

Minnesota Urban Small Sites BMP Manual

Stormwater Best Management Practices for Cold Climates

Prepared for the Metropolitan Council

by Barr Engineering Company

with guidance and support from **City of Minneapolis**

City of St. Paul

Minnehaha Creek Watershed District, Excelsior

Rice Creek Watershed District, Arden Hills

Six Cities Watershed Management Organization, Fridley

Printed July 2001 by Metropolitan Council Environmental Services
Mears Park Center, 230 E. 5th St.
St. Paul, MN 55101

Metropolitan Council

Chair: Ted Mondale

Director, Environmental Services: Helen Boyer

Project Coordinator: Gary Oberts

Phone: 651-602-1000

Metro information (prerecorded): 651-602-1000

Web site: www.metrocouncil.org

E-mail: data.center@metc.state.mn.us

Cover photograph: Loring Park, Minneapolis, by Kurt Leuthold

Acknowledgments

The Minnesota Urban Small Sites BMP Manual was created by Barr Engineering Company on behalf of the Metropolitan Council and the sponsoring organizations listed below. Barr extends thanks to these municipalities and agencies project management team for its support, advice and review during the course of the manual's production.

Project Management Team

Project Manager: Gary Oberts (Metropolitan Council)

Management Team Participants and Reviewers

Metropolitan Council: Gary Oberts, Jack Frost, Jim Larson, Karen Jensen

City of Minneapolis: Jodi Polzin, Jeff Lee, Paul Chellsen

City of St. Paul: Anne Weber, Mike Kassan

Minnehaha Creek Watershed District: Jim Hafner

Rice Creek Watershed District: Kate Drewry

Six Cities Watershed Management Organization: Jon Haukaas

Barr Engineering Team

Project Manager: Fred Rozumalski

Project Administrator: Charles Hathaway

Research and Writing: Erin Anderson, Diane Hellekson, Jim Merickel, Greg Wilson, Mark Wilson,
Chris Bonick

Reviewers: Kurt Leuthold, Henry Runke, Brad Lindaman

Design and Editing: Diane Hellekson, Karen Kaul

Table of Contents

Introduction	i
Chapter 1: Factors in BMP Selection	
Hydrology	1-1
Relationship of Hydrology and Watershed Management	1-8
Stormwater Pollutants	1-11
Cold Climate Concerns	1-13
Chapter 2: Selecting BMPs	
Pollution Prevention BMPs	2-1
Stormwater Treatment BMP Selection Matrix	2-3
Chapter 3: Best Management Practices	3-1
Runoff Pollution Prevention	3-3
Impervious Surface Reduction	
Street Design	3-5
Cul-de-Sac Design	3-9
Driveway Design	3-13
Parking Lot Design	3-17
Turf Pavers	3-23
Green Rooftops	3-29
Housekeeping	
Pavement Management	3-35
BMP Maintenance	3-41
Landscape Design and Maintenance	3-47
Animal Management	3-51
Construction Practices	
Grading	3-55
Sequencing	3-63
Vehicle Tracking Pads	3-69
Soil Erosion Control	
Mulches, Blankets and Mats	3-75
Vegetative Methods	3-85
Structural Methods	3-93
Sediment Control	
Silt Fences	3-105
Inlet Protection	3-113
Temporary Sedimentation Basins/Traps	3-121
Check Dams	3-131

Stormwater Treatment BMPs	3-139
Infiltration Systems	
On-Lot Infiltration	3-141
Infiltration Basins	3-155
Infiltration Trenches	3-169
Filtration Systems	
Bioretention Systems	3-181
Surface Sand Filters	3-191
Underground Filters	3-203
Filter Strips	3-213
Constructed Wetlands	
BMPs in Series	3-221
Stormwater Wetlands	3-227
Wet Swales	3-243
Retention Systems	
Wet Ponds	3-251
Extended Storage Ponds	3-267
Wet Vaults	3-281
Detention Systems	
Dry Ponds	3-287
Oversized Pipes	3-297
Oil/Grit Separators	3-301
Dry Swales	3-311
Flow Control Structures	
Permeable Weirs	3-319
Flow Splitters	3-323
Proprietary Flow Control Devices	3-331
 Chapter 4: Regulation of Water Quality	 4-1
Appendices	
A. Local Regulations	A-1
B. Local Examples of BMP Installations	B-1
C. Model Stormwater Ordinances	C-1
D. Source List	D-1

Introduction

Tools for Design

The Metropolitan Council's Smart Growth initiative is expected to result in more concentrated, more compact development within the Twin Cities metropolitan area. The Council is eager to see that small-site urban development and redevelopment help continue the improvements in lake and river quality that have occurred over the past few decades.

These water quality improvements can be sustained only if site developers and regulators have the tools to design and implement stormwater management methods that are both effective and site-appropriate. Although the Metropolitan Council is charged with protecting and improving regional water quality, it will be the metropolitan cities and watershed management organizations (WMOs) that will be directly responsible for promoting methods to achieve water quality.

This *Urban Small Sites BMP Manual* provides tools to assist Twin Cities municipalities and WMOs in guiding site development and redevelopment. The manual focuses on runoff management for small (less than five-acre) sites, and takes into account the peculiarities of stormwater management in Minnesota's climate.

First, to help explain the importance of proper stormwater management, explanatory sections focus on stormwater hydrology, pollutants and cold climate concerns. Included in Chapter 2 are guides to help developers and regulators choose the best management practices (BMPs) that will be most appropriate for the specific needs of the site.

The centerpiece of the manual, Chapter 3, is a set of 40 concise and practical stand-alone BMP sections, each illustrating a technique that makes sense in an urban small-site, cold-climate setting. Each of the BMP sections provides:

- Definition and description of the BMP
- Discussion of the BMP's means of operation
- Diagrams and information to guide design and installation
- Listing of inspection and maintenance considerations
- References for more detailed information

The final chapter of the manual gives a description of the federal, state and local regulatory considerations that urban small site designers and developers should understand.

The final chapter of the manual describes the federal, state and local regulatory considerations that urban small site designers and developers should be aware of.

Additional information is provided in the manual's appendices, which include: regulatory information for the sponsoring agencies; local BMP installation examples and contacts; sources for model stormwater ordinances; and a source list of BMP manuals and other references.

Please note that design details and recommendations given in this manual are provided only for explanation and illustration of key concepts. Not all design details are shown, and site-specific professional judgement is always required. In addition, some of the BMPs included involve efforts that may by law require permits or design by a registered design professional. No implementation of the practices in this manual should be allowed without an appropriate and demonstrated level of professional competence.