

Rouge River National Wet Weather Demonstration Project

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OVERVIEW

In an unique cooperative effort among governmental agencies at the federal, state county and local levels the range of water quality problems which impact urban rivers is being studied. The Rouge River National Wet Weather Demonstration Project (Rouge Project) is a comprehensive analysis of an entire watershed and the pollutant sources which impact the river's water quality. It looks at sources of pollution without regard to the political jurisdiction in which they are located. The Rouge Project is designed to provide for an analysis of these various sources of pollution and the technologies currently available for their remediation. At completion, it is expected to establish a method for determining the mix of control measures which provided greatest water quality improvement at most reasonable public expenditure.

The Rouge Project is being undertaken within the Rouge River Watershed in southeast Michigan. The Rouge is a highly urbanized watershed with a total area of 427 square miles. The drainage area includes parts of three different counties (Wayne, Oakland and Washtenaw) and all or part of 48 individual municipalities (cities or townships). Approximately 1.5 million people live and work within the watershed which is drained by over 125 miles of river channel.

The Rouge River has been cited by the regulatory agencies in past years as having serious pollution problems. Considerable effort has been taken within the watershed over the past 15 years to address the problems associated with dry weather discharges to the Rouge River. Individual municipal and industrial point source discharges have been brought into compliance with National Pollutant Discharge System (NPDES) permit requirements. And, with the completion of recent construction projects, dry weather impacts on the Rouge River, due to sanitary bypasses, have been eliminated.

However, during and following rain events numerous sources of pollution still affect the Rouge River. These sources are no different than those encountered in similar urban watersheds throughout the country. They include:

- C overflows from combined sewers
- C flows from separate storm sewer systems from variety of land uses including industrial, commercial, and residential areas
- C flows from storm drains and natural drainage courses serving undeveloped, recreational, and agricultural lands
- C contaminated sediments within the stream bed and impoundments which are resuspended in periods of high flow
- C overland flows and ground water interflow from abandoned municipal and private dumps.

Historically, each of these pollutant sources has been addressed as its own separated problem. In general, there has been no consideration of the overall water quality impact on a given stream segment which could potentially be achieved by incremental improvements across the range of pollutant sources. Often the required remedial measures are under the jurisdiction of many independent operating agencies and at the direction of a number of different regulatory agencies. In most instances, what is lacking is a comprehensive and holistic approach to the water quality of the river which takes into consideration the levels of pollutant reduction reasonably attainable from each of the range of sources.

Both technical and institutional pressures have driven this piece-meal approach. Rivers and their tributary watersheds pay no attention to man-made political boundaries; legislation and accompanying regulations have been source specific, and tailored to readily enforceable end-of-pipe solutions. Regulating agencies and local communities could logically respond only to each of the issues individually.

The Rouge Project was born out of a desire and critical need to take a more system-wide view of water pollution problems in urban watersheds. Through the efforts of U.S. Congressmen Dingell, Ford and Traxler, Wayne County through its Department of Environment (DOE), received federal funding of \$46,000,000 in 1992 toward this effort. Wayne County, through its County Executive, Edward McNamara, and its DOE Director, James Murray, is committed to conducting this study to the greatest extent possible on a watershed-wide approach. The Rouge Project has involved local community leaders from the entire watershed, including Oakland and Washtenaw Counties, in setting the course of the effort and in participating in major components of the demonstration.

PROJECT ELEMENTS

The Rouge Project, as currently funded, will take place over a three-year period and will establish the levels of pollution control which will be required within the Rouge Watershed in the future to further the goals and objectives of the Rouge River Remedial Action Plan (RAP). The overall Rouge Project effort is comprised

of a number of technical components including the following:

- C A computerized **Geographic Information System (GIS)** will be prepared. This GIS will accurately locate the river and each of its many tributaries, provide for the management and display of existing and expected water quality, define the locations of combined sewer and storm drainage discharges, relate land use and potential pollutant sources to both river location and water quality, and allow for other similar comparisons of complex data.

The GIS will function as a locational database, linking the capabilities of a relational database with those of automated mapping. Planners will be able to answer questions which require a combination of spatial and attribute data. This system will allow analytical data from water quality studies to be stored, sorted, and displayed in map formats. It will also allow land cover, soil type, and topographical data to be directly accessed by the computer models developed for this project.

- C An extensive program of **Water Quality Sampling** will be conducted. These tests will establish a baseline level of Rouge River water quality prior to the implementation of remedial activities. It will also help to pinpoint sources of pollution and establish their severity. Samples will be taken at permanent locations throughout the watershed on frequent regular intervals. Sampling will be performed at known and suspected pollution sources to help quantify both their local impacts and their effects on the river as a whole.

Additionally, sampling will be performed after the various control measures are implemented to assess the effectiveness of each alternative. Special sampling efforts will be undertaken as part of the Rouge Project. They will attempt to: estimate the portion of the nonpoint pollution attributable to atmospheric deposition, estimate the extent and severity of pollutants in sediments, and establish removal efficiencies of various control measures under a range of operational scenarios.

- C A group of **Computer Models** will be developed and implemented for the Rouge Project. A set of models will simulate the hydrological response of the watershed to rainfall and will predict the hydraulic transport levels of drainage and combined sewer systems in wet weather. They will be capable of predicting the magnitude and frequency of combined sewer overflows, and establish the quantities of stormwater runoff for various rain events. Other models will simulate the pollutant loading associated with the rainfall and predict the quality of water throughout the Rouge Watershed during and following rain storms.

These models will be used as planning tools to indicate how the river reacts today, and how various combinations of planned improvements will affect overall river quality. The models will become the backbone of a formal decisions support system which will assist both technicians and policy planners in determining which combination of physical improvements and policy decisions will have the most favorable affect on the overall water quality of the Rouge River.

- C As part of their current NPDES permit requirements each of the combined sewer operating agencies within the Rouge Watershed have agreed to a phased program for the construction of **Combined Sewer Overflow (CSO) Abatement Facilities**. These proposed facilities will consist of both sewer separation and detention basins. Under the Rouge Project, final designs will be completed, and plans and specifications will be prepared for at least eleven CSO control structures (detention basins), and at least six community sewer separations. Following this design effort, the local agencies are committed to construct these facilities and monitor their operation.

While final design decisions will remain with the local agencies and their designers, the Rouge Project will provide overall coordination to encourage substantial variance among the designs commensurate with the intent of the demonstration project. The efforts within this demonstration, together with the required ongoing monitoring, will provide the basis for determination of the design standards for structural improvements which will eventually be required throughout the Rouge Watershed in those areas served by combined sewers.

- C An assessment of pollutant loads from each of the currently identified **Nonpoint Sources** within the Rouge Watershed will be undertaken. The Rouge Project will also implement and evaluate various alternative methods of reducing these pollutant loadings. Both structural and non-structural best management practices will be included within the range of alternatives to be implemented and evaluated. Included within this program element are evaluations of the water quality impacts due to illicit connections to storm drainage facilities as well as runoff and ground water interflow from abandoned municipal and private dumps. In order to estimate water quality impacts during wet weather, the Rouge Project will also consider the effects of polluted sediments which can be resuspended during periods of high flow.

The work performed as part of this project element will allow for a comparison with pollutant load reductions obtained from combined sewer overflow controls. The Rouge Project will then be able to develop a comprehensive overall plan to logically reduce wet weather pollution within the Rouge Watershed, and to identify the levels of control required on both CSO and nonpoint sources in order to approach water quality standards.

- C As a parallel effort to the technical work elements identified above, the demonstration effort will evaluate the current **Institutional and Financial Framework** which is in place to deal with wet weather water pollution control in the Rouge Watershed. If the solutions recommended by this project are to be successful they must be able to be implemented within either the existing governmental structure or within a logical modification to current responsibilities and contractual arrangements.

Likewise, a fair and equitable method of financing the remedial actions needs to be developed. The Rouge Project will analyze current contractual arrangements between local units of

government and other operating agencies as to their applicability for ongoing project implementation. And, if necessary, the Rouge Project staff will explore a range of alternative institutional and financial relationships capable of controlling CSO and nonpoint sources of pollution.

- C The Rouge Project sees **Public Involvement and Education** as one of its major goals. The Rouge River, like urban rivers throughout the country, is a valuable resource. Each person who lives within its watershed boundaries needs to be educated as to how their individual daily actions affect the conditions of the river. From elected officials, to businessmen, to manufacturers, to homeowners, to school children, every person must be made aware of the part they must play in returning the Rouge River to its past vitality. The project will solicit community input through public meetings, special presentations to local officials and community leaders, and formal community educational programs.

A key element in this educational process will be an ongoing educational program targeted at junior high and high school students throughout the watershed. Through this innovative program students will be introduced to the dynamics of urban watersheds and will learn about the sources of pollution which impact the river. They will conduct hands on sampling of the river within their own neighborhoods, and assess its quality. In addition, the students will also become part of a unique watershed wide computer network allowing them to share and compare their findings with students who have conducted sampling in other parts of the river.

SUMMARY

The efforts currently underway as part of the Rouge Project have the potential to shape the future of urban wet weather water quality improvements efforts throughout the nation. It is anticipated that this project will better quantify and define the proportionate pollutant loadings attributable to various wet weather pollution sources. It is also expected that results from this effort will better identify the ranges in pollution reduction which can be expected from a wide range of control measures.

The Rouge Project also expects to develop certain tools for watershed analysis and planning. Using the environmental GIS, the hydrological and water quality models, and the watershed management decision support system developed through this project, the Rouge River Watershed will be able to be managed in a comprehensive and rational manner for years to come. These tools will be formulated for use on the Rouge River but will be designed to allow transferability to urban watersheds throughout the country. Although river characteristics, rainfall quantities, land use, sewer drainage system configurations, and other factors will be different, the methodology used within the Rouge Project, and the analysis procedures and systems which are being developed, will be adaptable for use by other planners.

Even the most elegantly conceived technical plan is doomed to failure without an appropriate institutional framework and an affordable financing plan for both capital and operational components The Rouge Project

will suggest an outline for these institutional and financial components. Through the direct transferability of institutional structure will be limited by the laws and policies of other urban areas, this project will provide, at minimum, a methodology for similar analysis by other policy planners.

The effect of urbanization and its pollution on rivers has taken hundreds of years to reach its full impact. To restore our rivers to acceptable water quality standards is the challenge we face. We believe that through the Rouge Project, our collective efforts will begin to set the standards and practices necessary to reach this goal.