Flexible Treatment Options Conclusions

May 18, 2012

MIDS Work Group Meeting

Presentation Outline

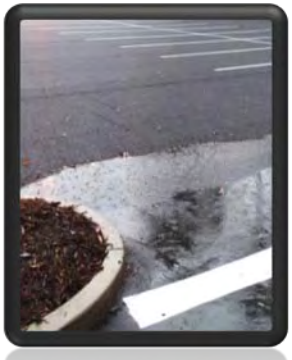
- Goal: Prepare for vote on performance goal for new developments with restrictions
  - Review past presentations
  - Address a few comments from last meeting

Background:
Performance Goal

"For new, nonlinear developments that create more than one acre of new impervious surface on sites without restrictions, stormwater runoff volumes will be controlled and the post-construction runoff volume shall be retained on site for 1.1 inches of runoff from impervious surfaces statewide."

1.1 inch

X



Flexible Treatment Considerations

- Objective for sites with restrictions is to still meet antidegradation requirements

Adoption of the MIDS package is a path to compliance with antidegradation

- MPCA's alternative analysis approach (draft) can provide a roadmap for evaluating flexible treatment options

Antidegradation Guiding Principals

No net increase in Volume, TP, TSS loading by

(1) use of volume control measures; or if not feasible, then

(2) avoiding, minimizing, mitigating, trading.

"Feasible"

Antidegradation Alternatives Analysis

Minnesota Pollution Control Agency

- Capable of being done with existing technology;
- In accordance with acceptable engineering standards;
- Consistent with reasonable public health, safety, and welfare requirements;
- Legally possible; and
- Has supportive governance that can be successfully put into practice to accomplish the task.

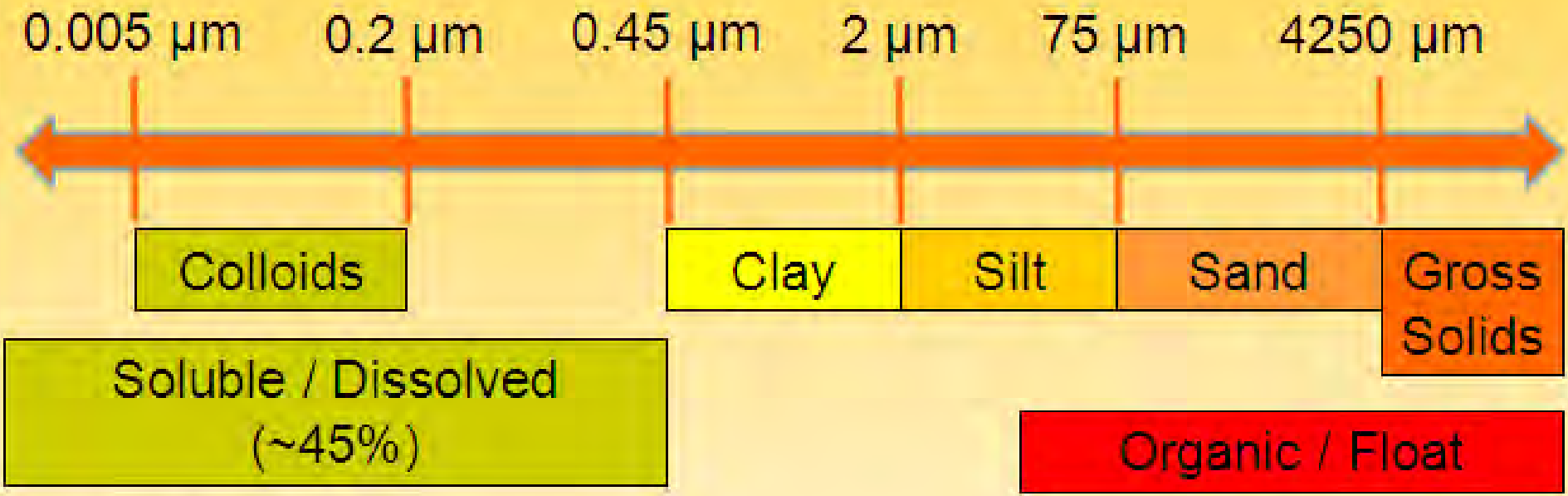
"Prudent"
(in context of antidegradation alternatives analysis):

- Selected with care and sound judgment
- Does not have unusual or extraordinary economic, social, or environmental costs

Background on "prudent" and "feasible" BMPs and their performance

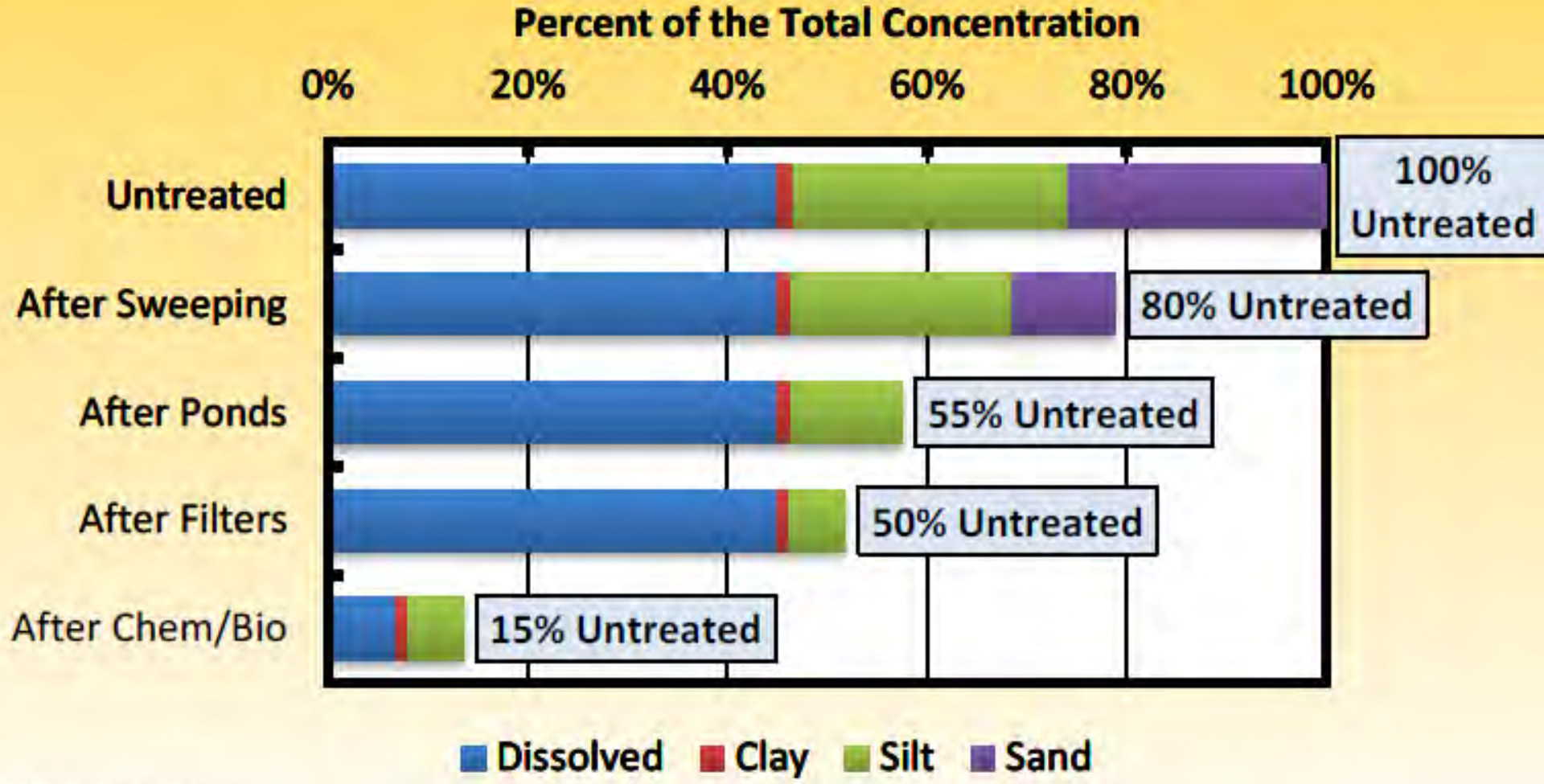
- Different BMPs remove different particle sizes & the pollutants attached to those particles
- Volume reduction BMPs remove pollutants from entire particle size spectrum
- Especially significant with phosphorus
  - Dissolved phosphorus difficult to remove

Pollutant Spectrum



- Varies by:
  - Pollutant
  - Location in management system

Treatment Train



NOTE: Estimated Values.

Refresher

- Of the phosphorus in stormwater, ~55% is particulate and ~45% is soluble (dissolved)
- Many BMPs only address particulate P
- To achieve >55% TP removal, few BMP options are available
  - Volume-reducing BMPs
  - Enhanced filtration (e.g., iron)
  - Additives (e.g., alum)

Refresher

"Because dissolved phosphorus has a higher bioavailability factor than particulate forms (Sharpley et al., 1992), removing only particulate fractions from stormwater only minimally reduces phosphorus bioavailability."

Performance Assessment of an Iron-Enhanced Sand Filtration Trench for Capturing Dissolved Phosphorus, Authors: Erickson, Andrew J. and Gulliver, John S.

Big Question:

Only non-infiltration, volume control BMPs (e.g., green roofs, re-use) and BMPs that manage dissolved phosphorus (e.g., enhanced filtration) can achieve similar treatment results on sites with restrictions.

Is requiring these BMPs prudent and feasible?

Yes

- Performance goal for sites with restrictions can be "provide equivalent TP removal"

No

- How much treatment is enough?

Clay Soil Site No. 3:
BMP = 2.0" off Impervious, Iron-Enhanced

Comparison[1]

	Volume Control 1.1”	Clay Site #1 1.1” No Iron	Clay Site #2 1.1” with Iron	Clay Site #3 2.0” with Iron
BMP % of Site	5%	5%	5%	8%
% Annual Volume Retained	90	0	0	0
% TP Removal	90	65	80	90
% DP Removal	90	0	70	80
% TSS Removal	90	80	80	90

1 Rough estimates for comparison purposes only

Example Site: 50% Impervious

BMP = Grassed Swale with Checks and Amended Soils to Biofiltration Basin

TP % Reduction	75/90
DP% Reduction	30/75
TSS% Reduction	96/98

Example Site:

14.2 acres, 80% impervious, Assume Clay Soils

TP % Reduction	**77**
DP% Reduction	**60**
TSS% Reduction	**84**
BMP Area % of Site	**7**
BMP % of Construction Cost*	**0.3**
Maintenance Cost	**$3,200**

Photo: Bing.com

* Doesn't include cost of reduced parking

Example Site:
14.2 acres, 80% impervious, Assume Clay Soils

TP % Reduction	82
DP% Reduction	60
TSS% Reduction	80
BMP Area % of Site	7
BMP % of Construction Cost*	0.7
Maintenance Cost	$8,000

Photo: Bing.com

* Doesn't include cost of reduced parking

Refresher

- Achieving 75% TP removal on a restricted site is feasible, but fewer BMP options are available
- Treatment train is helpful
- Calculator is a tool to estimate reductions
- Removals in calculator will be revised based on feedback/science

Refresher

- To match loading from natural D soil sites, need >87% TP removal
- Performance goal at non-restricted A-, B-, C-soil sites results in 87-92% TP removal
- To address stream, shallow lake, and lake standards in Twin Cities, need 67-92% TP removal

March meeting

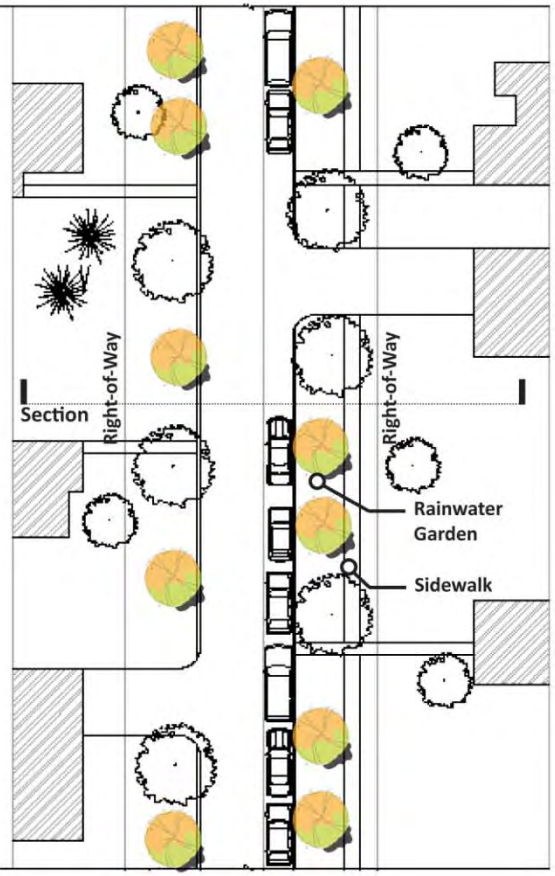
- What about sites with less imperviousness?

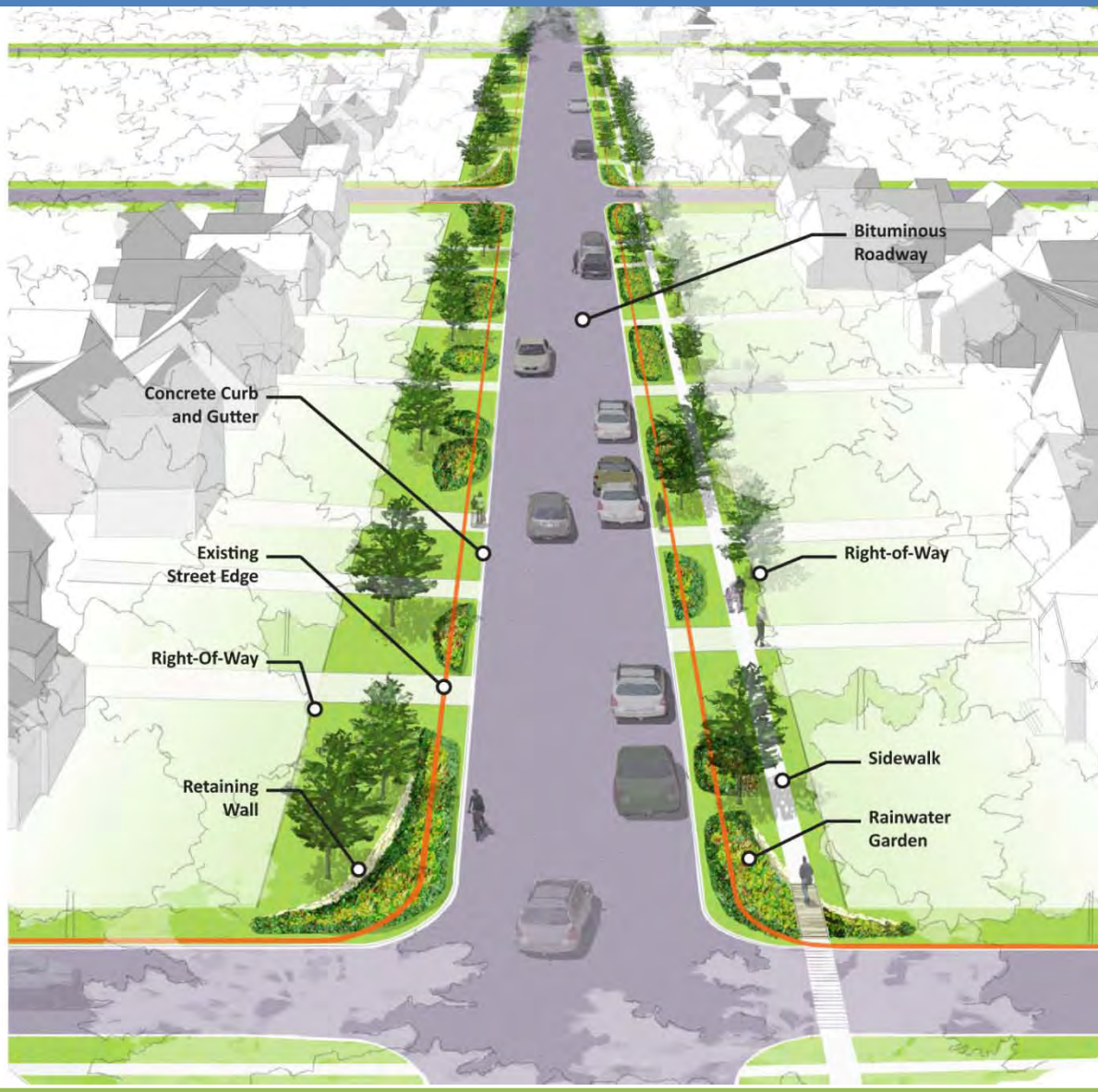

DELINEATED WETLAND
100-YR FLOOD ELEVATION
EXISTING WETLAND
BARLEY
SOIL TYPE
DRAINAGE DIVIDE
HIGHWAY
CORN
100-YR FLOOD ELEVATION
DELINEATED WETLAND
EXISTING WETLAND
BARN
LAWN
HOUSE
GRAVEL DRIVE
FARMSTEAD
DRAINAGE DIVIDE
SOIL TYPE
SOYBEANS
EXISTING
0
100
SCALE IN FEET


DELINEATED WETLAND
100-YR FLOOD ELEVATION
EXISTING WETLAND
SOIL TYPE
DRAINAGE DIVIDE
POND
HIGHWAY
100-YR FLOOD ELEVATION
DELINEATED WETLAND
EXISTING WETLAND
OPEN SPACE
RAINWATER GARDENS
SOIL TYPE
DRAINAGE DIVIDE
PROPOSED
0
100

A Retrofit Example
Burnsville Rainwater Garden Layout

Maplewood Example



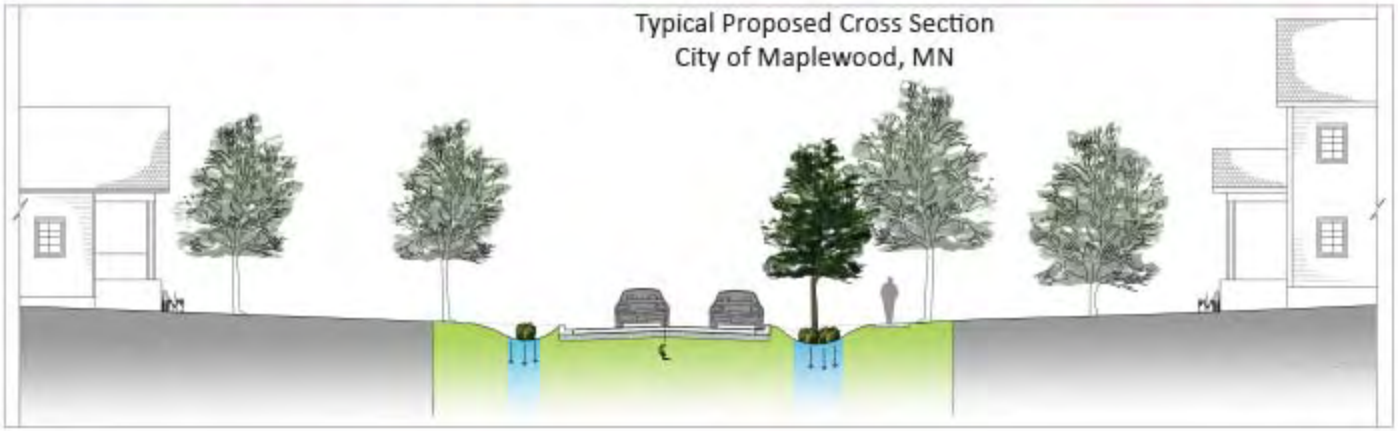


BARR

Residential Street Improvement Concept

05/14/2012

Maplewood Example



Legend

- Existing Tree
- Existing Curb Face
- Proposed Boulevard Landscaping
- Proposed Tree

Street Layout - Concept
Bartelmy-Meyer Area Street Improvements
Maplewood, Minnesota
Prepared by Barr Engineering - 11/03/2011

Site Development/Redevelopment Planning

Better Site Design (as feasible)

Assess Potential

Infiltration +
Reuse/Harvest +
Evapotranspiration

Site Full Performance Goal Achievement

- **New Development = 1.1 inch from IC**
- **Redevelopment = TBD**
- **Linear = TBD**

Site Restrictions as determined by Local Units of Government
Flexible Treatment Options

Partial Volume Control

Traditional + Treatments

Municipal-Wide Practices Tabulated Separately

Flexible Treatment - Mix and Match
75 % reduction in total phosphorus

- Ponds: No volume, up to 50% TP
- Infiltration: Volume up to ~20% + TP credits
- Biofiltration: Volume up to ~40% + TP credits
  - Enhanced iron sand filters (highly efficient removal of Soluble P – up to 85% P removal)
- Reuse – Case specific
- Evaporation (trees – TBD)
- Cumulative stormwater network treatment
  - Buffers, rate controls, sequencing BMPs
- Offsite Mitigation

Findings
During Performance Goal Development

Minnesota Pollution Control Agency

- Developed sites without BMPs produce ~2-4 times the average annual runoff volume of native conditions
- Volume control BMPs controlled the 1-year 24-hour peak rates for most scenarios

Minimal Impact Design Standards

Stormwater Performance Goals

Credits

Community Assistance Package

Simple Calculator for a Menu of Techniques

Stormwater Management

Low Impact Development
(and redevelopment/retrofits)

Performance Goal Options for Sites with Restrictions

- Option A – Achieve 75% removal of the annual TP load
- Option B – Draft Antidegration Approach (issues)
- Option C – Provide stormwater volume runoff control to the greatest extent feasible (and at least 0.6 inches times the new impervious surfaces), and phosphorus control in an amount equivalent to that which would be achieved through volume control of 1.1 inch times the site's new impervious surfaces

Option B: Antidegradation Approach Issues

- Local unit prepares antideg evaluation plan as part of SWPPP
- Establish Lower Treatment Bound (e.g.,~50% TP removal - ponds)
- If cannot mitigate, minimize to remove at least 50%, then subject to antideg review and approval (socio-economic analysis), public notice etc.
  - ? Review by Local Unit or MPCA (likely MPCA would have to review based on BW's read of the draft rules)