

# Rouge River National Wet Weather Demonstration Project

Wayne County, Michigan

## TECHNICAL MEMORANDUM Development of WMI Grant Program

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## TECHNICAL MEMORANDUM Development of WMI Grant Program

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# ACKNOWLEDGEMENTS

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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 restore the water quality in the Rouge River as necessary to:

- provide a safe and healthy environment for ourselves and future generations,
- protect downriver water resources such as the Detroit River and Lake Erie, and
- re-establish a healthy and diverse ecosystem within the Rouge River Watershed.

This will be accomplished through the development, implementation, and financial integration of a technical, social, and institutional framework leading to cost efficient, and innovative, watershed based solutions to control the wet weather problems in the Rouge River Watershed.

## PREFACE

The Rouge River has historically suffered and continues to suffer from the combined stress of pollutant loading from various sources. The vast majority of continuous point sources have been eliminated through the issuance and enforcement of National Pollutant Discharge Elimination System (NPDES) permits for municipal and industrial dischargers. Yet, as established in the Rouge River Remedial Action Plan (RAP), the river remains polluted primarily because of sources associated with wet weather flow.

The Rouge River National Wet Weather Demonstration Project (Rouge Project) is intended to evaluate each of the various sources of wet weather pollution; implement alternative remedial measures; investigate wet weather waste load allocations; establish associated pollutant load reductions; examine the financial and institutional impediments to wet weather pollution control; and recommend a plan and procedure for watershed-wide pollution control which is "implementable" in the Rouge and can be readily transferred to similar urban watersheds throughout the country.

The effort is not being conducted in isolation. The Rouge RAP provides a baseline from which Rouge Project efforts have begun. In fact, the Rouge Project can be viewed as the key component of the initial implementation of the RAP. In addition, ongoing regulatory efforts aimed at controlling Combined Sewer Overflow (CSO) discharge have also been integrated into the Rouge Project and all construction facilities will be in accordance to NPDES permits.

It is widely recognized, and reinforced by RAP recommendations, that CSO control by itself will not be sufficient to restore water quality to acceptable levels in the Rouge River and other similar urban rivers. The project has established a watershed-wide concept as its focus. Within the Rouge River Watershed, a range of pollution sources have been identified. They include: traditional urban runoff, illicit connections to drainage facilities, abandoned dumps within the river flood plain, wet fall and dry fall air deposition, and contaminated sediments within the river channel and impounded lakes.

The Rouge Project has incorporated efforts to develop analysis tools, organize existing and future data, conduct field surveys, collect and analyze water quality samples, develop and implement water quality models, design and test structural and nonstructural best management practices (BMPs), and establish loadings from nontraditional wet weather sources. Additionally, it includes components that will involve watershed residents in pollution control planning, and will study the institutional structure and financial capabilities of those entities responsible for long term implementation of the recommended watershed plan.

To efficiently manage an effort with diverse objectives, the project has been divided into ten program elements. Each of these has a specifically defined technical or operational purpose. Within each of these elements, work plans are developed to define specific activities to be performed as part of the project. These work plans define the Tasks and level of effort.

The program elements that have been established are as follows:

- Geographic Information System (GIS) and Mapping
- Data Collection and Management
- Sampling and Analytical Program
- Modeling and Decision Support System (DSS)
- Nonpoint Source Best Management Practices (BMPs)
- Combined Sewer Overflow (CSO) Design, Build and Test Facilities
- Value Engineering
- Public Information and Involvement
- Financial and Institutional
- Project Management, Coordination and Reporting

This document has been generated under the Nonpoint Source Best Management Practices (BMPs) Program Element and is a product of Work Plan 7, Task 3. This document describes the program developed for the use of the Waste Management, Inc. (WMI) grant money. The program specifies the use of WMI grant money to improve water quality to the Rouge River through the use of wetland systems.

## **ABSTRACT**

Development of WMI Grant Program

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Waste Management, Inc. (WMI) received a permit from the Department of Natural Resources to fill wetlands for the development of a sanitary landfill located in Van Buren Township. One of several conditions included in the permit was that WMI would provide to Wayne County a grant to allow for the construction of wetlands in the Lower or Middle Rouge River. These wetlands were to be created so as to improve the water quality of the Rouge River. Three wetland systems were designed and a consensus reached by the regulatory agencies to meet the requirements of the permit conditions as described in this document.

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## 1.0 INTRODUCTION

**1.1 PURPOSE OF PROPOSED PROJECT.** The purpose of this project is to create approximately 16 acres of wetlands within the Rouge River Watershed. A permit issued by Michigan Department of Natural Resources (MDNR), Permit No. 91-14-1303, to fill wetlands in Van Buren Township for the purpose of constructing a sanitary landfill was granted to Waste Management, Inc. (WMI) in 1991. One of several conditions included in the permit was that WMI would provide to Wayne County a grant to allow for the construction of wetlands in the Lower or Middle Rouge River. These wetlands were to be created so as to improve the water quality of the Rouge River. This project requires coordination and approval from MDNR and the United States Environmental Protection Agency (EPA).

**2.0 SITE DESCRIPTION AND EXISTING CONDITIONS.** As part of the WMI project, an extensive investigation was completed to identify and select appropriate sites in the watershed for wetland creation. Relevant information was collected including MIRIS maps, National Wetlands Inventory maps, aerial photography, land use maps, recreation maps, Wayne County Rouge Program Office (RPO) Geographic Information System (GIS) information of stormwater discharges, existing and historical drainage maps. This information was used to evaluate existing topography, soil types, adjacent land uses, hydrologic setting, fish and wildlife habitat, natural features, and stormwater management options. RPO actively researched and field surveyed various sites that could serve as demonstration sites to evaluate the effectiveness of wetlands in treating stormwater. Upon completion of this review recommended sites were discussed with the MDNR and EPA prior to final selection. Recommended sites for the proposed wetlands are located within the City of Inkster, north of Michigan Avenue between Inkster and Henry Ruff Roads. The created wetlands will be located in three areas situated adjacent to the Rouge River, as shown on *Figure 2-1*. Existing conditions at the selected wetland creation sites are as follows.

**2.1 WMI STUDY AREA 1.** Area 1 is located on the north side of the Rouge River on Wayne County Parks Division land between Inkster and Middlebelt Roads. The location for the proposed wetland creation is within an existing 12-acre upland field with grasses and herbaceous vegetation centrally located on the site. The site is bordered by steep slopes to the north and east, which is predominantly single family residential, and by the Rouge River floodplain to the south and a man-made berm to the west.

Currently stormwater from the 48-acre residential watershed discharges via a 42-inch pipe to a 0.35-acre emergent wetland in the north portion of the site. A portion of the stormwater discharge flows through a 1100-foot long ditch along the east edge of the site and discharges to the Rouge River. This constructed ditch is two feet wide and supports occasional wetland species such as willow along its banks.

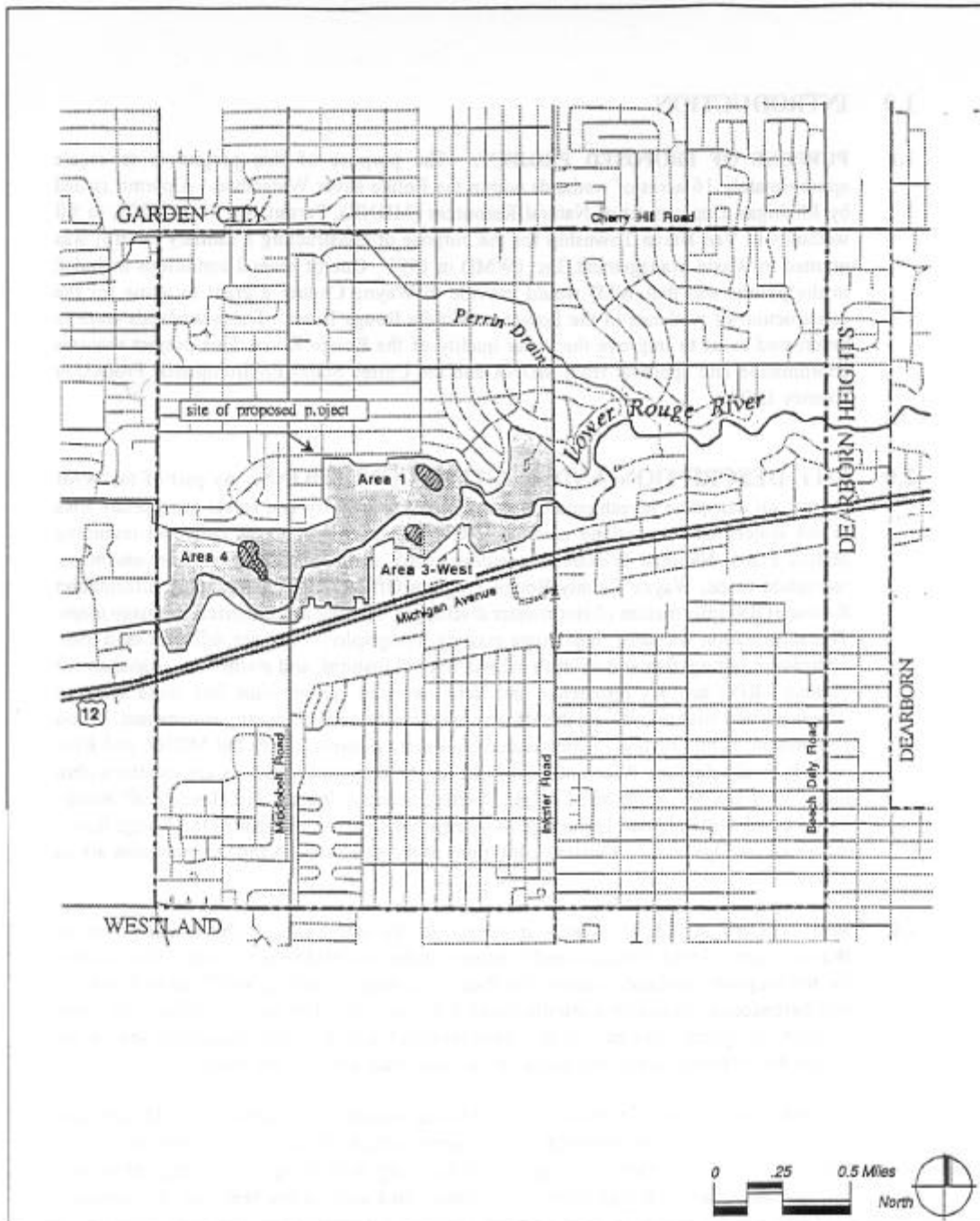


Figure 2-1: Waste Management Grant Program

The entire site is within the 100-year floodplain of the Rouge River. A 6.2-acre forested wetland is located along the south edge of the site, 1800 feet south of the storm sewer outlet, and extending to the banks of the Rouge River. The forested wetland contains boxelder, green ash, cottonwood and American elm.

**2.2 WMI STUDY AREA 3-WEST.** Area 3-West is located on the south side of the Rouge River on Wayne County Parks Division land between Inkster and Middlebelt Roads. The location for the proposed wetland creation is within an existing 5-acre upland field with grasses and herbaceous vegetation. The entire site is within the 100-year floodplain of the Rouge River. The site is bisected by an 80-foot long channel which currently conveys stormwater runoff from the 183-acre watershed consisting of primarily of residential and commercial land uses along Michigan Avenue just south of the site. The ditch has been partially filled with sediments resulting in some of the stormwater flow to overtop the west side of the ditch supporting a 2.4-acre emergent/scrub/shrub wetland. This wetland contains primarily willow, dogwood and cattail. While no detailed hydrogeological data have been collected, moderate base flow in the ditch indicates groundwater may also contribute to the wetland hydrology. It does not appear that the water from this wetland discharges directly into the Rouge River. Three acres of wetland will be created within the 5-acre upland field. The created wetland will be contiguous with and directly north of the existing 2.4-acre emergent/scrub/shrub wetland.

**2.3 WMI STUDY AREA 4.** Area 4 is located west of Middlebelt Road, north of the Rouge River on Wayne County Parks Division land. The location for the proposed wetland creation is within an existing 7-acre upland field representing a disturbed upland community. An intermittent drain traverses the site flowing easterly to a culvert at Middlebelt Road and discharging to the Rouge River. Surrounding the proposed site are approximately 18 acres of emergent and scrub/shrub wetlands along the drain corridor. These wetlands contains cattail, dogwood, willow and American elm. In addition, 12 acres of forested wetland are located adjacent to the river. The forested wetlands are dominated by American elm, cottonwood and willow. The proposed created wetland will be approximately 4 acres and contiguous with the existing wetland complexes. The wetland hydrology is expected to be maintained by precipitation, runoff from adjacent land and groundwater. The entire site is within the 100-year floodplain of the Rouge River.

**3.0 WETLAND DESIGN CRITERIA.** The proposed project will create new wetlands that are designed to function in perpetuity and will improve water quality to the Rouge River. The following paragraphs describe specific design activities proposed to meet the objectives of this mitigation program.

Design criteria for each of the wetland study areas were developed from modeled hydrological data in combination with characteristics of the available area. The proposed wetland creation areas contain similar design elements to provide comparable experimental

data which can be related to known design parameters. These elements include the incorporation of a sediment forebay at storm sewer discharges to settle the large particles before the stormwater enters the wetland system; treatment of "first flush" for most storm events; designed discharge outlets to the Rouge River with monitoring capabilities; and, intermediate monitoring points where applicable. The contributing storm sewer district for each study area has been defined and modeled so that the effect of a given wetland area on water quality and quantity can be determined. The influence or directly adjacent land is negligible.

The hydrology of the wetland study areas is also designed to be as similar as possible. As mentioned above, the wetland study areas will treat "first flush" runoff in the sediment forebay for most storm events. WMI Area 1 will receive the entire volume of stormwater generated from the 48-acre residential watershed. WMI Study Area 3-West will receive a maximum runoff equal to a two-year, 24 hour storm event; excess runoff will be diverted through the existing channels or drainageways directly to the Rouge River. WMI Study Area 4 will receive runoff from all storm events.

The volume of water to be directed to the study area wetlands will be variable, depending on experimental design; however, the treated volume of water will generally be proportional both to the size of the storm event and the size of the contributing storm sewer area. The sediment forebays have been designed to retain stormwater from designated storm events for approximately one hour to allow for settling of particles larger than 40um.

**3.1 WMI WETLAND 1.** The proposed WMI Wetland 1 will be designed as a 7-acre emergent wetland system. A sediment forebay will be constructed that will capture all of the stormwater flowing from the existing 42" storm sewer,. The stormwater will be directed through the sediment forebay and a newly created vegetated swale to the proposed wetland system. The outlet structure will discharge to the Rouge River 1100 feet from the current storm sewer discharge. The proposed outlet will include access for monitoring water quality and flow characteristics.

This wetland will function as an emergent wetland in perpetuity as required by the MDNR permit for the WMI wetlands. In addition, the wetland will be monitored and studied as part of the RPO demonstration project. Investigations of alternative flow rates and retention periods will be incorporated as part of the demonstration project. The results of these investigations will be used to establish the hydrology at the end of the demonstration period to optimize this wetland functions. The wetland area has been designed to be sustained by the contributions from the existing storm sewer area.

**3.2 WMI WETLAND 3-WEST.** WMI Wetland Area 3-West will be designed as a 5-acre emergent and scrub/shrub wetland created within an existing upland area. This wetland will function as an emergent wetland in perpetuity as required by the MDNR permit for the WMI wetlands. In addition, the wetland will be studied as part of the RPO demonstration project.

Stormwater will flow from the existing storm sewer, through the sediment forebay into the proposed wetland.

The created wetland will be apportioned into two wetland cells, one twice the size of the other. Flow will be directed from a sediment forebay, through the two cell wetland system into an outlet at the Rouge River. The outlet is located at a naturally occurring low point within the forested wetland along the river's banks. An outlet structure will be constructed at the discharge point to control retention time and water depth and allow for monitoring activities. The effect of wetland size on stormwater treatment will be demonstrated. The results of the demonstration studies will be used to optimize the wetland functions. The wetland area has been designed to be sustained by the contributions from the existing storm sewer area and to function as emergent wetland systems after the demonstration is completed.

**3.3 WMI WETLAND AREA 4.** The wetland creation site in Area 4 is located west of Middlebelt Road and north of the Rouge River. This 4-acre emergent wetland is proposed to be constructed in an upland area that is interspersed with scrub-shrub and emergent wetland types. The wetland hydrology will be maintained by capturing the flow from an intermittent drain dissecting the site, runoff from adjacent land, direct precipitation, and groundwater. The design of a wet meadow wetland anticipates periodic flooding and groundwater contributions to support the plant community. The wetland will be contiguous with a mixture of wetland and upland communities. Approximately 18 acres of emergent and scrub/shrub wetlands follow the drainage corridor and 12 acres of forested wetland are located adjacent to the river. The entire site is within the 100-year floodplain of the Rouge River.

**4.0 CURRENT STATUS OF WMI GRANT PROGRAM.** Coordination with MDNR, EPA Region V, and RPO has continued throughout the development of the WMI Grant Program. During the program development phase of the effort meetings were held with MDNR and EPA to discuss goals and constraints associated with the use of the grant. After several iterations of physical designs that depicted various methods of achieving the stated goals, a final design was selected. Consensus was reached regarding the proposed designs of the WMI created wetlands. Construction documents and specifications have been prepared with construction anticipated in early 1995.

The consensus plan also addressed the concerns of Wayne County Park Division, the property owner, regarding compatible land uses associated with the WMI wetland creation project. A master land use plan was revised to show that the construction of wetlands was compatible with the proposed land use of the property. Several presentations were made to Wayne County Executive Office, Wayne County Park Division, Wayne County Department of the Environment, and the City of Inkster during the preparation of the WMI design concept and construction documents.

