

THE ROUGE RIVER PROJECT  
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# Rouge River National Wet Weather Demonstration Project

Wayne County, Michigan

## GRANT 1 FINAL PROJECT REPORT

RPO-WMGT-SR19.00

————— March 1998 —————

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Wayne County, Michigan

SUPPLEMENTAL REPORT

Grant 1 Final Project Report

We would like to thank Carl R. Johnson, Kelly A. Cave, P.E. and Sandra R. Kiser for their assistance in the preparation and completion of this document.

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## Rouge River National Wet Weather Demonstration Project

### **MISSION STATEMENT**

The mission of the Rouge River National Wet Weather Demonstration Project is to demonstrate effective solutions to water quality problems facing an urban watershed highly impacted by wet weather and develop potential solutions and implement projects which will lead to the restoration of water quality in the Rouge River. The project will address both conventional and toxic pollutants to:

- provide a safe and healthy recreational river resource for present and future generations;
- re-establish a healthy and diverse ecosystem within the Rouge River Watershed;
- protect downstream water resources such as the Detroit River and Lake Erie; and
- help ensure compliance with federal, state and local environmental laws which protect human health and the environment.

This will be accomplished through the development, implementation and financial integration of technical, social and institutional frameworks leading to cost-efficient and innovative watershed-based solutions to wet weather problems. This watershed-based national demonstration project will provide other municipalities across the nation facing similar problems with guidance and potentially effective solutions.

## PREFACE

The Rouge River and its watershed are a primary source of pollution to the Great Lakes. The Clean Water Act of 1972 intended to make waterways "fishable and swimmable" by 1972. Although that goal has not been reached, great progress has been made in improving water quality in most waterways. The Rouge River Remedial Action Plan (RAP) provided a basis for which The Rouge River National Wet Weather Demonstration Project (Rouge Project) efforts were created: it identified the major sources of pollution and measured the relative contributions of each. The RAP is the continuing foundation for the Rouge Project and presents a framework for addressing the problems within the Rouge River by looking beyond treatment and focusing instead on prevention methods.

The Rouge Project was established under the initial Rouge Grant 1 from the United States Environment Protection Agency, Region 5, and enabled Wayne County to initiate a comprehensive watershed-wide pollution-control approach that addresses combined sewer overflow (CSO), stormwater management, and other nonpoint source controls through the application of innovative technologies, progressive financial and institutional arrangements, and creative public involvement and education programs.

Rouge Grant 2 provides the framework for the progression and implementation of Project goals as Wayne County continues its mission to develop potential solutions and implement projects which will lead to the restoration of water quality in the Rouge River. The Project will address both conventional and toxic pollutants to:

- provide a safe and healthy recreational river resource for present and future generations;
- re-establish a healthy and diverse ecosystem within the Rouge River Watershed;
- protect downstream water resources such as the Detroit River and Lake Erie; and
- help ensure compliance with federal, state, and local environmental laws which protect human health and environment.

This will be accomplished through the development, implementation, and financial integration of technical, social, and institutional frameworks leading to cost-efficient and innovative watershed-based solutions to wet weather problems. This watershed-based national demonstration project will provide other municipalities across the nation facing similar problems with guidance and potentially effective solutions.

Under Rouge Grant 2, the Rouge Project will build on lessons learned from Grant 1 efforts and focus on further integration of the goals of the overall Mission. To this end, Rouge Grant 2 concentrates on the following key Project areas:

- **Watershed Management** will continue under Rouge Grant 2 with the development and evaluation of wet weather and stormwater alternatives, the planning of long-term monitoring programs, and the ongoing efforts to enhance instream water quality, monitor rain and flow

levels, interpret data analysis, and present recommendations.

- **Nonpoint Source Pollution Control** will provide for the stormwater management, permit applications, and development of financial and institutional alternatives for wet-weather watershed management in concert with enhanced efforts to establish institutional partnerships. Toward the goal of institutional partnering, several community projects will be undertaken with watershed communities. Additional efforts include the inventory of wetlands and measurement of pollutant loads from abandoned dumps and air deposition with possible remediation of some sites.
- **CSO Construction Coordination** will continue to monitor the construction of CSO demonstration projects established under Grant 1. Additional planning and assistance will allow project coordinators to make additional recommendations on the design criteria of future CSO abatement facilities.
- **Public Involvement and Information** will reach and interact with more stakeholders, institutions, and regulatory agencies, thus fostering a renewed understanding and continued commitment to reducing pollution, and continuing the transfer of watershed management approaches way beyond the project. It will be the central mechanism for transmittal of the Project's Decision Support System tools, processes, and information necessary for sustaining a watershed management support system directly to varied audiences both within and outside the Rouge watershed.

Additional information on the Rouge River Project is available from many sources, including the Wayne County Department of Environment (WCDOE) and the Rouge Program Office (RPO).

## ABSTRACT

The *Grant 1 Final Project Report* for the Rouge Project is a concise description of achievements under Grant 1 to aid in the understanding of project expenditures. The audience is the USEPA Office of Inspector General and USEPA Project Officer. Work under EPA Grant 1 (No. #X995743-01) began in 1992 and extended to December 1997. The Rouge Project efforts continue under succeeding grants (Nos. Grant #X995743-02, 03 and 04 and #C995743-01). An *asset inventory report* is being submitted under separate cover and is not discussed in this report. This report identifies the approaches initiated under Grant 1 and includes a list of project deliverables in the appendix. Tables are also included which provide CSO basin construction information.

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**1.0 PURPOSE OF REPORT.** The *Grant 1 Final Project Report* for the Rouge River National Wet Weather Demonstration Project (Rouge Project) is a concise description of achievements under Grant 1 to aid in the understanding of project expenditures. The audience is the USEPA Office of Inspector General and USEPA Project Officer. Work under EPA Grant 1 (No. #X995743-01) began in 1992 and extended to December 1997. The Rouge Project efforts continue under succeeding grants (Nos. Grant #X995743-02, 03 and 04 and #C995743-01). An *asset inventory report* is being submitted under separate cover and is not discussed in this report.

**2.0 PROJECT BACKGROUND AND OVERVIEW.** The Rouge Project is a working example of the direction of the current discussion on national policy for stormwater and watershed management. In 1992, the project began developing demonstration projects for CSO control to determine optimal sizing for long-term control projects. A number of successes have been achieved to-date. Data from full-scale construction projects in pilot areas started to be generated in 1997. Stormwater management plans based on a locally-directed watershed approach are currently under development. Pilot best management practices (BMPs) projects are currently being implemented to support the decision-making for attainment of desired uses of the river. A variety of other activities important to use attainability are being explored such as creation of wetlands, dealing with abandoned dumps, dealing with contaminated sediments, protection and restoration of habitat, involving the public in watershed decision-making, and management of on-site sewage disposal systems. The CSO data suggests that large storms may have a different water quality impact than small storms. This could result in significantly reduced costs when communities move from implementation of nine minimum controls to long term control plans. Recreational use in the watershed has increased by opening up a stretch of the river to canoeing. This action has created new hopes and expectations for further increased use, some of which may be very difficult to achieve. The separate stormwater communities have begun to understand how they are part of the water quality problems. Although they are traditionally very independent, they are finding ways to work together voluntarily to address issues such as illicit connections, public education and implementation of BMPs. We are moving towards integration of all pollution sources and use attainment into a unified, consistent watershed management approach, but we recognize that it has not yet been achieved.

The Rouge Project is a comprehensive program to manage wet weather pollution to and restore the water quality of the Rouge River, a tributary to the Detroit River in Southeast Michigan which has 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. Sources of pollution to the river include industrial and municipal point sources, CSOs, stormwater runoff, interflow from abandoned dumps, and resuspension of contaminated sediment. Approximately 50 percent of the watershed is served by separate sewer systems, with an additional 20 percent of the watershed served by combined sewers and the remaining area unsewered.

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. CSO control is being implemented in phases, with Phase 1 currently underway. Eight communities are constructing 10 retention treatment basins to serve 35.1 acres of combined sewer system. Each of these basins is sized for different design storms or employ innovative technology. One retention/treatment tunnel is under construction in 1 community, containing 3.2 square miles of combined sewers. The physical and process details of the basins are contained in *Table 2.1*. The first of the basins listed above began to come on-line in 1997. Construction

TABLE 2.1 - CSO CONSTRUCTION COSTS

WAYNE COUNTY  
**Rouge River Demonstration Project**  
 EPA Grant No. X995743-01 (GRANT 1)  
**CSO Construction**

CSO Innovative Processes

- Dearborn Heights
- Detroit/Puritan-Fenkell
- Detroit/Seven Mile
- Oakland County/Acacia Park
- Oakland County/Bloomfield Village

Total cost for Innovative funding  
 CSO construction (Plymouth T. - 2nd Segment)  
 Total CSO Funding

<i>Federal and Local Shares</i>		
Grant Share	Min Local Match	Item Total
4,898,200	257,800	5,156,000
433,200	22,800	456,000
474,050	24,950	499,000
262,200	13,800	276,000
339,150	17,850	357,000
6,406,800	337,200	6,744,000
<u>167,941</u>	<u>137,406</u>	<u>305,347</u>
6,574,741	474,606	7,049,347

of separated sewers in 6 communities containing 3.5 square mile of combined sewers is nearing completion. Details of these projects are listed in *Table 2.2*. A two-year evaluation study of the CSO control program began on June 1, 1997. These results, coupled with efforts to control stormwater and other pollution sources in the watershed, will provide the basis for the Phase 2 CSO control efforts.

Wetlands were constructed in Grant 1. In Grant 2 (#X995743-02), an expanded program of innovative stormwater control technologies are being evaluated under the Rouge Project. A total of 60 pilot stormwater management projects are being implemented throughout the watershed by 25 different communities and agencies. Categories of pilot stormwater management projects currently underway include wetlands creation and restoration, structural practices such as grassed swales and detention ponds, pollution prevention programs such as the Rouge Friendly Business Program and other public education and involvement efforts, erosion control, streambank stabilization and habitat restoration, and sewage management such as a program to detect and eliminate failing septic systems.

The results of the CSO and stormwater pilot projects are being incorporated in the detailed watershed management planning ongoing throughout the 438 sq. mi. watershed in conjunction with the 48 watershed communities and state regulators. This effort is supported by three years of water quality and ecosystem monitoring and development of management tools such as a Geographic Information System (GIS) and continuous simulation watershed/water body computer models. The watershed management efforts are also supported by an extensive public information and outreach campaign. Identification of means to attain beneficial use of the resource at lower costs is continuously strived for, recognizing that future grouts to other watersheds are unlikely.

**2.1 PROGRAM MOTIVATION/HISTORY.** Completion of the Rouge River Remedial Action Plan (RAP) in 1987 and development of a CSO control strategy in Michigan caused the Michigan Department of Environmental Quality (formerly Department of Natural Resources) to issue NPDES permits to control CSOs. The permits pushed the communities in the Rouge River watershed to action since the communities felt the standards imposed by the permits were too onerous. Contested permits led to U.S. District Court involvement and a compromise demonstration program, consisting of a 2 phase CSO control program with a base level of abatement construction throughout the watershed in Phase 1 followed by assessment of water quality impacts and future construction phases to meet public health and water quality standards. The MDEQ NPDES permits reflect the agreement for demonstration. An EPA demonstration grant, "Grant 1," for this innovative watershed approach in an urban area was authorized by Congress in 1992 and four additional grants have been authorized. Wayne County, Michigan, is the grantee and allocates funds to the watershed communities and agencies through intergovernmental agreements.

As the Rouge Project efforts have evolved, it has become clear that the CSO control efforts

TABLE 2.2 - CSO & STORMWATER PROJECTS

WAYNE COUNTY <i>Rouge River Demonstration Project</i> EPA Grant No. X995743-01 (GRANT 1) <i>CSO &amp; Storm water project</i>	<i>Federal and Local Shares</i>		
	Grant Share	Min Local Match	Item Total
<b>Contractual</b>			
Landfill Site Closure (Dearborn Heights)	129,372	0	129,372
Phase I Plan & Design (P&D)			
Dearborn	1,759,332	195,481	1,954,813
Dearborn Heights	961,233	106,804	1,068,037
Detroit	5,613,028	623,670	6,236,698
Garden City	860,974	95,664	956,638
Inkster	889,212	98,801	988,013
Livonia	91,959	10,218	102,177
Oakland County/Acacia Park	734,880	81,653	816,533
Oakland County/Birmingham	1,688,605	187,623	1,876,228
Oakland County/Bloomfield Hills	93,547	10,394	103,941
Oakland County/Bloomfield Village	1,215,009	135,001	1,350,010
Plymouth Township	91,945	10,216	102,161
Redford Township	841,868	93,541	935,409
River Rouge	789,671	87,741	877,412
Wayne	510,266	56,696	566,962
Westland	321,662	35,740	357,402
<b>Total Contractual</b>	<b>16,592,562</b>	<b>1,829,243</b>	<b>18,421,806</b>
<b>Construction/Implementation</b>			
Wetlands	464,826	0	464,826
BMPs	97,365	0	97,365
Landfill Site Closure (Dearborn Heights)	473,939	0	473,939
CSO Innovative Processes			
Dearborn Heights	4,898,200	257,800	5,156,000
Detroit/Puritan-Fenkell	433,200	22,800	456,000
Detroit/Seven Mile	474,050	24,950	499,000
Oakland County/Acacia Park	262,200	13,800	276,000
Oakland County/Bloomfield Village	339,150	17,850	357,000
CSO construction (Plymouth T. - 2nd Segment)	172,580	141,201	313,781
<b>Total Construction</b>	<b>7,615,510</b>	<b>478,401</b>	<b>8,093,911</b>

alone will not achieve the water quality and beneficial use objectives for the river. Therefore, the Rouge Project team, comprised of communities and counties, industries, local/regional agencies, MDEQ, and USEPA, is working to develop a consensus-based design for a watershed-wide stormwater management and permit program meeting the needs of all local communities while focusing on the instream water quality issues facing the Rouge River watershed.

**2.2 PROGRAM IMPLEMENTATION.** As described above, first elements of the program (Grant 1) revolved around the implementation of the Phase 1 CSO control facilities and measures to quantify in detail the impacts to the river of all pollutant sources in the watershed. Water quality and ecosystem monitoring has involved an extensive effort in the collection, management, and analysis of data on rainfall, stream flow, instream water quality, CSO and stormwater quality, biological communities and habitat, instream bottom sediment, air deposition, and aesthetic conditions. In addition, the monitoring program includes measurement of the performance of various structural controls, wetlands, and non-structural BMPs. During 1994 and 1995, approximately 17,000 water quality samples were analyzed for conventional and priority pollutants and bacteria. Samples were taken of stream water quality, sediments, CSO and stormwater. The 1996 biological sampling involved a comprehensive assessment at 83 sites along 200 miles of waterway. Bottom sediment samples at over 180 locations were also analyzed for a variety of parameters. The Rouge Program Office worked in close cooperation with the USGS, Michigan Department of Environmental Quality, University of Michigan, Wayne State University, and Wayne County Department of Environmental Health in the development and execution of the monitoring. The sampling data showed that low dissolved oxygen levels and high bacteria levels were a problem in many areas of the watershed, including locations upstream of the combined sewer areas.

In Grant 1, a series of computer models have been developed to simulate the loadings and water quality response of the watershed under existing conditions and proposed future pollution management scenarios. Loading models include the RUNOFF, EXTRAN and TRANSPORT blocks of the Stormwater Management Model (SWMM). The instream water quality model is WASP, which has been calibrated and verified for the dissolved oxygen cycle over 120 miles of the four branches of the Rouge.

The Grant 1 monitoring and GIS efforts resulted in new work under Grant 2 to develop a series of water quality indicators that serve as a means of communicating information on water quality to the general public. These indicators are based on the Michigan Water Quality Standards, but they simplify the quantitative reporting of data by using icons related to various uses of the river, and rating individual river segments with colors red, yellow, and green representing poor, fair, and good water quality. These indicators will also be used to explain the expected improvements associated with proposed pollution control activities in the watershed.

Analysis of water quality data and computer model simulations led to the development of a strategy for managing with stormwater in the watershed. Under the Clean Water Act, stormwater NPDES permits are currently only required of one of the 48 communities in the watershed. It was realized that a watershed wide strategy was needed to address stormwater impacts. The first steps of this strategy are underway and include:

- A. Watershed wide stormwater and instream monitoring program.
- B. Demonstration and pilot projects in selected subwatersheds to evaluate alternative approaches to remediate stormwater pollution sources and mitigate the impacts of excessive flows.
- C. Analyze legal options for managing stormwater on the bases of hydrologic or watershed boundaries.

The greatest challenge that the project has faced has been the need to develop consensus and encourage participation by Counties, Cities, and Townships, regulators, and the public in the watershed approach to wet weather management. This challenge is being met through the effort to develop the consensus-based design for a watershed-wide stormwater management and permit program mentioned earlier. This effort attempts to the needs of all local communities while focusing on the instream water quality issues facing the Rouge River watershed. Through participation on the Wet Weather Federal Advisory Committee we are providing up-to-date information on what is working in the Rouge Project and finding new ideas to try out.

**2.3 INSTITUTIONAL STRUCTURE.** Wayne County Michigan is the federal grantee for the Rouge Program grants. The County provides program level reports to Region V of the U.S. Environmental Protection Agency. State water quality issues are coordinated with the Michigan Department of Environmental Quality (MDEQ). Each of the communities receiving federal grant funds have entered into interagency agreements with Wayne County to establish the project parameters and administrative controls needed to achieve NPDES and Rouge River project goals. Another major participant in the effort has been the Fifth U.S. District Court. The court participated in the first round of negotiations to set up the original demonstration project and continues to participate in the development of the watershed-wide stormwater permit. The 48 local units of government and the three counties collaborate in a number of other ways, including the Clean Neighborhood and Clean Business programs. Participation is rounded out by the efforts of the Rouge Remedial Action Committee, an advisory committee formed from the International Joint Committee efforts to identify and clean up polluted waters in the Great Lakes. Additionally, the project is further enhanced by the participation of the Friends of the Rouge, a non-profit organization dedicated to clean up the river, educate children in the watershed and improve river habitat.

The wastewater collection system, with two very small exceptions, conveys all flows to the

1 billion gallon per day wastewater treatment facility owned and operated by DWSD. Cities own and operate those sewers within their boundaries. Interceptor sewers which transport flows to the wastewater treatment facility are owned and operated by Drainage Districts headed by the County Drain Commissioner/Public Works Department. The drainage districts collect their revenue from the constituent communities through sewer rates. Ordinances/Tax Authority/Zoning are all controlled at the local level. DWSD funds the wastewater treatment facility operations and capitol costs through the sewer rate.

Public involvement has been wide ranging and significant. All CSO projects were required to follow prescribed procedures under the SRF program to ensure public involvement. Some communities went farther to include meetings with neighborhood groups. The Friends of the Rouge have a major educational project to provide education to community schools about water quality issues. A major focus of the Rouge River project has been to increase public awareness of the issues. Public information efforts have included media packages, press tours, press releases, reports, presentations to public groups, Internet sites, and a variety of printed brochures, reports and newsletters.

Although grant funding from the EPA enabled Rouge Project representatives to document the effects of wet weather pollution from the Rouge River and to develop an integrated strategy for reducing this pollution, it was that CSO control alone would not provide sufficient improvements in water quality to meet the County's objectives. Polluted stormwater would continue to degrade the river. Therefore, the Rouge Project began a comprehensive analysis of an entire watershed and the pollutant sources that impact the river's water quality.

Shortly after Grant 1 was awarded, the Rouge Program Office (RPO) was organized. The RPO serves as home to Rouge Project staff, including staff from more than 15 consultants and agencies. As the RPO was organized, a Steering Committee was formed to conduct oversight of the overall effort, comment on proposed work plans, and provide interface with local communities. This group consists of representatives from the EPA, MDEQ, Wayne County, Oakland County, the City of Detroit's Water and Sewerage Department (DWSD), the City of Dearborn, and the Rouge River Watershed Council. The Southeastern Michigan Council of Governments (SEMCOG) and the U.S. District court send ex-officio representatives to Steering Committee meetings.

As the Rouge Project became more active, representatives sought technical advice on various projects. Technical Advisory Groups or TAGs have been referred to as the "best minds" for focusing on efforts and providing input. TAGs were established to provide technical input to the work effort. Membership includes local and national experts in the various disciplines represented by project work elements. TAG members comprise representatives from Wayne, Oakland and Washtenaw Counties, local technical experts and university representatives. Membership is open to representatives of each Steering Committee member and other interested parties. Regular meetings between Rouge Project staff and these TAG members allow for extensive involvement and "peer review" of the technical aspects of the project as

it unfolds.

**2.4 PROGRAM ASSESSMENT.** There is general consensus among Wayne County, the local communities in the watershed, the MDEQ and EPA Region 5 and headquarters that the Rouge River project is successful. Only time will tell how success the project is in terms of demonstrating the watershed approach to wet weather pollution problems. However, the following are examples of success to date:

- a. An intensive, watershed wide monitoring program has provided a detailed baseline of data from which to measure future water quality improvements. The monitoring has pinpointed previously unknown pollution sources which have been or are being eliminated. Monitoring experience has allowed us to design a long-term program that relies less on chemical analysis of the water column and more on ecosystem health.
- b. GIS has proven to be a very useful tool for communication, data sharing, and analysis.
- c. Empowering communities with information on pollution causes and cures, and providing funding to seed sustainable efforts, has been successful.
- d. A voluntary approach to stormwater management based on the approach outlined by the Urban Wet Weather Flows Federal Advisory Committee, has been proposed, and is expected to receive state approval later this summer.
- e. The program has heightened awareness that a comprehensive watershed wide approach to pollution abatement that considers all of the sources is the only way to effectively reach the goal of cleaning up the Rouge River.

State and Federal regulators were true partners in attempting to identify appropriate ways to make the project successful and advance the knowledge of CSO and Nonpoint control strategies. Both MDEQ and EPA Region 5 personnel participated in the decision making process to ensure that innovative approaches to solving the wet weather problems were based on sound environmental principles. All members of the various organizations, communities, and institutions who have contributed to the program are optimistic that the goal of restoring the beneficial use of the Rouge River can be reached.

**3.0 GRANT 1 ACCOMPLISHMENTS.** The Rouge Project completed several CSO projects during Grant 1, along with other accomplishments which are summarized below:

- Planning and design of 17 CSO abatement projects. This consists of 10 CSO retention basins, 1 CSO tunnel and 6 sewer separation projects. Fifteen communities are included, with the City of Detroit undertaking a total of three projects. Planning and design costs funded by the grant are \$18,421,806 (*Table 2.1*). Unique construction features include basin design of a basin demonstration size of 1 year-1 hour and 20 to 30 minute design, effluent screening, swirl separator, varying basin compartment configurations, first-flush tanks, bigger size basins for comparison purposes, and shunt channels.
- Construction of innovative features for 5 CSO basin projects for a total construction cost of \$6,744,000; and the Plymouth Township Segment 2 Sewer Separation Project for a total construction cost of \$305,347.
- Value Engineering reviews of all of the CSO abatement design projects, resulting in construction costs savings of more than \$7 million to date.
- Development and initial implementation of watershed management tools, including:
  - *Water quality sampling and monitoring network*
  - *Geographic Information System*
  - *Database management system*
  - *Computer models to predict water quality*
- Used GIS technology to identify potential illicit connections throughout the Watershed.
- Establishment of programs to educate the public on environmental management issues through information networks and schools.
- Exchange and implementation of technical recommendations through advisory meetings of environmental engineers and regulatory agency staff.
- Review of institutional options to organize, finance and implement a watershed-wide environmental management program.
- A project quality management process, including a documented Quality Management Plan, a Quality Assurance Project Plan, Standard Operating Procedures and Field Sampling Plans.
- Heightened local involvement in the organization and process of watershed management.
- Defined stakeholder groups and performed watershed-wide survey which was used in the

development of the Public Information Strategy.

- Outreach meetings with local officials throughout the watershed to discuss the goals and progress of the Rouge Project.

**4.0 GRANT 1 PROGRAM ELEMENTS.** Under Grant 1, the Rouge Project was organized into 10 Program Elements to efficiently manage the effort. These elements served as logical building blocks for the Project. Each defined a technical or operational purpose and had an overall budget established to carry out those functions. Work plans were developed for each element to define specific activities to be performed as part of the project. The work plans defined detailed tasks, levels of effort and associated costs. The 10 Program Elements as defined under Grant 1 were: *GIS/Mapping; Data Collection and Management; Sampling Program; Modeling and Decision Support; Nonpoint Source BMPs; CSO Design, Build and Test; Value Engineering; Public Information/Involvement; Financial and Institutional; and Project Coordination and Reporting.* Below, a brief summation is presented for each work element.

**4.1 GEOGRAPHIC INFORMATION SYSTEM (GIS).** The Rouge Project has developed a state-of-the-art GIS system using Environmental Systems Research Institute's (ESRI) ARC/INFO GIS software, running on SUN stations in a UNIX environment. The GIS team spear-headed a 12-month development initiative to bring a comprehensive GIS system up for use and production. This work established a management framework; selected, procured and integrated the necessary hardware and software tools; developed common specifications for data collection; identified and incorporated appropriate existing data; and developed a decision support system for organizing project results and providing a link to water quality models.

Efforts began with a needs assessment that determined the specifications of hardware and software, and defined the scope of GIS data collection. The base map was created using the Michigan Resource Information System (MIRIS) natural resource and transport data from the State of Michigan and the EPA's Reach File stream data. In the data development phase of GIS data was evaluated for suitability, accuracy and integrity. The final phase required designing ARC/INFO and ORACLE databases to store the data, and connecting the SUN/UNIX environment to the RPO Novell network for easier user access. a hydrologic data structure (HDS) model was designed to support the efforts of the project. The HDS is a data model consisting of a set of procedures for associating, managing and analyzing watershed information within the Rouge Watershed and its river network.

**4.2 DATA COLLECTION AND MANAGEMENT.** Data management activities consist of several programs designed to assist users of the millions of RPO sampling data records. Data are currently available on the ORACLE (UNIX) database and is the foundation upon which all technical watershed management decisions of the Rouge Project can be based. Those data include: data handling and storage, data useability, data management and report, and data analysis. Preliminary data reports are prepared using the Statistical Analysis System (SAS) to describe the data currently available in the ORACLE database. These data analyses and interpretation activities provide users easy access to the electronic file.

The project developed an accurate basin wide drainage map; performed an inventory of land

use and soil type over the entire basin; surveyed the existing drainage network (both natural and man-made) to establish an accurate characterization; utilized Global Positioning System (GPS) technology to accurately locate key watershed components; and, conducted field surveys to determine physical properties of the drainage network and the surrounding watershed.

RPO DataView was introduced in 1994. This Windows-based application allows end users to access, browse and query the large sampling data sets from their personal computers. It is also the primary method of distributing large volumes of data to users outside the RPO—available on floppy or CD-ROM. Another database, MS-ACCESS, was introduced during Grant 1, and will be used as a part of the Rouge Project Reference Library. MS-ACCESS describes the reports, maps and data being collected from the 48 watershed communities.

**4.3 WATER QUALITY SAMPLING.** The Rouge Project conducted an intensive large scale sampling/monitoring program throughout the Rouge River Watershed. The program was a multi-year effort designed to provide field data for defining baseline or existing water quality conditions; to support the development of watershed-wide water quality models; and to evaluate various options that are designed to control pollutants from nonpoint sources (NPS) and CSOs.

The sampling program selected appropriate subareas and river segments for analysis; identified specific locations for flow metering and sampling; located industrial or commercial facilities which may have impact on sampling results; developed a comprehensive sampling and analysis protocol; installed permanent and temporary gages, meters and samplers; conducted sampling under both dry and wet weather conditions; investigated for unexpected pollutant sources; estimated pollutant loadings from a range of sources; performed limited treatability studies to determine appropriate remedial technologies; and, provided data analysis and reporting.

The overall program was comprised of a series of sampling/monitoring plans that were designed to collect data for use in defining the water and sediment quality, aesthetics, ecological diversity, and toxicity of the Rouge River; pollutant loadings from CSOs, stormwater runoff, and other specific sources; and the effectiveness of NPS best management practices (BMPs), CSO treatment basins, or combined sewer separation. The program focused on defining conditions during wet-weather, but dry-weather monitoring was also conducted to define the differences between wet and dry. Continuous monitoring, automatic sampling, and manual grab sampling were all applied in the collection of the required data. Stations were located at instream sites throughout the watershed, at inlets and outlets of control options, and at representative discharge points. Sampling frequency ranged from as frequent as once every 5 minutes (continuous or automatic equipment) to as long as once every 2 to 24 hours (manual grabs). Sampling continues under subsequent grants.

- 4.4 MODELING.** Water quality and water quantity modeling tools are being developed to evaluate alternative watershed management options in the Watershed. The modeling program began with a survey and analysis of modeling tools. Six models were chosen during the first phase of the program: Stormwater Management Model (SWMM - EPA), SWMM RUNOFF, SWMM TRANSPORT; Water Quality Simulation Program (WASP - EPA), Hydrologic Engineering Center, and Watershed Management Model (WMM - Camp Dresser & McKee). The models are being used in a three-tiered approach. Tier 1 models select small pilot areas with various watershed management options to initially define how to simulate those options in the full watershed-wide models. Tier 2 analyzes the effects of a wide variety of BMPs on the overall runoff volumes and pollutant loads to the Rouge River. The river's response to different water management scenarios is measured by Tier 3 models. These models were used as planning tools to better understanding how various combinations of planned improvements will affect the River's overall water quality.
- 4.5 NONPOINT SOURCE POLLUTION CONTROLS.** The Rouge RAP identified NPS pollution as a significant pollutant contributor to the Rouge River. NPS pollution to the Rouge River includes: stormwater runoff, leachate and interflow from abandoned dumps, illicit connections to storm drains, bacterial contamination from failing septic systems and contaminated bottom sediments in some areas of the river, such as instream impoundments. The Rouge Project has completed several studies and will implement and evaluate various alternative methods of reducing these NPS pollutant loadings, including the use of pollution prevention activities and constructed BMPs. Specific local subareas were identified within which controls can be implemented; the project identified a range of structural (end of pipe) and non-structural (management) controls that are applicable; initiated implementation of various controls within appropriate subbasins; and, analyzed results of the controls on discharge quality and river loading.
- 4.6 COMBINED SEWER OVERFLOW.** CSO control is an important first step in the watershed-wide approach to restoring recreational uses to the entire Rouge Watershed. Wayne County, local communities, MDNR, EPA and the U.S. District Court developed a phased approach to remediate the CSO problem. Implementation of CSO structural controls will be done in two phases. Eleven retention structures will be constructed during Phase I using a variety of sizes and features. Six communities will control all of their CSOs by separating their sewers. The effectiveness of these Phase I CSO controls will help determine the best solutions to implement in Phase II, when additional CSO control structures will be built. By 2005, all uncontrolled CSO discharges to the Rouge River will be eliminated.

Grant I was used for the design of both the retention facilities and the sewer separation projects. Completion of these projects, together with required ongoing monitoring, will improve the water quality of the Rouge River and the environmental quality of the Rouge Watershed. In addition, the full-scale analysis of various CSO technologies will provide valuable insight to the decision-making process for CSO control at the national level. (*See Tables 2.1 and 2.2 - CSO Construction Costs and CSO & Stormwater Projects*)

**4.7 VALUE ENGINEERING.** To ensure project compliance with all watershed goals, all CSO projects regardless of size were formally reviewed during the design phase. The formal review, termed value engineering workshops, identified ways that each project could be improved or goals achieved at lower cost. Over 17 projects were reviewed by staff or community engineers achieving a validated cost savings of over \$16 million.

**4.8 PUBLIC INFORMATION AND INVOLVEMENT.** Public information (PI) and involvement has played a significant role in the Rouge Project and in the effort to restore the Rouge River. Seven stakeholder groups were identified and were informed about the goals and progress of the Rouge Project as well as how watershed residents' daily actions affect the condition of the River. These groups include: local officials, the business community, the technical audience, schools, environmental organizations, the media and the general public. A basic understanding of the Rouge Project and the River has resulted in a strong commitment to reducing pollution. This effort has been accomplished through written materials, community-based programs and informational workshops.

Within this group of tasks a comprehensive program of public information, community outreach, citizen involvement, technology transfer, and project reporting was provided. The project included Southeast Michigan Council of Governments (SEMCOG) and the Rouge River Watershed Council as members of the steering committee. These organizations, coupled with the ongoing water quality management efforts through the Environmental Policy Advisory Council (EPAC), the Areawide Water Quality Board (AWQB), the Rouge River Remedial Action Plan Executive Steering and Basin Committees and the FOTR helps to inform the public.

The PI work effort has supported the FOTR Rouge Education Project which targets junior and senior high school students throughout the watershed. Students have been introduced to the dynamics of the urban watershed and the sources of pollution that degrade the River through classroom activities and water quality sampling.

**4.9 FINANCIAL AND INSTITUTIONAL ARRANGEMENTS (F/I).** The Rouge Project recognizes that watershed protection will not be achieved unless the financial/institutional issues are addressed and solved. This challenge is being met head-on with a full analysis of barriers and options for overcoming those barriers utilizing a process that will build trust and create a climate to succeed. In order to implement a comprehensive watershed-wide stormwater management system, watershed communities will work with EPA and MDNR officials. Together, they will develop institutional and regulatory options to cost-effectively manage stormwater on a watershed-wide basis. Communities will identify state and federal incentives that could be adopted to encourage a watershed approach to stormwater management, and create model stormwater ordinances for individual communities as part of a watershed-wide stormwater management plan. Additionally, specific pilot stormwater pollution control and monitoring projects will be implemented to demonstrate the cost effectiveness and feasibility of watershed-wide approaches.

A report prepared by Apogee Research, Incorporated provides in-depth detail of a year-long study. The study was performed to analyze alternative financial and institutional arrangements for the funding and management of water pollution control programs in the Rouge River Watershed. Results of the study encompassed the following: a review of financial and institutional arrangements in the Rouge River Watershed and the legal framework for alternative approaches; an examination of approaches applied elsewhere in Michigan and throughout the United States; and the formation and consideration of alternative approaches specifically applicable to the situation of the Rouge River Watershed. The F/I Technical Advisory Group which consisted of representatives of federal, state, regional, and local government agencies involved in the Demonstration Projects was very instrumental in the development of this study. (See *Study of Institutional and Financing Options*, July 1994)

**4.10 PROJECT COORDINATION AND REPORTING.** The Wayne County Department of Public Services, Division of Public Works, was the principal grantee responsible for overall program administration and fund disbursement. Detailed work plans for components of individual program elements as described above were reviewed and modified by a formal Project Steering Committee which provides overall direction for the project. The committee was made up of one representative from each of the following organizations: USEPA, MDNR, Wayne County, Oakland County, the City of Detroit's Water and Sewerage Department, City of Dearborn, SEMCOG and the Rouge River Watershed Council. The committee was chaired by the MDNR representative. An ex-officio member representing the U.S. Federal District Court was invited to attend Steering Committee meetings.

The Wayne County Division of Public Works acted as the overall project administrator. It was staffed by Wayne County personnel and supplemented by a program management team. This staff reported to the DPW Director who served as overseer of activities performed under contract by the various operating agencies, consultants and contractors.

This effort defined the planning activities for the Rouge Project to achieve to goals. Including in the planning activities were maintenance of finances, subgrantees, and oversight of Steering Committee meetings. The quality management system for environmental measurement activities that are undertaken by the Rouge Project are described in the Quality Assurance Project Plan (QAPP). The QAPP documents the manner by which sampling and analysis activities are to be performed. The QAPP covers a variety of topics including specific procedures for collecting and analyzing samples, documenting results, calibration, internal quality control checks, and assessing data precision, accuracy, completeness, and sensitivity.

The QAPP serves as the overall guidance when planning field activities. Since the majority of the sampling activities and analyses that will be performed under individual environmental measure plans will utilize the same procedures, a single QAPP was developed for all field and analytical activities to be conducted by the RPO.

## **APPENDIX A**

**Because of the size of this appendix, it has been intentionally omitted.  
If this is information that may be of interest to you, please contact the Rouge  
Program Office at (313) 961-0700.**