1995 Project Abstract
For the Period Ending June 30, 1997
This project was supported by MN Future Resources Fund

TITLE: Maplewood Innovative Storm Water Management Project\
PROJECT MANAGER: Kenneth G. Haider
ORGANIZATION: City of Maplewood
ADDRESS: 1830 East County Road B
WEB SITE ADDRESS: None
LEGAL CITATION: ML 1995, Ch. 220, Sec. 19, Subd 8 (d)
APPROPRIATION AMOUNT: $100,000

Statement of Objectives

The objective of this project is to design and construct a storm water management system in a residential neighborhood that fully utilizes infiltration. Neighborhood residents' participation and acceptance of the project are of paramount concern. The final objective is to document the process and create a guide book to disseminate the storm water management concepts tested by this project.

Overall Project Results

The project team consisted of representatives from the City of Maplewood, Ramsey-Washington Metro Watershed District, the University of Minnesota Department of Landscape Architecture, and the neighborhood residents. The residents were active participants in the project from the beginning. This was an extremely important element in the success of this project. Residents' perceptions, attitudes and ultimately acceptance were design elements considered throughout the process. The project design had to provide solutions for two important elements. The first is creating areas of standing water to stimulate infiltration of the storm water runoff, and the second is to provide a landscape that is supported by the neighborhood. Based on several neighborhood meetings and individual interviews with residents, four criteria were established to guide the landscape design.

1. The landscape must be designed so that maintenance is relatively easy and does not take much time.
2. Every attempt should be made to choose a plant pallet that is cognitively weed free and easily contained (no invasive, quickly spreading species).
3. Cognitive edges (property lines, landscape, home interfaces, road and drive edges) must be designed to enhance the quality of neatness.
4. Any area that will contain standing water for any amount of time should be designed for effective rapid infiltration and placed as far away from a house as possible.

These criteria were used throughout the design process of creating standing water areas within the roadway right of way. These infiltration areas were then landscaped based on the individual requests of the homeowners. There were several different landscape treatments for homeowners to choose from. Infiltration from these standing water areas was enhanced by vertically installing perforated pipes into the ground. The contractor devised an efficient method for installing these infiltration pipes. Input and feedback from the neighborhood has been constant throughout the process. The proposed design was modeled using the SWMM program. Based on the results of this modeling, it was determined that the only event resulting is discharge from the project area was a 100-year, 10-day snow melt. This was exiting news because it meant there was no surface water discharge from the project area into a nearby lake. There was no need to do continued monitoring or testing since the project area was self contained. The landscaping materials within the right of way withstood the winter and plowing very well. Virtually all of the plants and bushes were thriving this spring after a relatively severe winter. The residents are very happy with the look of their street and boulevards in the neighborhood.

Project Results Use and Dissemination

Details of the project have been presented at three conferences in the Twin City area thus far. The project is scheduled to be presented at a national conference of civil engineers later this fall. In addition there have been a number of tours set up for interested groups and individuals throughout the metropolitan area. The Landscape Architecture Department is producing a book called *Ecological Gardens for Amenity and Infrastructure Guidebook.*" One thousand copies of this book are being printed. They will be distributed through the university, the City of Maplewood, Ramsey-Washington Metro Watershed District and other agencies that have contact with an interested audience.

Date of Report: July 1, 1997 Work Program Amendment

LCMR Work Program 1995

I Project Title and Project Number: Maplewood Innovative Storm Water Management Project - F3

Program Manager: Kenneth G. Haider
Agency Affiliation: City of Maplewood
Mail Address: City Hall
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A Legal Citation: ML 95, Chp. 220, Art. 19, Sec. , Subd. 8 (d)
Total biennial LCMR appropriation: $100,000
Balance: $11,727

Appropriation Language:
This appropriation is from the future resources fund to the commissioner of pollution control agency for an agreement with the city of Maplewood to design, construct, and monitor a demonstration storm water management system. This appropriation must be matched by at least $165,000 of nonstate money.

B. Status of Match Requirement:
The project and its match funds have been given preliminary approval by the city council. The funds are budgeted at this time.

Match required	$165,000
Amount committed to date:	$165,000
Match spent to date:	$165,000

II. Project Summary:

Urban development is contributing increasing volumes of runoff, as well as nutrients such as phosphorus, that degrade water quality and impact use of lakes and rivers. Statewide and metropolitan area plans call for reductions in nonpoint-source pollution. However, despite resource concerns, citizens and public officials continue to prefer to drain residential yards and streets as quickly as possible to storm sewers and other channels rather than hold water on site. This project will implement alternative storm water management methods to hold and infiltrate storm water in an older neighborhood that is currently without storm sewers, but where these would be a logical improvement to deal with existing problems. The neighborhood and a typical new development will be modeled and the methods evaluated to predict their effectiveness in other urban areas. The cooperators believe that this system will be less costly than typical storm sewer systems, and will prevent typical environmental impacts of storm sewer drainage to lakes or other surface waters, Lake Phalen in this case. A demonstration of the effectiveness and public acceptance of this method, along with its lower costs, will increase the likelihood of acceptance and implementation by local governments.

III Six Month Work Program Update Summary

January 1, 1996
The computer modeling for the area is under way and should be finished shortly, gathering information and landscape preferences from residents is proceeding, the neighborhood has been cooperative. Project team design meetings are being held and have resulted in many options to be presented to the neighborhood in January.

July 1, 1996
The residents on the project have been very helpful in the design process. Fully twothirds of the owners have requested the more aggresive infiltration elements be isntalled in their yards. Designs are complete and a contract has been awarded with actual construction to begin in about a week.

January 1, 1997
The contractor was very slow in completing the work. The construction is finished and the infiltration components worked well during the fall rainfall events.

July 1, 1997
The system performed very well during the spring thaw. The neighborhood residents' reaction this spring has been very positive. There are no puddles on the street, and the plantings are doing well. No discharge has occurred from the site. The project has been presented at three statewide conferences and we have been invited to one national conference in the fall. A number of local groups have toured the project.

IV. Statement of Objectives:

A. Model Existing Neighborhood Conditions
Outcomes: Computer model of storm runoff quantity and quality
Gather base imagery of neighborhoods
Survey residents for landscape preferences

B. Design Storm Water System and Landscape Element
Outcomes: Develop construction plans and specifications for project
Design landscape elements
Design water quality monitoring system

C. Construct Improvements
Outcomes: Conduct bidding and contract award Monitor construction
Install water quality monitoring system

D. Monitor System Operation, Evaluate and Disseminate Result
Outcomes: Conduct water quality monitoring program
Gather and analyze data on neighborhood acceptance
Produce final report
Disseminate results through various media and organizations

Time Line for Completion of Objectives:

	7/95	1/96	6/96	1/97	6/97
Objective A. Model Existing Neighborhood Conditions	Xxxxxxxxx				
Objective B. Design Storm Water System and Landscape Elements		xxxxxxxxx			
Objective C. Construct Improvements			xxxxxxxxx		
Objective D. Monitor System Operation, Evaluate and Disseminate Results				xxxxxxxxxxx	

V. Objectives/Outcome:

A Title of Objective/Outcome: Model Existing Neighborhood Conditions

A. 1. Activity: Model existing Wakefield neighborhood hydrology using the SWMM program. The neighborhood drainage area included in the study is less than one-quarter square mile. (Map of study area is attached.) A typical twoblock area has been chosen within this study area for intensive use of alternative storm water management methods and monitoring. A Maplewood neighborhood of similar size and topography that uses standard storm water control methods will be selected, modeled and monitored in an identical fashion to serve as a control for comparison to the Wakefield neighborhood.

A. 1. a. Context within the project: Modeling and initial monitoring will establish the baseline for the test and control neighborhoods. Modeling and monitoring will include water quantity and quality parameters, including phosphorus, nitrogen, and suspended solids. These are the critical pollutants affecting water quality in lakes in the Phalen chain-of-lakes watershed, as well as many other urban watersheds.

watersheds

A. 1. b. Methods: Using the SWMM computer program, both test and control will be modeled. Through observation and measurement the model will be calibrated for small storm events, which make up the majority of runoff from this neighborhood to area lakes.

A. 1. c. Materials: None

A. 1. d. Budget: $5,000
Total biennial LCMR budget: $5,000
LCMR balance: $0
Match: $0
Match balance:

A. 1. e. Time Line:

	7/95	1/96	6/96	1/97	6/97
Product #1 Computer output of modeling results	xxxxxxxx				

A. 1. f. Work program update:
- Flow monitoring has been completed.
- Modeling by the consultant is underway and should be completed soon.
- Modeling is complete. The 1 00-year, 1 0-day snowmelt is the only event that results in runoff leaving the catchment area.

A. 2. Activity: Model existing water quality using the SWMM program

A. 2. a. Context within the project: Establishes a baseline of water quality for the test neighborhood.

A. 2. b. Methods: Based on neighborhood modeling and monitoring, the SWMM program will be used to predict quantity and quality of runoff, including phosphorus, nitrogen, and suspended solids.

A. 2. c. Materials: None

A. 2. d. Budget: $5,000
Total biennial LCMR budget: $5,000
LCMR balance: $0
Match: $0
Match balance: $0

A. 2. e. Time Line:

	7/95	1/96	6/96	1/97	6/97
Product #1 Computer output	xxxxxx				

A. 2. f. Work program update:
- Sampling for runoff quality is complete.
- Modeling by the consultant is under way and should be completed soon.
- Modeling is complete.

A. 3. Activity: Design water quality monitoring methods

A. 3. a. Context within project: This activity will define the water quality monitoring system used to evaluate the success of the project, based on results in both the test and control neighborhoods.

A. 3. b. Methods: Water quality specialists will evaluate different sampling methods based on topography and flow rates, and chose those best matched to Wakefield neighborhood conditions to design a monitoring system for this project. The area under consideration is flat and the size is limited; this may require the design of special collection techniques to be used in roadside swales or within pavements to collect water quantity and quality information as sites are monitored during storm events.

Project partners anticipate identifying 3 to 4 sampling points within each of the test control areas, and using at least two different sampling techniques to obtain the designed water quantity and quality data. Sites will be monitored during storm events.

A. 3. c. Materials: None

A. 3. b. Budget: $6,000
Total biennial LCMR budget: $6,000
LCMR balance: $0
Match: $0
Match balance: $0

A. 3. e. Time Line

	7/95	1/96	6/96	1/97	6/97
Product #1 Plan and report		xxxxxxxx			

A. 3. f. Work program update:
- Design of sampling methods is a consideration during project meetings.
- Final design cannnot be determined until improvement designs are complete.
- Lack of grade in the project area makes this activity diffficult.
- No discharge from the project was predicted by the model.
- No monitoring was designed or installed since there is no discharge to monitor.

A. 4. Activity: Anticipate the neighborhood perception of the existing conditions and alternative ecological storm water system.

A. 4. a. Context within the project: Through photography of existing conditions and interviews with neighborhood residents, establish baseline imagery, attitudes, and values in the neighborhood; as a basis to develop and test alternative designs developed with resident input.

A. 4. b. Methods: Gather landscape data through photographic slide documentation of existing neighborhood conditions in Wakefield and control neighborhoods, and from borrow imagery sites to document existing conditions and collect needed images to develop landscape simulations. Hold neighborhood meetings and interviews with 12 to 14 residents in the two-block intensive study area to inform them about the project, and to determine their perceptions and attitudes about current neighborhood appearance and storm water conditions. Select a small number (<3) neighborhood homes as design prototypes. For the prototypes, develop six simulations showing the appearance of alternative storm water systems in the Wakefield neighborhood, that might be used in typical urban/suburban yards to enhance storm water detection and ecological quality of home landscapes. Interview neighborhood residents to determine their reactions and acceptance of the prototypes.

A. 4. c. Materials: None

A. 4. d. Budget: $10,700
Total biennial LCMR budget: $0
LCMR balance: $0
Match: $0
Match balance: $0
McKnight Grant: $10,700

A. 1. e. Time Line:

	7/94	1/95	6/95	1/96	6/96
Product #1 Video imaging simulation of prototypes		xxxxxxxxxxxxxxx			

A. 4. f. Work program update:
- Photographs of summer and fall seasons are complete.
- Neighborhood and resident interviews have been conducted.
- The project team have developed many alternatives to be considered at future meetings with residents.
- This activity is complete and will be documented in the final report.

B Title of Objective/Outcome Design Improvements

B. 1. Activity Design pavement and innovative storm water management practices that will work in this neighborhood and Twin Cities Metro area While a variety of techniques (such as porous pavements) are used in other parts of the U.S , practices need to be designed and tested that work in Minnesota climatic conditions, and are acceptable to area residents. project partners anticipate using a variety of structures such as infiltration trenches, positioned at naturally low spots in the neighborhood. Partners will document design specifics of the alternative strategies

B. 1. a. Context within the project: The design documents will serve as the basis for contractor bids and construction, as well as to communicate the methods used to other communities interested in alternative storm water management methods.

B. 1. b. Methods: Professional engineering design standards will be used for this project. Available documents and literature will be used to aid in design and identify possible alternative structures to be tested. The project team will develop new designs based on function, cost, and acceptance by the neighborhood.

B. 1. c. Materials: None

B. 1. d. Budget: $13,000
Total biennial LCMR budget: $3,000
LCMR balance: $0
Match: $10,000
Match balance: $0

B. 1. e. Time Line:

	7/95	1/96	6/96	1/97	6/97
Product #1 Plans and specifications		xxxxxxx			

B. 1. f. Work program update
- One project team design meeting has resulted in variety of alternative design elements.
- Design options were presented at neighborhood meeting. Due to requests by residents, standard street section design was incorporated with rural type ditch section. Boulevard ditches (swales) graded to drain to dry ponding area with driveways and curb stops as check dams. Smaller storm events to utilize numerous depressions, while larger events will be properly handled with overflow drainage going to large ponding area.
- Redesign occurred throughout the construction process to fully satisfy the residents.

B. 2. Activity: Design the landscape elements of the storm water system. Landscape architects, engineers, and water quality management professionals will work together to design landscape elements such as planted swales, planted depressions, and other landscape elements that should increase storm water infiltration. Designs will specify appropriate native and noninvasive plant materials that will add to the effectiveness of these landscape elements, as well as add to their acceptance by neighborhood residents. Partners will document the specifics of these designs for use in construction, planting, and in communication to residents and others.

B. 2. a. Context: Integrate the landscape elements into the project design and construction.

B. 2. b. Methods: Interview residents using at least two neighborhood meetings (about 30 participants anticipated at each meeting) to determine responses to the prototype landscape designs, and landscape elements incorporated into the project.

B. 2. c. Materials: None

B. 2. d. Budget: $13,300
Total biennial LCMR budget: $0
LCMR balance: $0
Match: $0
Match balance: $0
MPCA 319 funds: $13,300
MPCA 319 funds balance: $0

B. 2. e. Time Line:

	7/95	1/96	6/96	1/97	6/97
Product #1 Plans and specification		xxxxxxxx			

B. 2. f. Work program update:
- A number of project team meetings has resulted in a number of alternative landscape designs.
- It is anticipated that a neighborhood meeting will be conducted in January.
- Neighborhood meetings were held to discuss project team designs. Options were prented by team and voted on by residents. Final landscape design was completed by team and presented to residents at house visits by team. Minor revisions were incorporated due to resident requests. Project was bid requiring landscape specialist from contractor.

C Title of Objective/Outcome Construction

C. 1. Activity. Award contract and monitor construction, particularly noting any activity or changes needed to accommodate alternative storm water elements or landscaping.

C. 1. a. Context within the project. New pavement and innovative storm water system are installed.

C. 1. b. Methods: A contracting company and appropriate subcontractors are hired to install the improvements according to the plans and specifications.

C. 1. c. Materials: None

C. 1. d. Budget: ~~$205,000~~ $235,273
Total biennial LCMR budget: ~~$0~~ $30,273
LCMR balance: $0
Match: $155,000
Match balance: $0
MPCA319 funds: $50,000
MPCA 319 funds balance: $0

C. 1. e. Time Line:

	7/95	1/96	6/96	1/97	6/97
Product #1			xxxxxxx		
Completed construction and supporting inspections					

C. 1. f. Work program update: Construction proceeded slowly. All design elements were incorporated into the construction. Construction is complete. The construction cost of the project was greater than planned. An adjustment is requested due to the increase.

C. 2. Activity: Install water quality monitoring equipment in both the test and control neighborhoods.

C. 2. a. Context within the project: Initial step in measuring the success of the storm water management practices in the test vs. control neighborhood.

C. 2. b. Methods: Equipment will be installed according to the plans prepared in Activity A. 3.

C. 2. c. Materials: None

C. 2. d. Budget: $1 1,000
Total biennial LCMR budget: $9,000
LCMR balance: $9,000
Match: $0
Match balance: $0
MPCA 319 funds: $2,000
MPCA 319 funds balance: $2,000

C. 2. e. Time Line:

	7/95	1/96	6/96	1/97	6/97
Product #1			xxxxxxx		
Equipment installation					

C. 2. f. Work program update:
- This activity was not needed and could not be performed since no discharge from the site was expected.

D Title of Objective/Outcome Monitor, Evaluate, and Final Report

D 1. Activity. Conduct water quality monitoring program in the test and control neighborhoods during storm events beginning 6/96 (when equipment is installed) through the end of the rain season.

D. 1 a. Context within the project: Effectiveness of the storm water practices are monitored and compared with control neighborhood.

D. 1. b. Methods: The rented equipment installed in Activity C. 2. are monitored and maintained.

D. 1. c. Materials: None

D. 1 d. Budget: $35,100
D. 1. e. Total biennial LCMR budget: $31,000
LCMR balance: $31,000
Match: $0
Match balance: $0
MPCA319 funds: $4,100
MPCA319 funds balance: $4,100

D. 1. E. Time Line

7/95	1/96	6/96	1/97	6/97

Product #1 xxxxxxxxxxxxx
Water quality data

D. 1. f. Work program update: Water quality data from the test and control neighborhood has been collected.
- The monitoring was not done because there was no storm water discharger after the project.

D. 2. Activity: Evaluate neighborhood response to ecological storm water system Conduct neighborhood meetings and individual interviews with neighborhood residents to determine their perceptions and acceptance of the alternative storm water elements and landscaping.

D. 2. a. Context within the project: Neighborhood acceptance of the project and alternative storm water infiltration methods is critical to the success of this project.

D. 2. b. Methods: Through two neighborhood meetings and in-home interviews, survey the residents attitudes and reactions for issues that developed during and after the installation and establishment of the storm water system.

D. 2. c. Materials: None

D. 2. d. Budget: $39,000
Total biennial LCMR budget: $29,000
LCMR balance: $0
Match: $0
Match Balance: $0
MPCA319 funds: $10,000
MPCA319 funds balance: $0

D. 2. e. Time Line

7/95	1/96	6/96	1/97	6/97

Product #1 xxxxxxxxxxx
Executive summary report

D. 2. f. Work program update:
- Due to the very close and constant contact throughout the project between city staff and residents, no formal survey was needed. The residents enthusiastically supported the project, expecially after the superior performance during the spring thaw. The residents comments and aacceptance of the project formed the basis for the designs in the guidebook

why prof. staff
if no "extra"
effort entered

D. 3. Activity: Assemble and compare water quality data, and data from meetings and interviews with neighborhood residents that evaluate perceptions and acceptance of alternative storm water methods.

D. 3. a. Context within the project: The success of the project is identified through the comparison of before and after water quality data from the Wakefield neighborhood, comparison to similar results from the control neighborhood, and by neighborhood acceptance of the alternative elements and landscaping.

D. 3. b. Methods: The data is assembled in usable format for comparison, and the project team evaluates the results and conclusions are reached. The data will include a video and audio record of project activities and resident interviews, as well as water quality and quantity monitoring data, data on system performance, costs, and other information gathered during the project.

D. 3. c. Materials: None

D. 3. d. Budget: $6,000
Total biennial LCMR budget: $0
Match: $0
Match balance: $0

D. 3. e. Time Line

	7/95	1/96	6/96	1/97	6/97
Product #1 Data compilation			xxxxxxxxxx		

D. 3. F. Work program update
- No water quality data is available because there was no discharge from the site.
- The available data has been assembled.

D. 4. Activity: Product final report

D. 4. a. Context within the project: Results are published and disseminated.

D. 4. b. Methods: Project team will write the final report and disseminate the information through direct distribution, news releases, and presentations to organizations.

D. 4. c. Materials: None

D. 4. d. Budget: ~~$6,000~~ $10,000
Total biennial LCMR budget: $0
Match: $0
Match balance: $0

D. 4. d. Time Line:

	7/95	1/96	6/96	1/97	6/97
Product #1 Final report				xxx	

D. 4. f. Work program update:
- The final report and the "Ecological Gardens For Amenity and Infrastructure Guidebook" are complete. Printing costs for the 1000 copies of the guidebook added $4,000 to this activity.

VI Evaluation:

Success of the innovative methods in effectively holding and infiltrating storm water will be measured through monitoring systems installed as part of the construction, and comparison of post-project runoff quality and quantity with preproject conditions. Runoff conditions will also be compared to typical new development, that will be modeled to determine potential impacts of installing the alternative methods used in the older neighborhood project area

Success of the methods will also be determined through pre- and post-project surveys conducted among neighborhood residents to determine their attitudes and acceptance of current conditions and the alternative storm water methods implemented through this project.

VII. Context Within Field:

Some of the practices used in this project have been used individually before. This project proposes to integrate the application of a number of applications in a local setting and not only evaluate their effectiveness from a runoff perspective, and evaluate the acceptance of property owners. This last step is often overlooked by much of the current research.

VIII. Budget Context:

(a) Funding for this project comes from four sources:

LCMR	$100,000
City match	165,000
MPCA 319 Grant	79,400
McKnight Foundation Grant	- 10,700
Total	$355,100

The McKnight Foundation Grant is being used to fund Activity A. 4. 4.

Activity A. 4. is already in progress due to weather constraints. This work is being funded outside of this project, but does produce important information and is, therefore, included in the work program.

b. Summary of 319 Funds

Total 319 funds requested: $ 79,400

Funds expenditure:

Modeling neighborhood conditions and resident survey	29,400
Construct infiltration structures in project area and instal monitoring systems	50,000

Match:

Source	Activity	Amount
City of Maplewood	Construction costs (Work plan Item 2)	$165,000
USDA Forest Service	Resident attitudes and perceptions surveyed by U of M LA Department	

IX. Dissemination:

A final report will be published describing the project and its results. Data collected during the project will be freely shared. It is anticipated that the local newspaper and the community newsletter will be used to keep the general public informed about the project. In addition, opportunities for presentations to the North American Lake Management Society, City Engineers' Association, Water Resources Conference, Minnesota Lake Association Conference, and others will be explored.

X. Time:

The project has begun because certain photographic data must be gathered during the growing season. The funding is through a grant from the McKnight Foundation.

XI. Cooperation:

The City of Maplewood, Ramsey-Washington Metro Watershed District, and Ramsey County will work jointly through all phases of the project. The University of Minnesota, Department of Landscape Architecture, is providing expertise in the area of ecological landscape design, video imaging, and evaluating acceptance of the project.

XII. Reporting Requirements:

Semiannual six-month work program update reports will be submitted not later than January 1, 1996, July 1, 1996, January 1, 1997, and a final six-month work program update and final report by June 30, 1997.

XIII. Required Attachment:

1. Qualifications: Project Manager: Kenneth G. Haider
Current position: Public Works Director/City Engineer with the city of Maplewood. Over 20 years experience in engineering and management. Technical background is provided through design experience, maintenance experience, and formal as well as continuing education.