

JUL 07 1999

Date of Report: 30 June 1999

Date of Next Status Report: Final

Date of Work Program Approval:

Project Complete Date: 30 June 1999

LCMR Work Program 1997

I. Project Title: Preventing Stormwater Runoff Problems Through Watershed Land Design

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Total Biennial Project Budget:

\$LCMR: \$280,000

– LCMR Amount Spent: 280,000

\$LCMR Balance: \$0

A. Legal Citation: ML 1997, Chapt. 216, Sec. 15 , Subdiv. 9f.

Appropriation Language: This appropriation is from the future resources fund to the University of Minnesota to develop watershed-based land design models for preserving habitat and traditional patterns, and preventing flooding and water quality degradation.

II. PROJECT SUMMARY AND RESULTS: Develop watershed-based land design models for preserving habitat and traditional patterns, and preventing flooding and water quality degradation. Results include model development standards and code language, design guides and a discussion report.

III. PROGRESS SUMMARY: The project is essentially complete except for printing of the final report, which is scheduled for July 1999.

IV. OUTLINE OF PROJECT RESULTS:

- **Result 1: Identified Conflicts and Opportunities.** Identification of stormwater-based conflicts and opportunities in the combined effect of

Federal, state and local policies, laws and regulations controlling land development. Analysis of conflicts and opportunities in terms of their combined effect on the preservation of habitat and the prevention of storm water quality degradation and flooding. BENEFITS: (1) A comprehensive analysis of conflicts and opportunities for the entire land area of the Brown's Creek Watershed in Washington County as the case study. (2) A representative analysis for Washington County. (3) A general indication of such potential conflicts and opportunities for urbanizing communities throughout the entire state.

STATUS OF RESULT 1: Work on this result is essentially complete. We have put the work from this task up on the project web page.

- * Budget:\$29,575
Spent:\$29,575 Balance:.....\$0
- * Completion Date: 2 January 1998 changed to 31 March 1998

- **Result 2 Analytical Case Studies – Traditional Regional Village and Development Design Precedents.** Identification, selection and documentation of important case study examples to explain the form and use of historical village and hamlet development design for the region. Selection of cases for site visits will be based on relevance to the project issues identified in Result 1 and potential for efficiency and effectiveness of field work in terms of contribution to the achievement of the project goal and objectives. The specific number of case studies selected will depend on the specific array of relevant case study example prospects identified from a literature and geographic searches, and the specific accessibility of the prospects in terms of their relative geographic locations and the limits of time and budget. Examples will be drawn from in the St. Croix River watershed. Case studies will be analyzed and interpreted for today's needs to promote the goal and objectives stated above.

BENEFITS: Case studies and interpretations will be applicable for the Lower St. Croix watershed.

STATUS OF RESULT 2: The analytical Case studies of the traditional regional village and development design precedents are essentially complete. We found a need to drop some towns as case studies as investigation showed them to be redundant. We added the town of Marine-on-St. Croix to address some key issues that proved to be lacking in the original array of towns selected. These issues had to do with the effect of cultural and economic changes over time that influenced water handling decisions in town development. Case study maps and text are posted on the project's web page.

* Budget:\$23,936
 Spent\$23,936 Balance:.....\$0
 * Completion Date: 30 June 1998 rescheduled to 30 September 1998.

- **Result 3 Analytical Case Studies – National Historical Precedents of Designed Communities.** Identification, selection and documentation of a series of important case studies documenting and interpreting recent national precedents of designed communities that have tested new ideas for development (such as Cluster Development, Rural Hamlets, Bio-Infrastructure Development and Neo-Traditional Development). Selected case studies will be examined in situ for determination of actual effectiveness of new ideas as applied on the ground. Selection of example cases for site visits will be based on relevance to the project issues identified in Result 1 and potential for efficiency and effectiveness of field work in terms of contribution to the achievement of the project goal and objectives. The specific number of case studies selected will depend on the specific array of relevant case study example prospects identified from a literature search, and the specific accessibility of the prospects in terms of their relative geographic locations and the limits of time and budget. Case studies will be analyzed and interpreted to inform the development of model codes and design controls to promote the goal and objectives stated above.

BENEFITS: (1) Case studies and interpretations will be applicable for the entire area of the Lower St. Croix watershed. (2) General applicability in the Twin Cities Metropolitan Area and the state.

STATUS OF RESULT 3: The analysis of the national historical precedents of designed communities is essentially complete, with a few analytical drawings remaining to be done at this point. Case study maps and text are complete and representative examples have been posted on the project's web page.

* Budget:\$25,239
 Spent:25,239 Balance:.....\$0
 * Completion Date: 1 September 1998 rescheduled to 31 March 1999.

- **Result 4 Model Development Standards and Code Language.** Draft model development standards and code language tailored to take advantage of opportunities and remedy policy conflicts with goals of preserving habitat and preventing runoff water quality degradation and downstream flooding.

BENEFITS: (1)The model standards and code language will be specifically designed for adoption in the Lower St. Croix River watershed. (2) The general uniformity of land use controls in

urbanizing areas means the models will also generally apply to urbanizing watersheds throughout the state.

STATUS OF RESULT 4: A model cluster code has been developed and was tested under Result 5. Potential changes to other statutes and laws that might be useful in supplementing remedies offered by better subdivision regulations were identified in consultation with the project team for the Water Quality Cooperatives Pilot Project (Legal Citation: ML 1997, Chapt. 216, Sec. 2, Subdiv. 2).

- * Budget:\$87,492
Spent\$87,492 Balance:.....\$0
- * Completion Date: 3 January 1999 revised to March 31, 1999

- **Result 5 Illustrative Design Guides.** Illustrative design guides to instruct land owners, design professionals, developers, builders and policy administrators in the appropriate design and review of new subdivisions, both small and large, to meet model standards and code language requirements.

BENEFITS: The utility of the design guides same as Result 4.

STATUS OF RESULT 5: Work from Result 1 has been framed for use in the design guides. Work focused on the effect of regulations and approaches to design that result from such regulation on hydrologic cycle and storm water runoff process. Four representative case study sites in the Brown's Creek watershed were selected and designed using typical development densities as tests of design stormwater performance. Each site was designed using conventional development standards and then again using the model cluster code completed in Result 4. Each site was then analyzed for stormwater performance. HydroCAD was used to determine stormwater performance from a water quantity viewpoint and Dr. Robert Pitt's Small Storm Hydrology Method was used to analyze performance from a water quality viewpoint. In each case, analyses were performed for predevelopment conditions, conventional development designs and water quality cluster designs.

- * Budget:\$98,373
Spent\$98,373 Balance:.....\$0
- * Completion Date: 30 June 1999

- **Result 6 Discussion Report.** Discussion report for a future conference on planning and design for watershed level problem solving to be funded by other grants in partnerships with other interested entities.

BENEFITS: Discussion report will be informative to urbanizing watersheds.

STATUS OF RESULT 6: Work on this result is essentially complete, save for some editing and printing. Printing is under contract and is scheduled to begin on 15 July 1999 and completion by July 31.

* Budget:\$15,385

Spent\$15,385

Balance:.....\$0

* Completion Date: 30 June 1999

V. DISSEMINATION: The products developed under this project will be documented and distributed primarily in three ways:

- A. Web Site:** As information is developed on the project, summaries (and in some cases whole documents) will be posted on the College of Architecture and Landscape Architecture world wide web site: www.cala.umn.edu. It is planned that the project would have a separate button on the web page designated "Watershed Land Design" so interested parties could easily go right to our project information.
- B. Fact Sheets:** Some information developed for the project will be published on fact sheets for distribution through the Department of Landscape Architecture at the University of Minnesota. These fact sheets will be analogous to the University of Minnesota Extension Service Fact Sheets and used in a similar manner. The fact sheets would be produced on an 8 1/2 by 11 inch paper format, suitable for photocopy reproduction. The topics of the fact sheets will be determined by what is found and developed under Results 1 through 5.
- C. Discussion Report:** This will include all of the information developed in Results 1 through 5, including the design guides. It will be reproduced in the quantity permitted by the length of the document and budget available to reproduce it. It will be made available to a range of interested parties identified by the project.

VI. CONTEXT:

- A. Significance:** The current magnitude of urbanization in the rural landscape of Minnesota threatens water resources in new ways. New approaches to land design are needed to protect these resources. This project will pursue protection by preventive means through integrated regulation and guidance of development on a watershed basis. The goal of the project is to promote transformation of the current land development process and design patterns aimed at preventing flooding and storm water runoff quality degradation, and preserving habitat biodiversity and traditional land design patterns, through the development of new, watershed based, environmentally sensitive land design model codes and design guides. The project focuses on achieving three objectives: Using the case study method, develop new patterns for land design that (1) contribute to holding runoff yield from new development at or below pre-development conditions; (2) contribute to holding runoff velocities at or below pre-development conditions; (3) are documented and explained to address perceived concerns and promote adoption by policy-makers.
- Area Focus. The urbanizing edge of the St. Croix Valley in Washington County provides an opportunity to investigate the development of these

new, preventive approaches. The Brown's Creek Watershed and Washington County will be the focus of a comprehensive study of controls and practices. Brown's Creek is significant because of its recent flooding problems and the issue of thermal pollution of the DNR public access trout stream at its mouth.

- Conflicts and Opportunities in Existing Policies and Laws. Public regulations that affect quantity and quality of stormwater runoff do not address the form and process of urbanization on a watershed basis. Most flooding and water quality problems caused by urbanization are typically addressed by focusing on mitigation measures to remedy the effects of typical urbanization land design. Standard land design form and process are routinely taken as givens. The opportunity is to frame a new land design form and process through a new policy and regulatory structure that understands that the quantity and quality of runoff are directly related to the proportion of paved surfaces and their arrangement relative to channels and pipes receiving runoff from them.
- Rational Nexus to Public Purpose. Local development control is fragmented and resistant to change because of uncertainty about the defensibility of alternatives to conventional practice. The recent series of U.S. Supreme Court decisions in the land use control arena have brought emphasis to the importance of a clear rational connection between land use control and legitimate state interest. Defensibility is essential to promote the adoption of meaningful change in development controls. The model controls and standards developed in this project will be explicitly connected to public stormwater runoff interests, and drafted by an independent entity.
- Interpretation of Policy Ideas for Regional Use. In recent decades there have been several new communities developed nationally that are important precedents to inform this project. Also, new development control tools and ideas have been applied nationally such as Cluster Development, Conservation Districting, Rural Hamlets and Villages, and Neo-Traditional Development. The insight and experience offered by these precedents will be interpreted to help cast new models to meet the goals and objectives of this project.
- Traditional Settlement. Prior to World War II, traditional land development often resulted in changes that produced a net reduction in peak discharges and runoff volume compared to pre-development agricultural land cover conditions. For this reason, as well as to preserve the historical rural character of St. Croix region, precedents of the traditional forms of land design will also be used to inform the design of new models for land design control.
- Education. Model code language and standards are not sufficient to achieve results. The proposed illustrative design guides are needed to inform and instruct land owners, design professionals and policy administrators how to use the models for new subdivisions, both small and large.

B. Time: July 1, 1997 through June 30, 1999.

- C. Budget Context:** The University of Minnesota Extension Service has funded \$69,850 in pilot studies on this project for two years. The College of Architecture and Landscape Architecture has provided in-kind services in the amount of \$50,000 for those pilot studies. At least \$50,000 more is being sought from foundations to organize and hold a conference on the results of this project for public officials, decision-makers, developers, professionals and other interested individuals.

	<u>July 1995 - June 1997</u> Prior expenditures on this project	<u>July 1997 - June 1999</u> Proposed expenditures on this project	<u>July 1999 - June 2001</u> Anticipated future expenditures on this project
1. LCMR	\$0	\$280,000	\$0
2. Other State	\$119,850	\$0	\$0
3. Non-State Cash	\$0	\$0	\$50,000
Total	\$119,850	\$280,000	\$50,000

BUDGET:

Personnel

Project Manager Vogel (0.37 of full-time).....	\$54,669
Cooperator Neckar (0.181 of full time).....	32,864
Cooperator Sykes (0.187 of full time)	29,822
Consultants.....	25,000
Clerical.....	18,750
Graduate Res. Assistants (1.259 of full time).....	86,765

Total Personnel..... \$247,870

Equipment.....\$2,950

Acquisition.....\$0

Development\$0

Other Expenses

Printing, Photo.....	\$10,000
Materials.....	1,650
Data gathering (travel – see especially Result 3, also 1 & 2).....	9,600
Data gathering.....	4,350
Miscellaneous	3,580

Total..... \$280,000

Work responsibilities will be generally handled in this way. Vogel will be responsible for day-to-day progress on the project directing the activities of the graduate research assistants through all results area tasks. Graduate research assistants will be loaded on results areas generally in proportion to the budgets identified in part IV (Outline of Project Results) of this work plan. Cooperators Neckar and Sykes will contribute their expertise and efforts in the areas indicated under part VII, Cooperation, below. Sykes will be the primary cooperator in Result 1, "Identified Conflicts and Opportunities". Neckar will be the primary cooperator in Result 2, "Analytical Case Studies – Traditional Regional Village and Development Design Precedents." Sykes and Neckar will divide responsibilities

for oversight consultation, report drafting and guidebook content design and writing needs, as determined in the course of project activity, for the following results areas:

- Result 3 — “Analytical Case Studies – National Historical Precedents of Designed Communities”
- Result 4 — “Model Development Standards”
- Result 5 — “Illustrative Design Guidelines”

Vogel will manage the completion of Result 6, “Discussion Report.”

VII. COOPERATION:

Roles of cooperators will be to provide two general categories of service to this Project:

1. Research and design oversight in relation to the guidance of the work of graduate student research assistants.
2. Products that contribute both to the tangible and conceptual results.

The cooperators will be responsible for the production of analyses in textual and graphic forms, model design ideas and standards, and other results below as anticipated by the project proposal. Since the expertise embodied in the cooperators' previous work matches rather closely the kinds of results anticipated in this project, there will be a fairly large order of involvement in these activities.

The cooperators are:

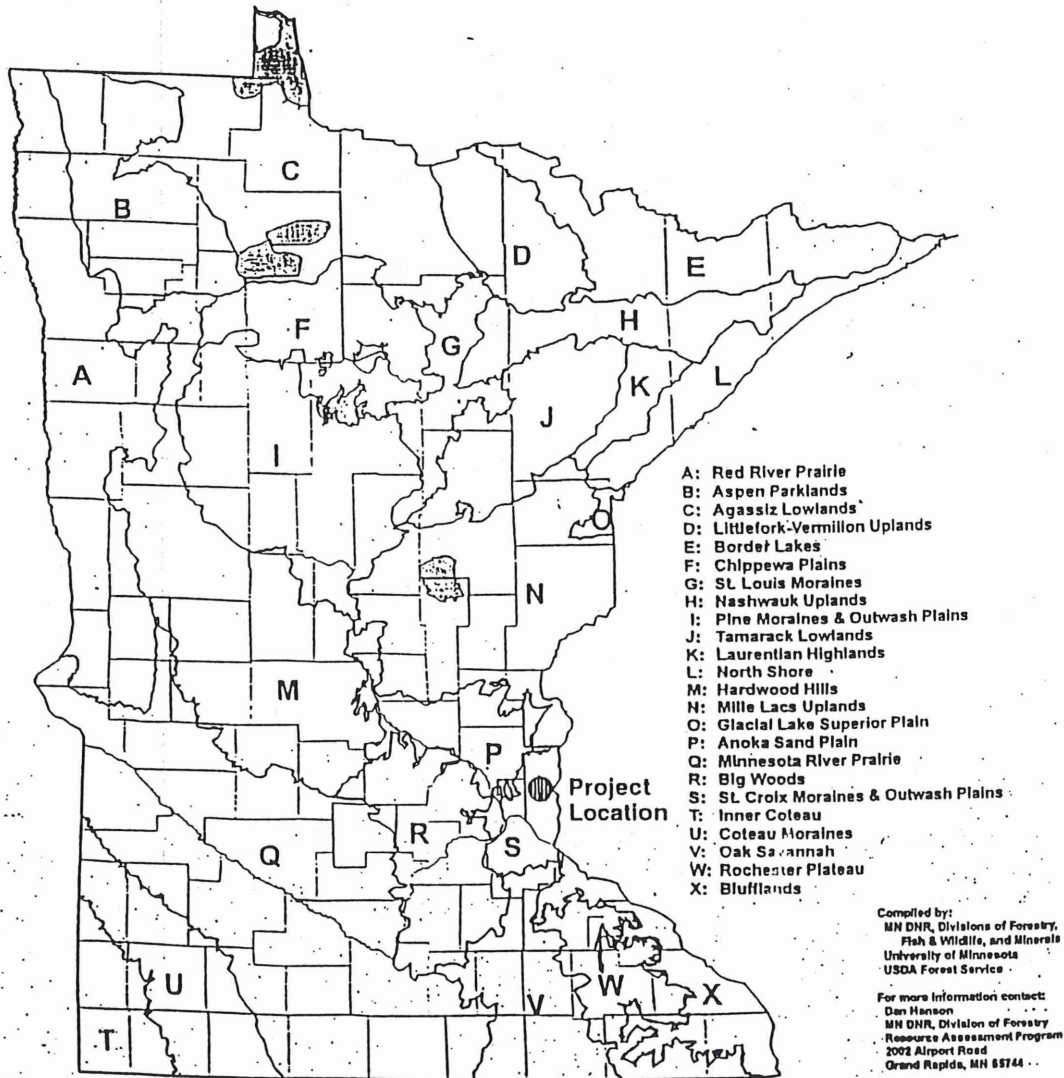
Department of Landscape Architecture, University of Minnesota – Lance M. Neckar, Associate Professor (18.6% time*, \$32,864).

Department of Landscape Architecture, University of Minnesota – Robert D. Sykes, Associate Professor (18.7 % time*, \$31,822).

* Percent time is the *average* over two years, of a full-time 12 month per year base salary plus benefits. Actual effort will vary over project duration: at some times it will be above and at other times below the average percent time. This variation will be due to the nature of the work required of each individual, which varies from task to task within each result area.

VIII. LOCATION: Map Showing Project Location in Minnesota (next page)

VIII. LOCATION: Map Showing Project Location in Minnesota



IX. REPORTING REQUIREMENTS: Periodic work program progress reports will be submitted not later than January 1998, July 1998, and January 1999. A final work program report and associated products will be submitted by June 30, 1999.

X. FOR RESEARCH PROJECTS: Not Applicable.