Compliance of each individual permittee will be addressed in their SWPPI.

Of equal importance is the recognition that the Main 3-4 will continue to experience the impacts of CSOs, SSOs and contaminated sediments beyond the 5-year timeframe of the short term objectives/actions. For this reason comprehensive chemical monitoring is not proposed in the near term. As the effects of the proposed capital projects are realized (Phase II CSO control, SSO control and restoration of the paved portions of the river channel) the improvements in water quality will also be realized.

PROCESS FOR REVISING THE PLAN

The main purpose of the Subwatershed Management Plan (SWMP) is to identify and implement actions needed to restore designated uses and resolve water quality and quantity concerns. As stated in the permit language, the long term goals of this voluntary permit “shall include protection of designated uses of the receiving waters as defined in Michigan’s Water Quality Standards”. These designated uses are as follows:

- Agriculture
- Industrial water supply
- Public water supply at the point of intake (not applicable to Rouge)
- Navigation
- Warmwater fishery or cold water fishery (Johnson Creek)
- Other indigenous aquatic life and wildlife
- Partial body contact recreation
- Full body contact recreation between May 1 and October 31.

The SWMP must be reviewed and revised (if necessary) 2 years after it is submitted. Although the SWMP does not need to be formally approved by MDEQ (as the SWPPIs do) communities will not be eligible for CMI funds unless their WMP is formally approved by the MDEQ. Revision of the SWMP does require additional public involvement.

The schematic diagram shown in Figure 6 illustrates the revision process.

If the SWMP needs revision the Subwatershed Advisory Groups will meet to develop the revised plan. EPA and MDEQ view the application of the Maximum Extent Practicable (MEP) standard as an iterative process. As stated in the Phase II Storm Water Permit Text: “Successive iteration of the mix of BMPs and measurable goals will be driven by the objective of assuring maintenance of water quality standards.” In many cases the process of meeting water quality standards may take two to three permit terms (10-15 years).

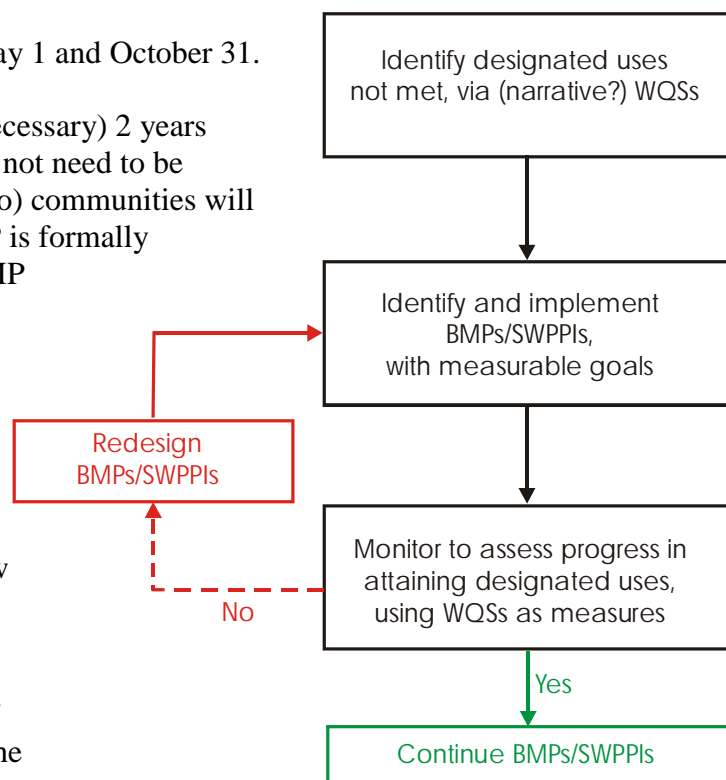


Figure 6: Revision Process

Each community (permittee) will submit an annual report to the MDEQ. This should include an explanation of progress towards goals listed in the SWMP and the status of actions listed in the SWPPI. It should also include discussions of proposed revisions/modifications to the original goals/action in the SWMP and/or SWPPI that may be needed.