

A background image of a forest stream with a small waterfall, surrounded by green trees and foliage.

City of Columbia, Missouri Stormwater Management & Water Quality Design Manual

Presented By:

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Intuition & Logic
February 2007

INTUITION
& LOGIC

Agenda

1. Introduction
2. New Manual Development Process
 - Differences Between New Manual And Kansas City Manuals
3. Stormwater Management and Water Quality Design Manual Review
4. How the New Manual is Implemented and Used
5. Effect of Changing The Criteria
6. Questions and Discussion

INTRODUCTION

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- The application of our current stormwater requirements is resulting in:
 - Degradation of our streams and watershed water resources



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 - Degradation of our streams and watershed water resources
 - Significant future expenses in stream channel restoration, utility relocation, and other related infrastructure maintenance costs.
 - Not fulfilling or meeting citizen's expectations when they buy new homes.





Introduction

- Manual is overdue for an update.
 - Last updated in 1992.
 - City has been discussing this for years (since Phase II)
- EPA mandate

Introduction

■ Federal Requirement

"You **must develop, implement and enforce** a program to address storm water runoff from new development and redevelopment projects that disturb greater than or equal to one acre including projects less than one acre that are part of a larger common plan of development or sale that discharge into your MS4. Your program **must insure** that controls are in place that would **prevent or minimize water quality impacts**. Further you must:

1. Develop and implement strategies which include a combination of **structural; and/or non-structural best management practices (BMP)** appropriate for your community;
2. **Use an ordinance** or other regulatory mechanism to address post-construction runoff from new development and or redevelopment projects to the extent allowable under state, tribal or local law;
3. **Insure adequate long-term operations and maintenance of BMPs."**





Introduction

- How do we address these issues?
 - Don't create the problem
 - Don't add to the ones already created
- ...change development practices

NEW MANUAL DEVELOPMENT PROCESS



Manual Development Process

- Columbia Stormwater Manual Team:
 - John Glascock
 - George Montgomery
 - Tom Wellman
 - David Sorrell
 - David Nichols
 - Jerry Edwards
 - Mark Meyer
- Local knowledge, APWA 5600 Knowledge, other national standards



Manual Development Process

- What we did
 - Looked at and discussed several different manuals and information as a potential base: Denver, Georgia, Seattle, Maryland, Austin, Ontario...
 - APWA/MARC was appropriate for our state Missouri (125 miles away)

A background image of a forest stream with water flowing over rocks, surrounded by green trees and foliage.

Manual Development Process

- Benefits of APWA 5600 and MARC Q2 revision process
 - There is a standing committee in KC revising 5600 and the Q2 manual. The work on the treatment train is ongoing.
 - We will benefit from these efforts by networking with the KC committees and coordinating revisions as appropriate.

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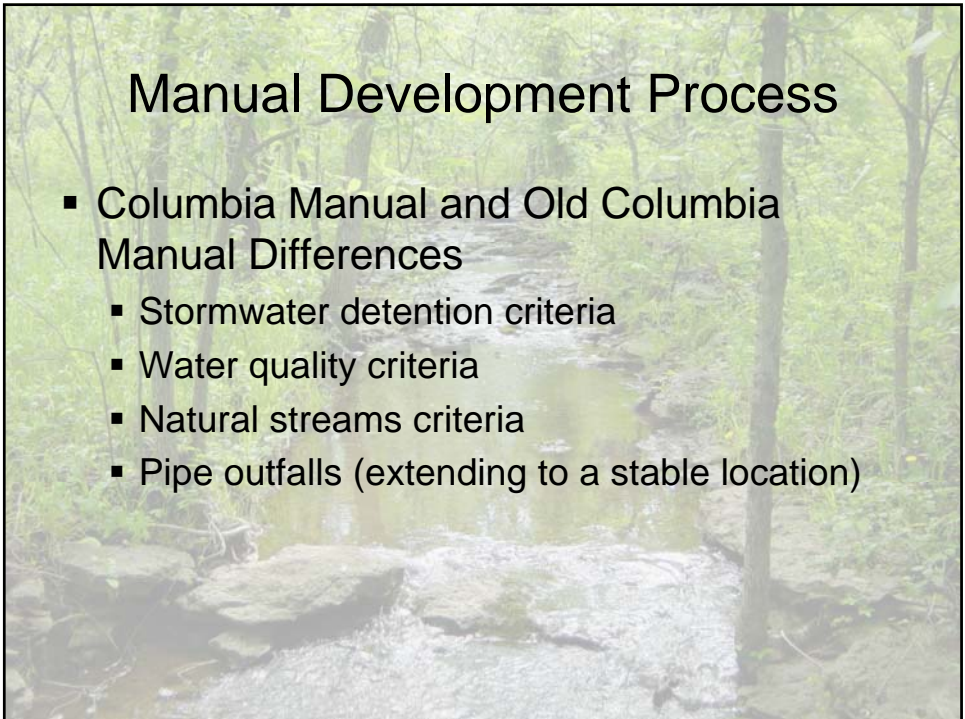
Manual Development Process

- What we did
 - Reviewed APWA/MARC word by word and revised to meet local needs.
 - Sent draft out for comment
 - Revised/Responded to comments
 - Five month process for local engineers to comment and many changes were made.



Manual Development Process

- Columbia Manual MARC Differences
 - Mostly Formatting
 - We changed the acreage limit on Rational Method
 - 100 acres and less use Rational Method
 - Reduced Water Quality Storm (to adjust to our regional conditions)
 - Reduced stream assessment requirements
 - Reduced critical shear stress requirements
 - Reduced size requirements on detention basins
 - Overflow and easements

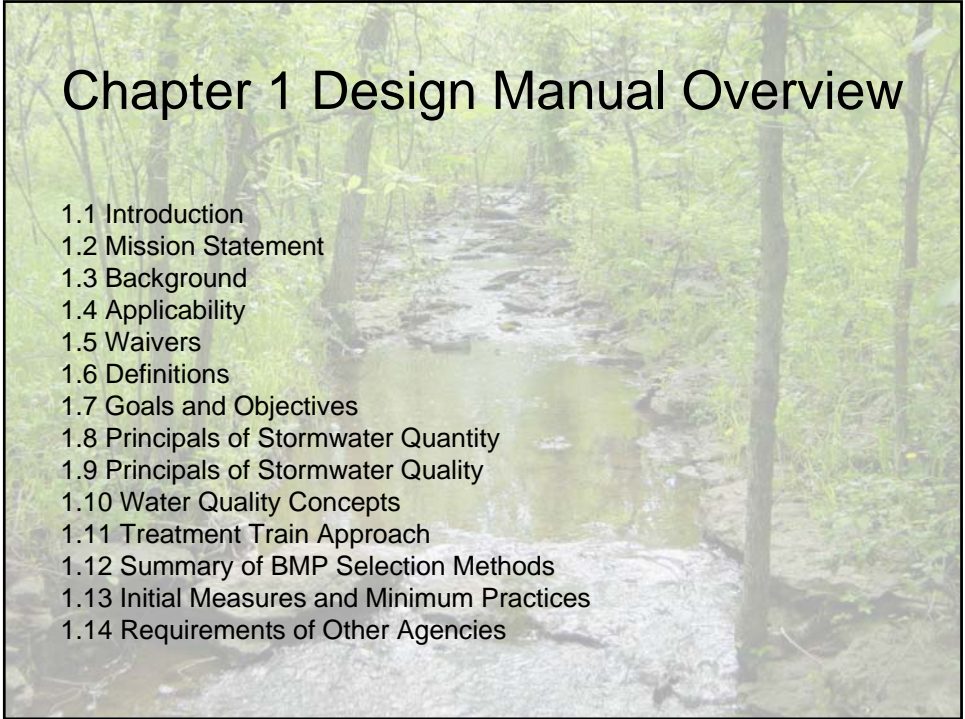


Manual Development Process

- Columbia Manual and Old Columbia Manual Differences
 - Stormwater detention criteria
 - Water quality criteria
 - Natural streams criteria
 - Pipe outfalls (extending to a stable location)



COLUMBIA STORMWATER MANAGEMENT AND WATER QUALITY DESIGN MANUAL REVIEW



Chapter 1 Design Manual Overview

- 1.1 Introduction
- 1.2 Mission Statement
- 1.3 Background
- 1.4 Applicability
- 1.5 Waivers
- 1.6 Definitions
- 1.7 Goals and Objectives
- 1.8 Principals of Stormwater Quantity
- 1.9 Principals of Stormwater Quality
- 1.10 Water Quality Concepts
- 1.11 Treatment Train Approach
- 1.12 Summary of BMP Selection Methods
- 1.13 Initial Measures and Minimum Practices
- 1.14 Requirements of Other Agencies

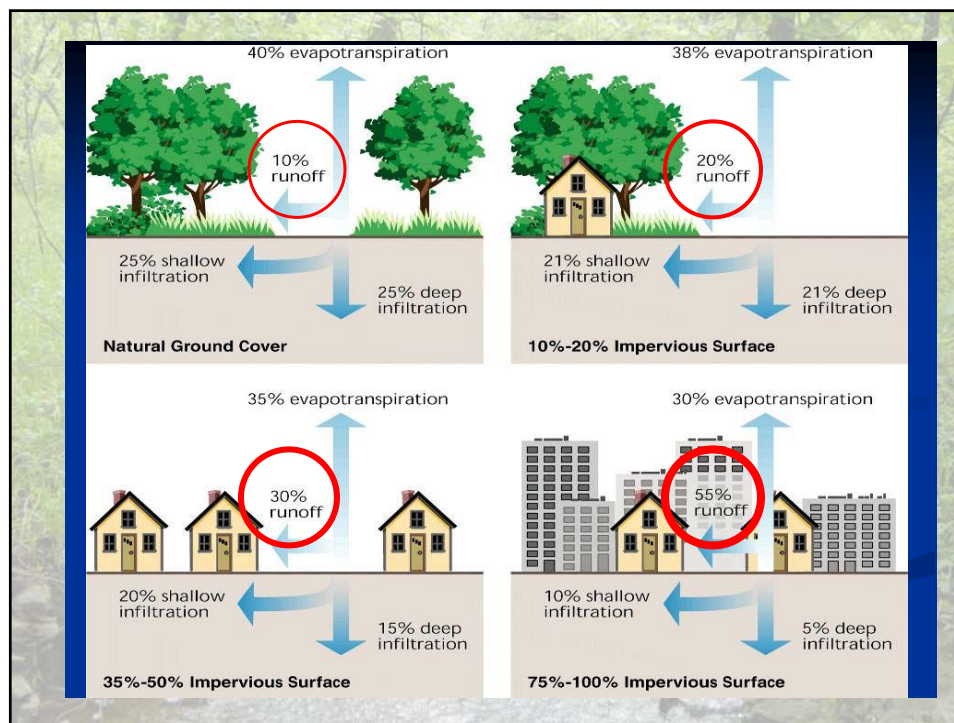


Chapter 1 Design Manual Overview

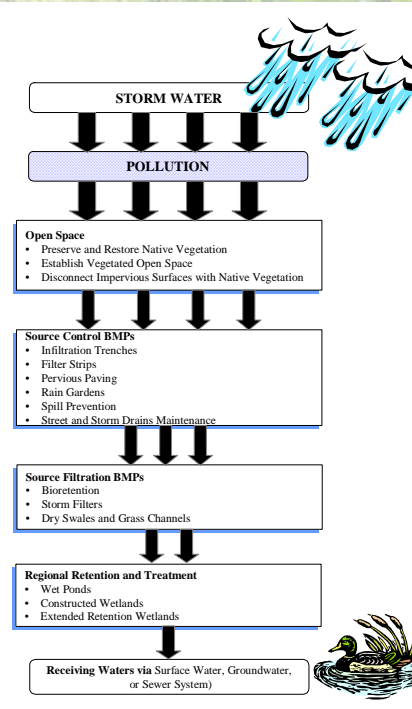
The mission of the City of Columbia Stormwater Management Ordinance and the Stormwater Management and Water Quality Manual is to protect the quality of life by producing the least amount of stormwater runoff as possible and by protecting those natural resources necessary for watershed health and integrity.

Chapter 1 Design Manual Overview

- Streams are an asset to the community and should be regarded as such.
- The presence and protection of natural resources is fundamental to the quality of life of the citizens of Columbia and every facet of the stormwater system must recognize this.
- The best method of management is to preserve, restore and mimic natural processes.
- One of the best ways to manage stormwater runoff is to generate as little as possible and treat stormwater as near the source as possible.

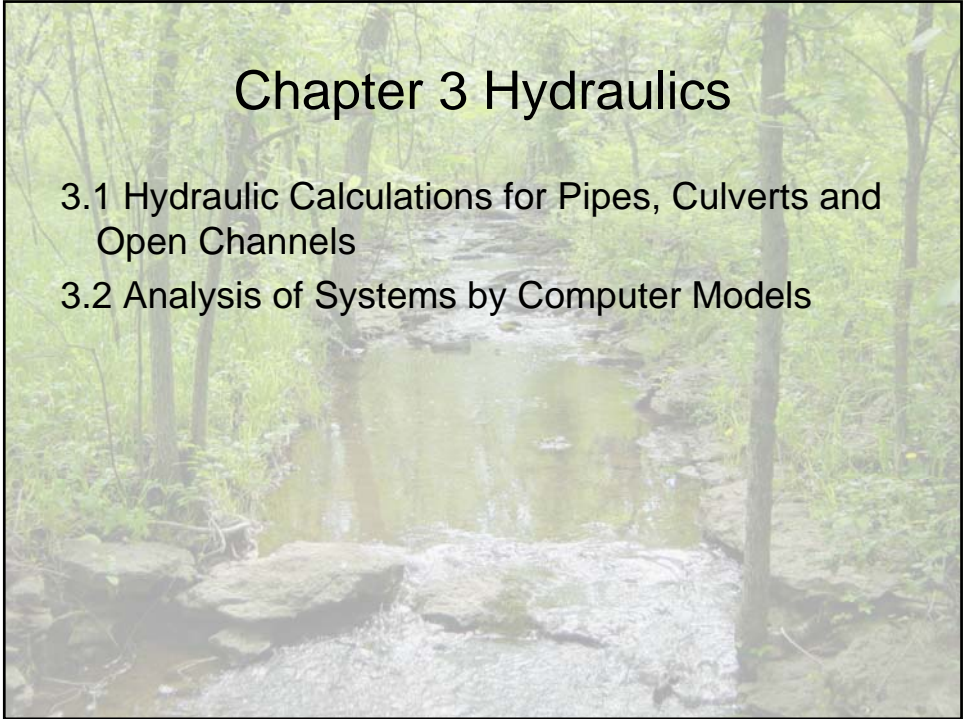


- Treatment Train
 - Open Space
 - Source Control BMPs
 - Source Filtration BMPs
 - Regional Retention
 - Receiving Waters



Chapter 2 Hydrology

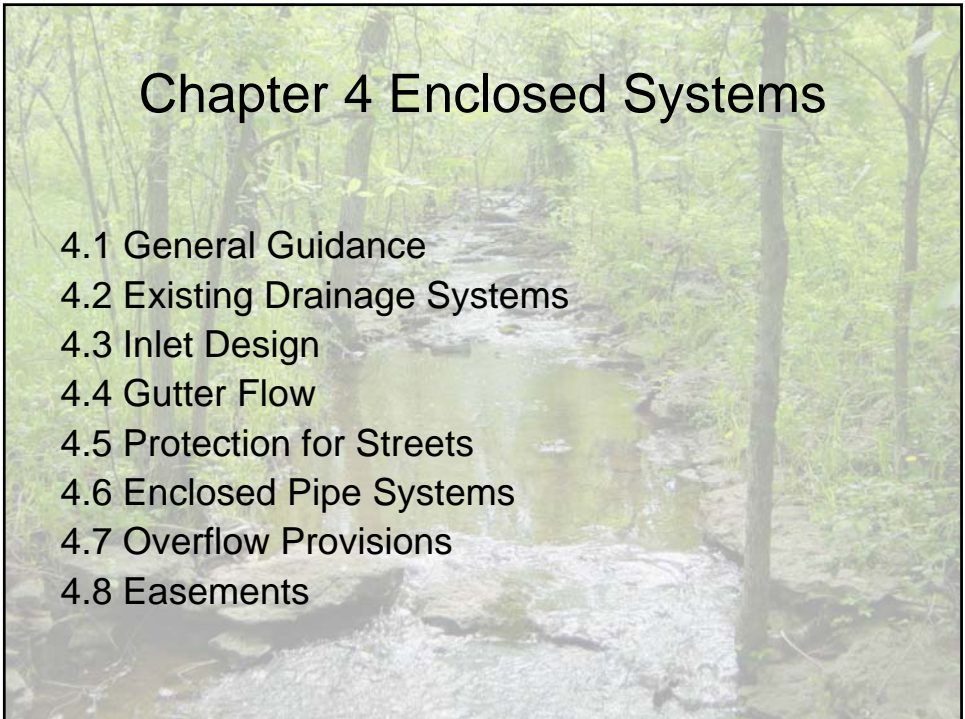
- This section sets forth the hydrologic parameters to be used in computations to determine **volumes and peak rates of storm water runoff**.
- Two methods can be used to estimate the WQv for a proposed development
 1. the Short-Cut Method for sites with one predominant type of cover and a drainage area less than 10 acres
 2. Small-Storm Hydrology Method



Chapter 3 Hydraulics

3.1 Hydraulic Calculations for Pipes, Culverts and Open Channels

3.2 Analysis of Systems by Computer Models



Chapter 4 Enclosed Systems

4.1 General Guidance

4.2 Existing Drainage Systems

4.3 Inlet Design

4.4 Gutter Flow

4.5 Protection for Streets

4.6 Enclosed Pipe Systems

4.7 Overflow Provisions

4.8 Easements

Chapter 5 Open Channels

5.1 Natural Streams

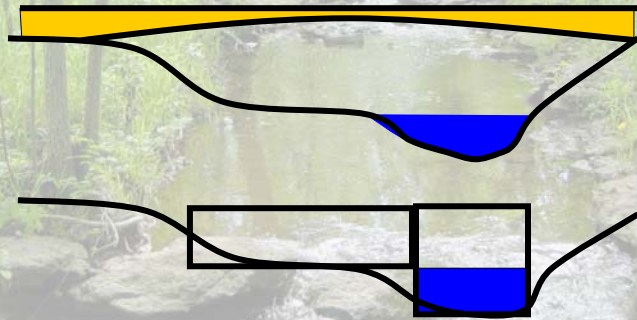
5.2 Engineered Channels

Chapter 5 Open Channels Natural Streams

Stream Section Shape



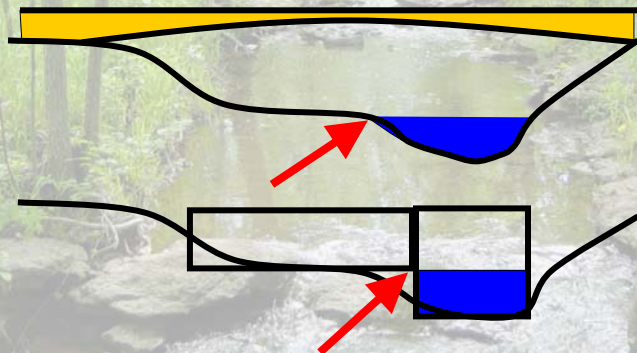
Chapter 5 Open Channels Natural Streams



Stream Section Shape

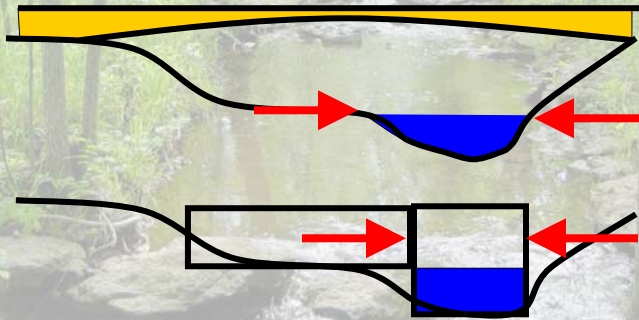
Chapter 5 Open Channels Natural Streams

Bank Full Elevation



Chapter 5 Open Channels Natural Streams

Bank Full Width



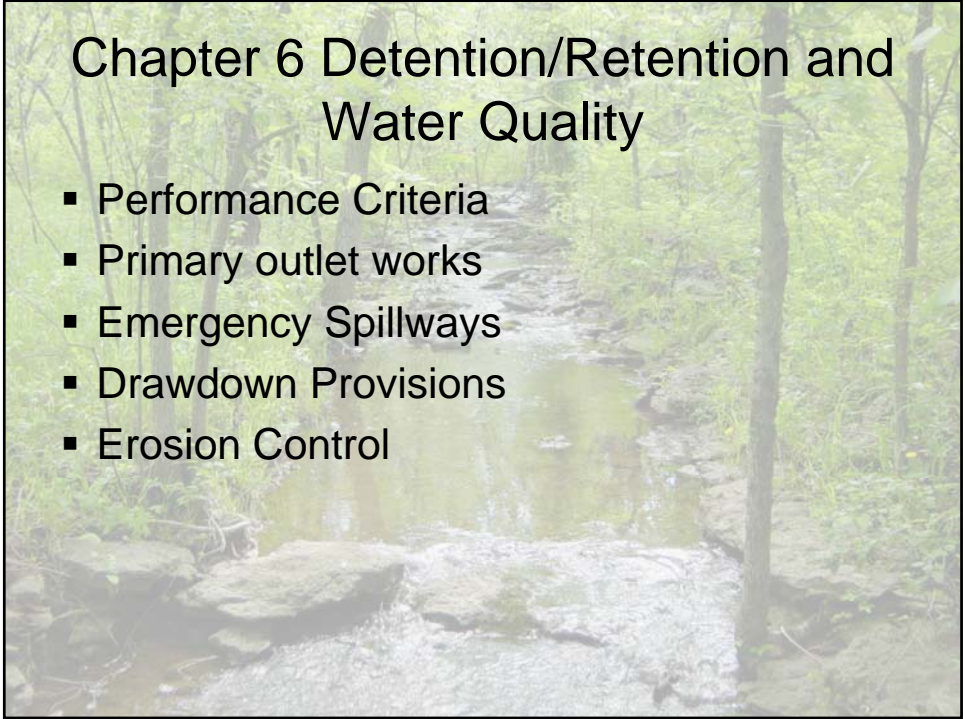






Chapter 5 Open Channels Engineered Channels

- Design Storm
- Velocity
- Freeboard
- Channel lining
- Lining Material
- Channel Side Slopes
- Alignment Changes
- Vertical Wall Channels
- Energy Management



Chapter 6 Detention/Retention and Water Quality

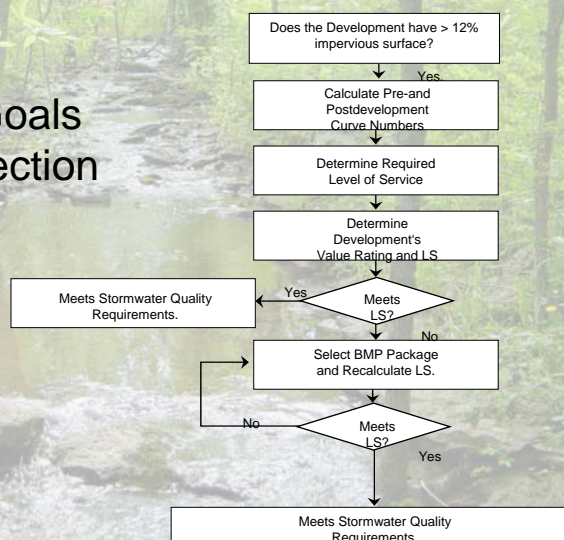
- Performance Criteria
- Primary outlet works
- Emergency Spillways
- Drawdown Provisions
- Erosion Control

Chapter 6 Detention/Retention and Water Quality

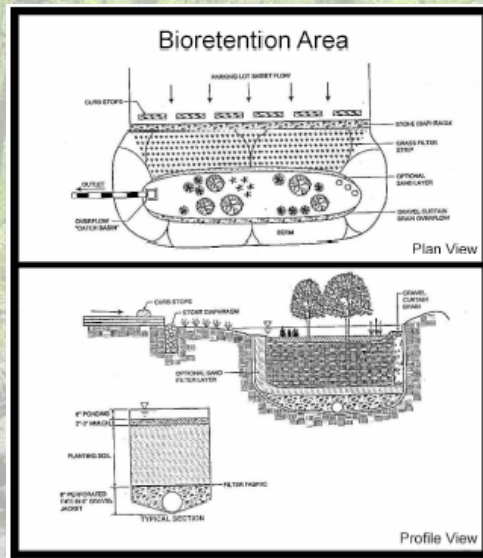
- Wet Basins
- Dry Basins
- Rooftop Storage
- Parking lot Storage
- Other Storage

Chapter 6 Water Quality

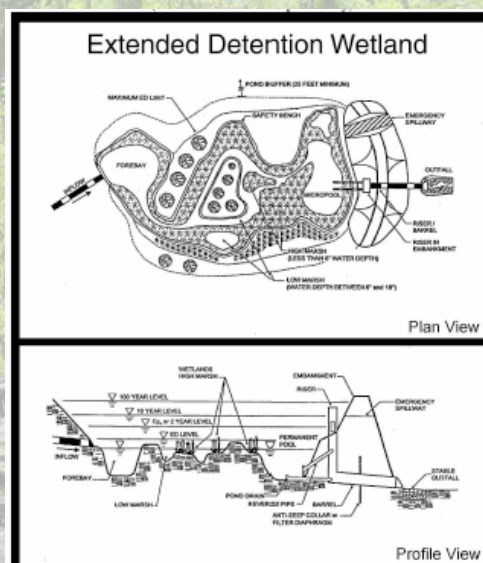
Water Quality Goals and BMP Selection



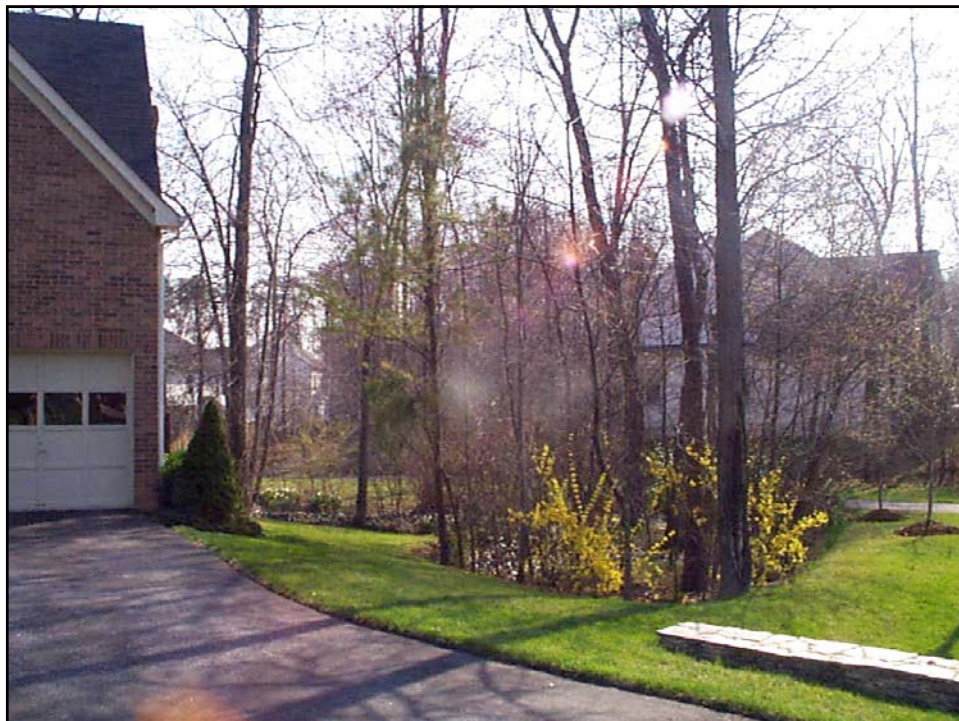
Chapter 6 Water Quality



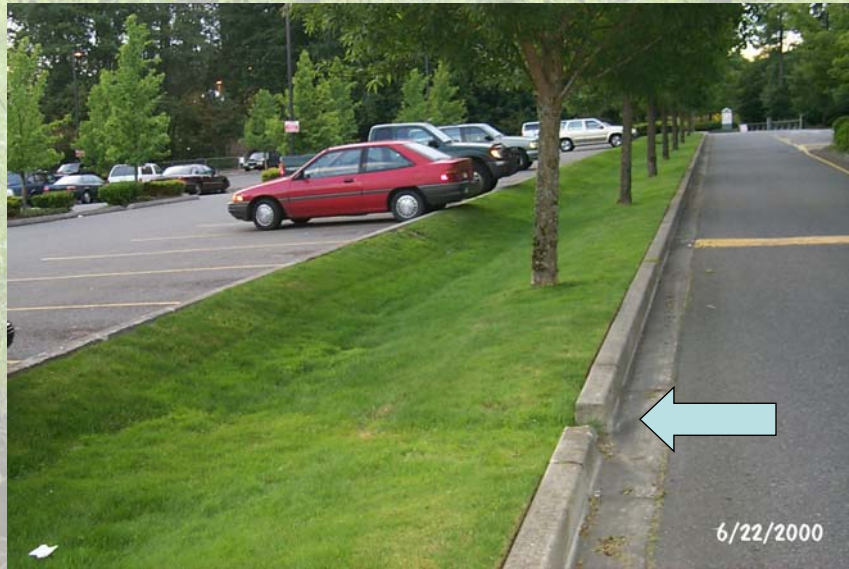
Chapter 6 Water Quality



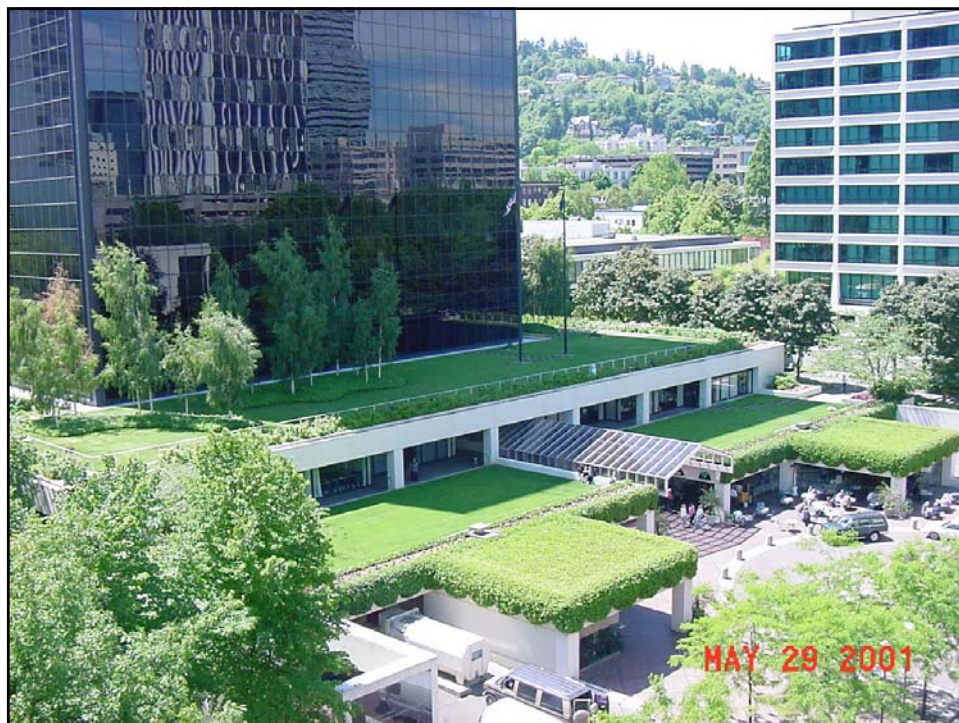




Vegetated Conveyance









Remaining Sections

- CHAPTER 7 PLAN REQUIREMENTS
- REFERENCES
- APPENDIX A GENERAL GUIDANCE FOR NON STRUCTURAL BMPs
- APPENDIX B GENERAL GUIDANCE FOR STRUCTURAL BMPs
- APPENDIX C ADDITIONAL BMP DESIGN GUIDANCE
- APPENDIX D RECOMMENDED PLANT MATERIALS
- APPENDIX E STANDARD SPECIFICATIONS
- APPENDIX F TABLES AND FIGURES

**HOW THE NEW MANUAL IS
IMPLEMENTED AND USED**



Implementation and Use

- How is the new manual implemented?
 - Amending Chapter 12A of the City Code as it relates to land preservation and stormwater management.
 - That is what the Council will be adopting. It approves the Manual for usage, among other things
 - The plan is to have the ordinance effective on June 4th ,2007.



Implementation and Use

- Sec. 12A-86. Purpose.
 - The purpose of this article is to establish minimum stormwater management requirements and controls to protect and safeguard the general health, safety and welfare of the public.



Implementation and Use

- Sec. 12A-87. Applicability.
 - This article shall apply to all developments and redevelopments that alter the surface of the land, including but not limited to, pavement, buildings and structures with the following exceptions: ...



Implementation and Use

- Sec. 12A-88. Stormwater management plan required.
- Sec. 12A-89. Stormwater pollution prevention plan required.
- Sec. 12A-90. Stormwater management performance standards.

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Implementation and Use

- Sec. 12A-91. Stormwater Management and Water Quality Manual.
 - The city council approves the Stormwater Management and Water Quality Manual prepared by the public works department dated January, 2007. The director is authorized to revise the Water Quality Manual periodically as advances in stormwater control practices evolve. All such revisions must be consistent with the provisions of this article.

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Implementation and Use

- Stormwater Management and Water Quality Manual Use:
 - It is a technical document to be used by design engineers
 - Staff is committed to meeting with local engineers on an ongoing basis to make further changes to the manual to meet the needs of all parties.

EFFECT OF CHANGING THE CRITERIA

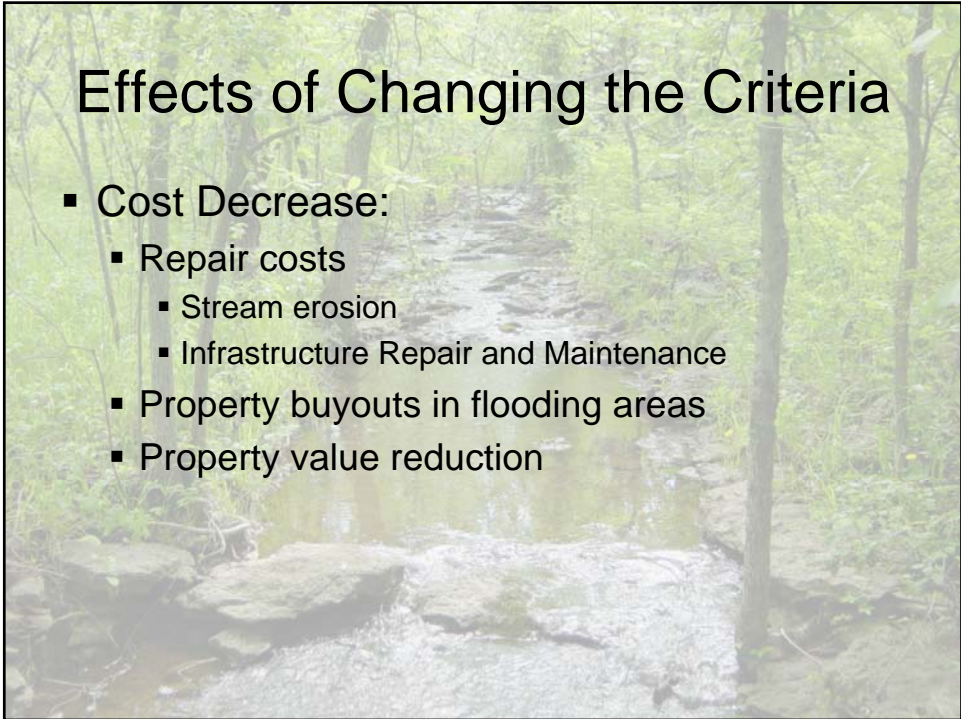
Effects of Changing the Criteria

- Who else is doing this in Missouri?
 - Kansas City, St. Louis, Springfield, Jefferson City
- How has it affected other communities?
 - They all seem to be doing well
 - Austin, Baltimore, Denver, Seattle, Atlanta, Kansas City...
 - It appears that after the initial change was made, the reaction has been to continue to add to, modify and strengthen their manuals.



Effects of Changing the Criteria

- Cost Increases:
 - Increased up front capital costs for design and construction equates to increased upfront cost for the buying/leasing public
 - Increased regular maintenance costs



Effects of Changing the Criteria

- Cost Decrease:
 - Repair costs
 - Stream erosion
 - Infrastructure Repair and Maintenance
 - Property buyouts in flooding areas
 - Property value reduction



Effects of Changing the Criteria

- 5.3 million dollars allocated to fix stormwater problems
 - Only to address the most severe flooding problems
 - ...This money was ALSO allocated to quit creating new problems

QUESTIONS AND DISCUSSION

Questions

- Why did we combine the Manuals?
 - Simplify
 - KC didn't because it is for a 7 county region. We don't have to separate sections (many in KC wish they could have combined the manuals
 - St. Louis county put water quality in with detention
 - Both manuals are being adopted in the KC area.



Questions

- Why not address Quantity only? Do we need to address water quality? Water quality is the big cost driver.
 - Water quantity (detention) and the stream buffer are the big cost drivers. The water quality is not a huge cost driver
 - Once the detention is in, adding water quality is not a big deal.
 - The sample site is a good example: the detention basins took out two lots



Questions

- Why don't we include everyone in the standards, not just urban developments?
 - The EPA Phase II regulations exempt agricultural activities. While we all recognize that agricultural activities can and do have watershed impacts over the natural conditions their impact is a good deal less than when urbanization rolls through. Hence the Phase II regulations apply to new developments.

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Questions

- Applying this new ordinance to only new development is unfair. Why do existing homeowners get a pass?
 - Existing homeowners are getting a free pass is not totally correct. Here's why. When our stormwater utility was approved in the early 1990's all property owners were and still are charged a monthly utility fee. Those fees, commingled with development charges, assessed at the time of a building permit for a new structure are used to fix preexisting, known problems.

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Questions

- Problem is we continue to create new problems because our stormwater manual is inadequate. So we need a new design manual to "stop the bleeding".
- This, then is a two pronged approach,
 1. everyone is assessed so existing problems can be corrected and
 2. new design standards are put into place for new development so that new problems are not created.



Questions

- This is the exact same approach used by the Vandiver Committee in 1960 and 1961 when they tackled the problem of bad streets and high street maintenance costs in Columbia. They developed proper street design standards for all new streets and implemented a funding strategy (tax billing) to repair all the existing bad streets. What we have here with stormwater is history repeating itself.



Questions?